

CITY OF WEST PALM BEACH, FLORIDA



WEST PALM BEACH

**CITY OF WEST PALM BEACH
PILGRIM ROAD AND PLYMOUTH ROAD
WATER, SEWER AND DRAINAGE
IMPROVEMENTS**

CTA Project # 22-0048-001-01

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**CITY OF WEST PALM BEACH
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PROJECT: PILGRIM ROAD & PLYMOUTH ROAD

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SUMMARY OF WORK

PART 1 - GENERAL

1.01 PROJECT

A. This Project consists of:

- The base bid consists of Water Main replacement, Gravity Sanitary Sewer Main replacement, Drainage installation, and Roadway Restoration, preparation and implementation of Maintenance of traffic Plan(s), coordination with franchise utilities, and Traffic Engineering, and all else necessary for a complete and functional project that meets or exceeds all requirements of the City of West Palm Beach Services and Utility Department.

Pursuant to the installation of the Infrastructure Improvements located both in the public Right-of-Way and private property, including landscaping, driveways, pavement, curbing, sidewalks, fences and other miscellaneous items, shall be restored to their original condition or better.

Working Hours shall be between 8 am to 5 pm Monday thru Friday unless otherwise approved by the OWNER.

This Projects Construction Improvements are indicated on the Plans, Details, Specifications and Contract Documents for this project.

1.02 WORK DESCRIPTION

A. Civil Work:

Civil work includes, but is not limited to; mobilization, maintenance of traffic, utility locations, site clearing, tree removal/relocation, earthwork, potable water line installation/construction, water services, sewer services, drainage installation, roadway restoration, curb and gutter restoration, and sidewalk restoration along with incidental work and items necessary to complete the project as shown on the Drawings and specified.

1.03 GOVERNING STANDARDS

A. In carrying out the Work, CONTRACTOR shall comply with all basic materials and construction requirements as shown on the Drawing and specified herein and with all notes and details shown on the Drawings, with Schedules, Supplemental Specifications, Technical Specifications, and specific requirements relating to construction activities.

1.04 COMPENSATION

- A. The CONTRACTOR's compensation for providing all labor, materials, equipment and performing all construction and installation as shown on the Drawings and included in the Specifications will be in accordance with the provisions of Section 01024 herein.

END OF SECTION 01010

SECTION 01024

MEASUREMENT AND PAYMENT

1.01 GENERAL

- A. The CONTRACTOR shall receive and accept the compensation provided in the Proposal and Contract as full payment for furnishing all materials, labor, tools and equipment, for performing all operations necessary to complete the work under the Contract, and also in full payment for all loss or damages arising from the nature of the work, or from the action of the elements or from any unforeseen difficulties that may be encountered during the prosecution of the work until final acceptance by the OWNER.
- B. Payment for the various items of the Bid Form shall constitute full compensation for CONTRACTOR's superintendent at the job site full-time during furnishing and installing all components of the proposed infrastructure improvements including but not limited to furnishing and installing all pipe and structures' complete in place including but not limited to bends, tees, outlets, fittings, blind flanges and specials, including connections to existing pipelines shown on the Drawings; including surveying both horizontal and vertical control for construction of the structures, pipeline and appurtenances; including all earthwork, trench excavation as shown on the Drawings, removal and disposal of waste, unsuitable and excess material, furnishing and installing pipe bedding material, all backfill and compaction of native material, and dewatering as required; including potholing to verify locations of existing utilities in advance of construction; the restoration of interfering portions of existing service and utility lines that are not included in other bid items and shown on the Drawings, restraint of pipe shown the on the Drawings and grouting of pipe joints; including providing the water for pressure testing; furnishing, installation, and removal of test heads, cleanup, and restoration of all improvements incidental to construction for which there are no other bid items; including but not limited to, sprinkler systems, drainage systems, guardrails, landscaping, fences, curbs and gutters, and all other work not included in other bid items.
- C. The prices stated in the 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 Drawings and specified herein. The basis of payment for an item at the price shown in the proposal shall be in accordance with the description of that item in this Section.
- D. 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 determine that the Proposal or list of Bid Items has not established a price for some item of work; the

CONTRACTOR shall include that work in some other applicable Bid Item, so that the Proposal for the project reflects the CONTRACTOR's total price for completing the work in its entirety.

- E. CONTRACTOR is advised that bid items may be deleted if not required. No compensation will be made for deleted/not used bid items.
- F. If a bid item unit quantity within the Bid Form is exceeded, CONTRACTOR shall notify OWNER and ENGINEER. Payment for improvements/work exceeding any bid item unit quantity within the Bid Form shall be approved by the OWNER and ENGINEER.

1.02 MOBILIZATION (Bid Item No. 1)

A. Description.

Perform preparatory work and operations in mobilizing for beginning work on the project, including, but not limited to, bonds and insurance, those operations necessary for the movement of personnel, equipment, supplies, and incidentals to the project site and for the establishment of temporary offices, buildings, safety equipment and first aid supplies, and sanitary and other facilities. Include any other preconstruction expense, including pre construction videography, protection of existing trees with tree barricade, issue/provide door hangers to affected residents in order to make them aware of proposed construction activities, construction water, coordination with franchise utilities including holding of utility poles during construction, necessary for the start of the work, excluding the cost of construction materials.

B. Basis of Payment.

The work and incidental costs specified as being covered under this Section will be paid for at the Contract lump sum price for the item of Mobilization.

C. Mobilization Payments:

The pay item for Mobilization will be made in partial payments in accordance with the following:

Percent of Original Contract Amount Earned	Allowable Percent of the Lump Sum Price for the Item*
10%	25%
25%	50%
50%	75%
100%	100%

*Mobilization pay item will be limited to 7.5% of the original Contract amount for the project. Any remaining amount will be paid upon

completion of all work on the project.

The standard retainage will be applied to these allowances. Partial payments made on this item will in no way act to preclude or limit any of the provisions for partial payments otherwise provided for by the Contract.

1.03 INSURANCE BONDS (Bid Item No. 2)

- A. Payment for performance and payment guaranty and insurance will be made at the lump sum price named in the Bid Form. The CONTRACTOR may request payment for this bid item after the Initial Notice to Proceed has been issued.
- B. Bonds and Insurance are limited to 3% of the Total Bid Items. Any amount in excess of 3% will be moved to Bid Item No. 1, Mobilization, however, the total bid amount will not change. The 3% ceiling on Bonds and Insurance is not responsiveness, just an instruction on the amount the OWNER will pay for Bonds and Insurance.

1.04 MAINTENANCE OF TRAFFIC (Bid Item No. 3)

- A. See Maintenance of Traffic Section 01570, and all other references to traffic control in this document and any regulatory requirements.
- B. Lump sum price named in the Bid Form shall include the preparation and processing of Maintenance of Traffic Plans for approval by City of West Palm Beach, including a Florida Licensed Professional Traffic Engineer preparing the MOT plans. No lane closures during Holiday periods.
- C. Payment for maintenance of traffic will be made at the lump sum price named in the Bid Form. Payment for maintenance of traffic will be made in equal monthly amounts during the duration of the contract time.

1.05 AUDIO VIDEO DOCUMENTATION (Bid Item No. 4)

- A. The CONTRACTOR's bid lump sum price shall include all labor, materials, equipment, and incidentals necessary to produce and submit the audio-video documentation in accordance with Specification Section 01320 (all requirements under Section 01320 fall under this bid item).
- B. Payment for Bid Item 4 will be made in equal monthly amounts throughout the duration of active construction.

1.06 PROJECT RECORD DOCUMENTS (Bid Item No. 5)

- A. See Field Engineering Section 1050 and Engineers As-built requirements on General Notes & Specifications Sheet C-2.

- B. Lump sum price named in the Bid Form shall include the preparation of as-builts signed and sealed by a State of Florida Licensed Land Surveyor and revisions to as-builts per ENGINEER/OWNER/GOVERNMENTAL AGENCIES comments.
- C. As-builts in pdf format shall be submitted for the following: each pay application and prior to water main disinfection and prior to drawing water from existing water mains for sample points/bacteriological testing.
- D. Payment shall be made on percentage of As-built documentation complete.

1.07 UTILITY LOCATES (Bid Item No. 6)

- A. The CONTRACTOR's bid lump sum price shall include full compensation for labor, materials, equipment and incidentals necessary to locate and trace the underground utility lines using electromagnetic (EM), ground penetrating radar (GPR), and test holes to confirm the location of existing underground utilities that may pose a conflict or otherwise impact this Work. Conflicts may be determined as shown on the plans and/or observed in the field. The CONTRACTOR shall be responsible to locate all buried pipelines, power, sanitary and telephone and control utilities. This work also includes marking the located lines with the appropriate colors and performing soft dig excavations in areas of conflict. This work is necessary to verify existing utilities to develop detailed pipe layout drawings, schedule(s) of materials and equipment, and shop drawings based on the findings of the field locations and investigations. The CONTRACTOR shall include all information collected from their utility location work and the associated soft dig excavations on their as-built drawings. No additional payment shall be made to the CONTRACTOR for re-work required and/or damage caused by the CONTRACTOR's failure to perform adequate subsurface utility investigation prior to beginning construction.
- B. The locate level shall meet the Quality levels A through D described below:
- C. Quality Level A - Precise horizontal and vertical location of utilities obtained by the actual exposure and subsequent measurement of subsurface utilities, usually at a specific point.
- D. Quality Level B - Information obtained through the application of appropriate surface geophysical methods to determine the existence and approximate horizontal position of subsurface utilities.
- E. Quality Level C - Information obtained by surveying and plotting visible above-ground utility features and by using professional judgment in correlating this information to Quality Level D.
- F. Quality Level D - Information derived from existing records or oral recollections.

- G. Payment for Bid Item 6 will be made in equal monthly amounts throughout the duration of active construction.

1.08 ENVIRONMENTAL PROTECTION PLAN (NPDES PERMIT & SWPPP)
(Bid Item No. 7)

- A. Measurement for payment for preparation and implementation of the Environmental Protection Plan, which includes NPDES and SWPPP requirements, payment will be made in partial payments in accordance with Table provided below during the duration of the project.
- B. Payment for implementation of the Environmental Protection Plan maintenance will be made at the lump sum price named in the Bid Form. Payment for preparation and implementation of the Environmental Protection Plan shall include preparing Stormwater Prevention Pollution Plan (SWPPP) and implementation of best management practices (BMP) and environmental pollution protection throughout construction including but not limited to silt fences, temporary stabilized gravel construction entrance(s), concrete wash down area(s), sandbags, and straw bales, gutter buddies adjacent to existing and proposed curb inlets, drainage structure/inlet protection, and turbidity barriers.
- C. The pay item for Environmental Protection Plan will be made in partial payments in accordance with the following:

Percent of Original Contract Amount Earned	Allowable Percent of the Lump Sum Price for the Item*
10%	25%
25%	50%
50%	75%
100%	100%

*Environmental Protection Plan pay item will be limited to 2.5% of the original Contract amount for the project. Any remaining amount will be paid upon completion of all work on the project.

1.09 FURNISH AND INSTALL WATER MAIN PIPE (Bid Item No. 8 & 9)

- A. Measurement for payment for furnishing and installing water main pipe will be based upon the quantity of linear feet actually constructed and accepted as determined by measurement along the centerline of the pipe in place, inclusive of valve structures, vaults and casings, megalugs, restraints all in accordance with the requirements of the Contract Documents.
- B. Payment for furnishing and installing water main pipe will be made at the unit price per linear foot of pipe named in the Bid Form which price shall constitute full compensation for the complete installation of water main pipe and restraints,

including but not limited to, providing all necessary pipe excavation (including hand digging), dewatering, bedding, backfilling, compaction, tracer wire, joint restraints, transition connections from proposed P.V.C. to proposed D.I.P., clearing/removal and disposal of vegetation/sod/trees/shrubs, connection to existing fire hydrant assemblies, pressure testing (including thru existing dry lines), filling and flushing, pigging and cannon flushing (including thru existing dry lines), disinfection, chlorination, bacteriological testing meeting the requirements of the Florida Department of Health, connections to existing water main by means of removing existing plugs and connecting new water main, "soft digs" to determine location and size of existing water mains for connecting new water main, spool pieces, 4" plug with 2" terminal blow-off, and temporary removal and re-placement of existing sign post assemblies as required for a complete and functional installation.

- C. This line item includes clearing and grubbing vegetative areas along with removal and disposal of trees less than 3.5" in diameter (measured at 4.5' above highest adjacent grade) due to installation of proposed water main (ENGINEER/OWNER approval required prior to removal of any trees or shrubs). However, the ENGINEER/OWNER may direct the CONTRACTOR to relocate trees to adjacent private property when requested by the resident. Payment to relocate trees will be covered under RELOCATE EXISTING TREES bid item. The resident must sign a waiver and assume maintenance responsibility for trees in such situations. CONTRACTOR shall stake right of way limits a minimum of two weeks in advance of construction in order to coordinate with adjacent property OWNERS and possible conflicting utilities.

1.10 FURNISH AND INSTALL DIP FITTINGS (Bid Item No. 10)

- A. Measurement for payment to furnish and install fittings shall be based upon the unit bid price per ton named in the Bid Form for such fittings furnished all in accordance with the Contract Documents. Weight will be based on compact fitting weight only not including megalugs.
- B. Payment for furnishing and installing fittings shall be at the unit bid price per ton and shall include furnishing, complete installation including storing and transporting the fittings (includes plugs for future connection).

1.11 FURNISH & INSTALL NEW WATER/IRRIGATION METER WITH A TIER 8 TRAFFIC RATED BOX & LID (Bid Item No. 11 & 12)

- A. Measurement for payment to furnish and install new water meter box and relocate existing water meter to new meter box, and re-connection to existing water service will be based upon the actual quantity, each, of meters installed, water meters actually relocated and reconnection to existing water service, all in accordance with the Contract Documents.

- B. Payment for furnishing and installing new water meter box and relocating existing water meter to new meter box, and re-connection to existing water service will be made at the unit price, each, named in the Bid Form which price shall constitute full compensation for its complete, relocation of the existing water meter to new meter box, new meter box, water service piping and fittings, bedding, field verifying existing meter/water service connection point at existing water main, field explorations necessary to locate existing water meters, cutting and plugging existing water service on OWNER side of existing water meter, field verify existing meter locations and sizes, remove and dispose existing water meter box and service, and all else necessary for a complete and functional installation. Payment for this item shall be made upon completion of all items stated above.
- C. This item also includes connecting proposed water service to existing water service on the customers side of the water meter on private property. Water service pipe / fittings shall be schedule 40 PVC matching the pipe size of the existing water service. This includes all trenching, applying for and obtaining building plumbing permit from OWNER, crew time for searching/excavating for existing water service, tie in location up to 10' within private property, backfill, and complete restoration of private property, water service fittings on the customer side of the water meter, and all fittings required to connect the new water service to the existing water service on private property.
- D. This item shall also include reading and recording of meter readings prior to and upon completion of relocation of meters.
- E. Water meter locations shown on plan views are for graphical purposes only. This line item includes coordination with ENGINEER and OWNER to determine the appropriate location for new water meters.

1.12 FURNISH & INSTALL NEW SINGLE WATER SERVICE
(Bid Item No. 13 thru 16)

- A. Measurement for payment to furnish and install new single water service will be based upon the actual quantity, each, of water services installed, all in accordance with the Contract Documents.
- B. Payment for furnishing and installing new single water service will be made at the unit price, each, named in the Bid Form which price shall constitute full compensation for its complete installation of the new water service piping and connection from the new or existing water main to the meter box, casing pipe, excavation, backfill, bedding, connection to new or existing water main, tapping saddles, corporation stops, fittings, field verifying existing meter/water service connection point at existing water main, field explorations necessary to locate

existing water meters, field verify existing meter locations and sizes, and all else necessary for a complete and functional installation. Payment for this item shall be made upon completion of all items stated above.

- C. Short water service shall be defined by 25 feet or less of service piping (from main to front of new water meter box location). Long water service shall be defined by more than 25 feet of service piping (from main to front of new water meter box location).
- D. Water service locations shown on plan views are for graphical purposes only. This line item includes coordination with ENGINEER and OWNER to determine the appropriate location for new water services at main line.

1.13 FURNISH AND INSTALL GATE VALVE W/BOX (Bid Item No. 17 & 18)

- A. Measurement for payment to furnish and install valves will be based upon actual quantity, each, of such valves and boxes furnished and installed, all in accordance with the requirements of the Contract Documents, except that additional valves incorporated for testing purposes shall be at the sole expense of the CONTRACTOR.
- B. Payment for furnishing and installing valves, boxes, and painted blue lid will be made at the unit price, each, named in the Bid Form which price shall constitute full compensation for the completed installation of the valve, including valve box with painted blue lid and extension to finish grade and concrete collar installed in unpaved areas.

1.14 FURNISH & INSTALL FIRE HYDRANT ASSEMBLY (Bid Item No. 19)

- A. Measurement for payment to furnish and install fire hydrant assemblies shall be at the unit bid price per each fire hydrant assemblies furnished in accordance with the Contract Documents.
- B. Payment for furnishing and installing fire hydrant assemblies shall be at the unit bid price per each and shall include excavation, backfill, compaction, furnishing, storing, and transporting. Fire hydrant assemblies shall include the following: complete fire hydrant, 6-inch gate valve (including valve box with red paint on lid and extension to finished grade and concrete collar in unpaved areas), 6-inch ductile iron pipe from gate valve to fire hydrant, bends, pipe restraints, Guard Posts, zinc plated tie rods with duc lugs or eye bolts, fire hydrant extensions, and blue reflective pavement marker (R.P.M.) installed within center of drive aisle closest to fire hydrant.
- C. This line item shall include removing and salvaging existing fire hydrant assemblies including plugging of the existing main, delivery of the fire hydrant assembly to OWNER and all restoration WORK.

1.15 FURNISH AND INSTALL TAPPING SLEEVE AND VALVE
(Bid Item No. 20 & 21)

- A. Measurement for payment to connect to existing water main with tapping sleeve and valve/saddle tap and corporation stop will be based upon actual quantity, each, of such tapping sleeve and valve/saddle tap and corporation stop (furnished and installed), all in accordance with the requirements of the Contract Documents.
- B. Payment for connection to existing main with tapping sleeves and valves/saddle tap and corporation stop will be made at the unit price each, named in the Bid Form, which price shall constitute full compensation for the satisfactory connection including furnishing and installation of the tapping sleeve, valve, valve extension and valve box, valve extension to finished grade, restraining existing water main in accordance with OWNER's latest standard detail restraint table, dewatering, excavation, backfill, bedding, "soft digs" to determine location and size of existing water mains for connection point, and all else necessary for a complete and functional installation.

1.16 CUT EXISTING WATER MAIN & CONNECT PROPOSED WATER MAIN
(Bid Item No. 22 thru 24)

- A. Measurement for payment to cut existing water main and connect proposed water main will be based upon actual quantity, each, of such connections made in accordance with the contract document.
- B. Payment to cut existing water main and connect proposed water main will be made at the unit price each, named in the Bid Form which price shall constitute full compensation for the completed installation of the connection, including shutting down existing main (which includes verifying location of existing adjacent gate valves), cutting main, temporary caps, restraining existing water main a minimum of one (1) joint or per restraint table requirements (whichever is more stringent) on each side of the connection point, spool pieces and installation of the connection fittings, excavation, backfill, bedding, "soft digs" to determine location and size of existing water mains for connection point and all else necessary for a complete and functional installation.
- C. This pay item is intended for cutting and connecting to existing water mains 4" and greater.

1.17 FURNISH & INSTALL LINE STOP (Bid Item No. 25 thru 27)

- A. Measurement for payment to furnish and install line stops will be based upon actual quantity, each of such line stops furnished and installed, all in accordance with the requirements of the Contract Documents.

- B. Payment for furnishing and installing line stops will be made at the unit price each, named in the Bid Form which price shall constitute full compensation for the completed installation of the line stop, valve, valve box and extension to finish grade, concrete pad/jacket, pipe restraining per joint and thrust restraint details on Sheet C-16, concrete thrust blocks/plugs, concrete collar installed in unpaved areas, removal of line stop appurtenances after existing flow isolation is no longer required, coordination with OWNER to determine if nearby existing valves can be used to isolate flows, dewatering, excavation, backfill, and all else necessary for a complete and functional installation.
- C. Line stops shall be used when nearby existing valves cannot be used to isolate existing flows when cutting into an existing main and at the discretion and approval of the OWNER and ENGINEER.

1.18 FURNISH & INSTALL EXCAVATABLE FLOWABLE FILL PER FDOT SPECIFICATION SECTION 121 (Bid Item No. 28)

- A. Measurement for payment to furnish and install excavatable flowable fill will be based upon the actual cubic yards of excavatable flowable fill installed, all in accordance with the Contract Documents.
- B. Payment for to furnishing and installing excavatable flowable fill be made at the unit price per cubic yard of flowable fill installed over water main piping named in the Bid Form and all else necessary for a complete and functional installation.
- C. The intended use of this line item is to install excavatable flowable fill over new water main piping to avoid a deep excavation under an existing utility. The use of the line item is at the discretion and approval of the OWNER and ENGINEER.

1.19 FURNISH AND INSTALL SAMPLE POINT (Bid Item No. 29)

- A. Measurement for payment for sample points will be based upon the actual quantity; each of such sample points furnished and installed, all in accordance with requirements of the Contract documents.
- B. Payment for sample points will be made at the unit price, each, named in the Bid Form which price shall constitute full compensation for the complete installation of sample point, testing, chlorination, bacteriological testing meeting the requirements of the Florida Department of Health, removal and disposal after sampling is complete.
- C. OWNER will only pay for passing bacteriological tests.
- D. Failing bacteriological tests must be retested on all portions of the water main connected to that failed testing site, not just the one local site that fails.

- E. Review set of as-builts shall be provided to ENGINEER prior to water main disinfection and prior to drawing water from existing water mains for sample points/bacteriological testing.

1.20 FURNISH & INSTALL 2" TERMINAL BLOWOFF (Bid Item No. 30)

- A. Measurement for payment to furnish and install 2" terminal blowoff will be based upon actual quantity, each of such 2" terminal blowoff furnished and installed, all in accordance with the requirements of the Contract Documents.
- B. Payment for furnishing and installing 2" terminal blowoff will be made at the unit price each, named in the Bid Form which price shall constitute full compensation for the completed installation of the 2" terminal blowoff with boxes, including completed installation of Concrete Meter Box extended to finish grade with traffic type lid and concrete collar installed in unpaved areas, trench excavation (including hand digging), disposal of all excess material, dewatering, backfill and compaction of trenches, density testing, maintaining uninterrupted services of existing utilities, providing access to driveways and roadways at all times, cleaning the site of work location, protection of existing utilities, structures, trees, shrubs, and lawns, protection and repair of existing irrigation systems, fittings, corporation stops, plugs, copper risers, nipples, brass pipe, elbows, angles valves, caps, cutting, connections, fittings and all other materials for a complete installation, as shown on the Drawings and specified herein.

1.21 ADJUST EXISTING MANHOLE RIM TO FINISHED GRADE (Bid Item No. 31)

- A. Measurement for payment to adjust existing manhole rim to finished grade will be based upon actual quantity, each of such manhole rim adjusted to finish grade, all in accordance with the requirements of the Contract Documents.
- B. Payment for adjusting existing manhole rim to finished grade shall include all labor, materials, equipment, tools, and incidentals necessary to adjust existing manholes to finished grade. This item includes, but is not limited to: the completed adjustment/resetting of manhole covers, excavation, pavement restoration, adjustment rings, cutting of structure, removal and replacement of brickwork, additional brickwork, mortar, backfill, compaction, coordination with franchise utilities, providing access to driveways and roadways at all times, protection of existing utilities, structures, trees, shrubs, and lawns, and all other work required for the complete installation.
- C. This line item is a result of proposed asphalt milling and re-surfacing operations which may require the adjustment of existing manhole/catch basin/structure rims to finished grade to meet the Mill and Resurface Section(s).

1.22 ADJUST EXISTING VALVE BOX TO FINISHED GRADE (Bid Item No. 32)

- A. Measurement for payment to adjust existing valve box to finished grade will be based upon actual quantity, each of such manhole rim adjusted to finish grade, all in accordance with the requirements of the Contract Documents.
- B. Payment for adjusting existing valve box to finished grade shall include all labor, materials, equipment, tools, and incidentals necessary to adjust existing valve boxes to finished grade. This item includes, but is not limited to: the adjustment/resetting of valve boxes, excavation, pavement restoration, completed horizontal and vertical adjustment of the valve boxes, extensions, and replacement of damaged boxes (if required), providing access to driveways and roadways at all times, protection of existing utilities, structures, trees, shrubs, and lawns, and all other work required for the complete adjustment.
- C. This item is a result of proposed asphalt milling and re-surfacing operations which may require the adjustment of existing valve boxes to finished grade to meet the Mill and Overlay Section(s).

1.23 REMOVE AND DISPOSE EXISTING 3" - 6" ASBESTOS CEMENT WATER MAIN (Bid Item No. 33)

- A. Measurement for payment to remove and dispose of existing asbestos cement water main will be based upon the actual linear feet of water main piping removed and disposed of, all in accordance with the Contract Documents.
- B. Payment for removing and dispose of existing asbestos cement water main pipe will be made at the unit price per linear foot of pipe named in the Bid Form which price shall constitute full compensation for removing and disposing of such pipe, removing the existing tee fitting and installing sleeve at the main, including excavation, dewatering, cutting existing pipe, capping existing pipe, removing existing valves, backfilling trench, compaction, and all restoration work.
- C. Removal and disposal of asbestos cement pipe shall be in accordance with State and Local laws.

1.24 ABANDON & GROUT FILL EXISTING WATER MAIN PIPE (Bid Item No. 34)

- A. Measurement for payment to abandon, cap and grout pipe will be based upon the actual quantity of linear feet of such pipe actually grout filled and abandoned, all in accordance with the Contract Documents.
- B. Payment for abandoning, capping and grouting of existing pipe will be made at the unit price per linear foot of pipe named in the Bid Form which price shall constitute full compensation for the abandoning, grouting per FDOT Specification Section 121 and plugging of such pipe, including excavation, installation of vent

caps at sufficient spacing to allow for proper grouting, cutting existing pipe, capping existing pipe, removing the existing tee fitting and installing sleeve at the main, backfilling trench, compaction, valve and fitting restraint, concrete plug, thread rods and all restoration work. Limits of payment for abandonment shall be based on as-built locations of caps installed for grouting.

- C. CONTRACTOR shall verify that all existing house connections have been disconnected prior to grouting of existing pipelines. Any damages incurred to private property due to house connections not disconnected prior to grouting the pipe, the CONTRACTOR shall repair and/or replace damage at no expense to the OWNER.

1.25 FURNISH & INSTALL SANITARY SEWER MAIN PIPING (Bid Item No. 35 & 36)

- A. Measurement for payment for furnishing and installing sewer pipe will be based upon the quantity of linear feet of such pipe actually constructed as determined by measurement along the centerline of the pipe in place, not including through structures, all in accordance with the requirements of the Contract Documents.
- B. Payment for furnishing and installing sewer pipe shall constitute full compensation for the complete installation of the sewer pipe including but not limited to pipe, excavation, dewatering, sheeting, testing, TV/Video inspection and lamping, coordination with West Palm Beach Utilities regarding the support and relocation of existing power pole(s), coordination with franchise utilities (FPL, FPU Gas, Comcast, AT&T, etc.) regarding the relocation of buried and overhead utilities, backfill, cleaning and compaction. Pipe must meet strict OWNER standards for line and grade.
- C. Existing service must be maintained to all customers throughout the course of construction. Temporary piping, temporary lateral connections, tanker truck usage, dumping fees, pumps, etc. and all else necessary to maintain service is included as part of this Bid Item.
- D. This line item shall also include the video inspection of all gravity sanitary sewer mains after construction; sanitary sewer laterals (if necessary), cleaning of pipe, all equipment necessary to provide electronic media in accordance with the Contract Documents for OWNER review and approval and all else necessary for acceptance of media by OWNER. Any rejections that require re-televising will be performed at the cost of the CONTRACTOR.

1.26 FURNISH & INSTALL PRE-CAST 4' DIA. SANITARY SEWER MANHOLE
(Bid Item No. 37)

- A. Measurement for payment to furnish and install sanitary sewer manhole structures will be based upon the actual quantity, each, of such manholes/maintenance access structures constructed, all in accordance with

the requirement of the Contract Documents.

- B. Payment for furnishing and installing sanitary sewer manhole structures will be made at the unit price, each, named in the Bid Form which price shall constitute full compensation for the completed installation of the structure including but not limited to excavation, dewatering, sheeting, backfill and compaction, reinforcing, topslab, manhole ring and cover, brickwork, grout, concrete collar, boot, interior and exterior coatings, testing of interior coatings, and construction of the reinforced concrete structure including precast bench and invert system.
- C. Existing service must be maintained to all customers throughout the course of construction. Temporary piping, temporary lateral connections, tanker truck usage, dumping fees, pumps, etc. and all else necessary to maintain service to customers is included as part of this Bid Item.

1.27 POTHOLE EXISTING SANITARY SEWER LATERAL OUTSIDE OF AND NEAR BUILDING STRUCTURE (Bid Item No. 38)

- A. Measurement for payment to pothole existing sewer lateral outside of and near building structure will be based at the unit price, each, of such to each property where the existing sanitary sewer lateral was potholed all in accordance with the requirement of the Contract Documents.
- B. Payment to pothole existing sewer lateral outside of and near building structure will be made at the unit price, each, named in the Bid Form which price shall constitute full compensation including but not limited to investigate and field verify the location, size, and condition of the existing sewer lateral, and coordinate with the OWNER and ENGINEER to determine the location for the new sewer lateral based on site conditions, constructability, residents' preference regarding work on private property, and the OWNER's discretion. This item also includes performing investigations as necessary to identify any/all existing cleanouts located at the property, as defined by F.A.C. and Florida Plumbing Code.

1.28 FURNISH & INSTALL NEW 6" SANITARY SEWER LATERAL WITHIN RIGHT-OF-WAY WITH NEW CLEANOUT AND BOX LOCATED AT PROPERTY LINE. (Bid Item No. 39)

- A. Measurement for payment to furnish and install sanitary sewer laterals will be based upon the actual quantity, each, of such sanitary sewer laterals installed, all in accordance with requirements of the Contract Documents.
- B. Payment for furnishing and installing sanitary sewer laterals will be made at the unit price, each, named in the Bid Form which price shall constitute full compensation for the complete installation of the sanitary sewer laterals at required size including main line wye (which may include PVC, DIP, or C900

material), clean out(s), material adaptor bends and fittings to property line, cleanout, cleanout box with pea rock, concrete collars around cleanout box (when required), excavation, dewatering, bypass pumping (with all equipment and materials necessary), any form and amount of shoring, utility pole protection, backfill and compaction. The CONTRACTOR is responsible for locating existing lateral on private property, for adjusting the location of the proposed clean outs and laterals accordingly, and for the restoration of any disturbed surface features including, but not limited to fencing, driveways, walkways, mailboxes, decorations, irrigation and landscaping inside and outside of the public right-of-way. Laterals with the length up to 75 feet shall be classified as sewer lateral; laterals greater than or equal to a length of 75 feet shall be classified as long sewer lateral and will require additional cleanouts at 75 feet intervals to be included in cost.

1.29 CUT AND REPLACE EXISTING SANITARY SEWER LATERAL WITHIN RIGHT-OF-WAY INCLUDING NEW 6" CLEANOUT AT PROPERTY LINE (Bid Item No. 40)

- A. Measurement and payment for cutting the existing sanitary sewer lateral at the right-of-way line, installing a new 6" cleanout at the property line with fittings, and removing and replacing the existing sanitary sewer lateral within the right-of-way from the new cleanout to the new sanitary sewer main with pipe and fittings will be based upon the actual quantity, each, of such completed installations, all in accordance with the requirements of the Contract Documents.
- B. Payment will be made at the unit price, each, indicated on the Bid Form, which shall constitute full compensation for all labor, equipment, and materials necessary for the completed installation, including but not limited to: PVC pipe (SDR-26) or DIP pipe, cleanout box and cover, wye, riser, plug fittings, pea rock base, excavation, dewatering, backfill and compaction, bedding, link seal, boots, and cutting excess lateral piping to make connections.
- C. Existing service must be maintained to all customers throughout construction. Temporary piping, temporary lateral connections, tanker truck usage, dumping fees, pumps, and all else necessary to maintain continuous service to customers shall be included as part of this Bid Item.

1.30 REHABILITATE EXISTING SANITARY MANHOLE (Bid Item No. 41)

- A. Measurement for payment to rehabilitate existing sanitary sewer manhole will be based upon the actual quantity, each, of the manholes actually rehabilitated, all in accordance with the Contract Documents per specification Section 02771 Manhole Rehabilitation.
- B. Payment for rehabilitating existing sanitary sewer manhole will be made at the unit price, each, indicated on the Item Bid Form which price shall constitute full compensation for the rehabilitation of the existing manhole, including excavation;

removal and disposal of existing top slab, brickwork, grout work, sealing, bench and invert repair; removal and compaction, and all restoration WORK.

1.31 FURNISH & INSTALL CURED-IN-PLACE LINER IN EXISTING SEWER GRAVITY MAINS (EASEMENT EAST OF PILGRIM ROAD) (Bid Item No. 42)

- A. Measurement for payment to furnish and install cured-in-place liner in existing sewer gravity main will be based upon the actual quantity of linear feet of pipe lined 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 per specification Section 02765 Cured-In-Place Pipe Lining for Gravity Pipe.
- B. Payment for furnishing and installing cure-in-place liner in existing sewer gravity main will be made at the unit price per linear foot of pipe named in the Bid Form which price shall constitute full compensation for the complete installation of cured-in-place pipe liner but not 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; by-pass pumping; post-lining television surveys; chemical joint sealing if necessary; pipe lining; 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.

1.32 CLEAN C.C. TV 8" SANITARY SEWER PIPE (EASEMENT EAST OF PILGRIM ROAD) (Bid Item No. 43)

- A. Measurement and payment for cleaning and providing video inspections of sanitary sewer will be based upon the actual quantity of linear feet of cleaning and video inspection recorded and approved for sanitary sewer, all in accordance with the Contract Documents per specification Section 02752 Television Survey for Cure In Place Lining.
- B. Payment for cleaning and providing video inspection of sanitary sewer shall include but not be limited to: cleaning of sanitary lines and structures, mobilization of video equipment, video inspection services, preparation of a report summarizing all of the findings in the video inspection, providing two (2) copies of all video inspections recorded and all related labor and materials. CONTRACTOR will be responsible for all coordination and scheduling of video inspection services. CONTRACTOR shall schedule sufficient time for the review of the video inspection report by the ENGINEER and by the OWNER. All inspections are to be observed by the ENGINEER. Any inspections rejected due

to condition of the pipe, cleanliness of the pipe or quality of the footage will not be compensated for again. Re-inspection of lines that failed previously and repaired will not be compensated for again.

1.33 REMOVE EXISTING SANITARY MANHOLE (Bid Item No. 44)

- A. Measurement for payment to remove and dispose existing sanitary sewer maintenance access structures regardless of depth will be based upon the actual quantity, each, of such maintenance access structures removed and disposed of, all in accordance with the requirement of the Contract Documents.
- B. Payment for removing and disposing of existing sanitary sewer maintenance access structures regardless of depth will be made at the unit price, each, indicated on the Bid Form which price shall constitute full compensation for the complete removal and disposal of the maintenance access structure, brickwork, frame and cover including excavation, dewatering, backfilling trench, and compaction.
- C. Existing service must be maintained to all customers throughout the course of construction. Temporary piping, temporary lateral connections, tanker truck usage, dumping fees, pumps, etc. and all else necessary to maintain service is included as part of this Bid Item.

1.34 REMOVE & DISPOSE EXISTING 8" SANITARY SEWER PIPE (PILGRIM ROAD) (Bid Item No. 45 and 46)

- A. Measurement for payment to remove and dispose of existing sanitary sewer pipe regardless of depth and material will be based upon the actual quantity of linear feet of such pipe actually removed all in accordance with the Contract Documents.
- B. Payment for removal and disposal of existing sanitary sewer pipe regardless of depth and material will be made at the unit bid price per linear foot of pipe indicated on the Bid Form which price shall constitute full compensation for the removal and disposal of all pipe materials and pipe lining including excavation, dewatering, removal of fittings, backfilling trench, compaction and all restoration WORK.
- C. Removal and disposal of pipe shall be in accordance with State and Local laws.
- D. This line item shall also include removal and disposal of existing cleanout and box, existing concrete collar and existing lateral piping fifteen (15') feet beyond existing sanitary sewer cleanout location (on the customers side) and shall include but not be limited to backfill, compaction and complete restoration and all else necessary for a complete and functional removal and disposal.

- E. Existing sanitary service(s) must be maintained to all customers throughout the course of construction. Temporary piping, temporary lateral connections, tanker truck usage, dumping fees, pumps, etc. and all else necessary to maintain service is included as part of this Bid Item.

1.35 MILL EXISTING ROADWAY ASPHALT (1") (WITHIN OWNER R.O.W.)
(Bid Item No. 47)

- A. Measurement for payment of milling of existing pavement within OWNER R.O.W. will be based upon the quantity of square yards of such existing pavement actually milled, as detailed in the DRAWINGS, all in accordance with the requirements of the Contract Documents.
- B. Payment for milling of existing pavement at the depth indicated within OWNER R.O.W. will be made at the unit price per square yard for such milling as named and at the thickness indicated in the Bid Form which price will constitute full compensation milling, removal of milled material, complete in place to the cross section and depth shown on the DRAWINGS; including night work, restoration of traffic loop detectors, temporary pavement markings, and saw cutting of all pavement and all cleanup of the area disturbed by this construction.

1.36 FURNISH & PLACE RESURFACE ASPHALT (WEARING COURSE-MIN. 1" FC-9.5 WITHIN CITY R.O.W.) (Bid Item No. 48)

- A. Measurement for payment of for furnishing and installing asphalt concrete pavement resurface will be based upon the quantity of square yards of such asphalt concrete pavement actually constructed, as detailed in the DRAWINGS, all in accordance with the requirements of the Contract Documents.
- B. Payment for placement of asphalt concrete pavement resurface at the thickness indicated will be made at the unit price per square yard for such placement as named and at the thickness indicated in the Bid Form which price will constitute full compensation for applying a tack coat and furnishing, placing and compacting all asphalt surface, complete in place to the cross section and thickness shown on the DRAWINGS; including night work, restoration of traffic loop detectors, installation of temporary thermoplastic pavement markings, milling and saw cutting of all pavement and all cleanup of the area disturbed by this construction.

1.37 REMOVE & DISPOSE EXISTING ASPHALT PAVEMENT CROSS SECTION
(Bid Item No. 49)

- A. Measurement for payment to remove and dispose of existing pavement roadway and driveways within OWNER Right-of-Way, and proposed or existing easements will be based upon the actual quantity of square yards of such pavement actually removed (regardless of thickness), all in accordance with the

Contract Documents.

- B. Payment for removal and disposal of existing asphalt pavement roadway and driveways will be made at the unit price per square yard of pavement indicated on the Bid Form which price shall constitute full compensation for the removal and disposal of such pavement (regardless of thickness), base material, subgrade, etc. (including excavation).

1.38 FURNISH & PLACE 1 INCH TYPE SP-9.5 ASPHALT (1ST LIFT)
(RESTORATION) (Bid Item No. 50)

- A. Measurement for payment of asphalt concrete pavement within OWNER Right-of-Way, and proposed or existing easements will be based upon the quantity of square yards of such asphalt concrete pavement actually constructed, as detailed in the DRAWINGS, all in accordance with the requirements of the Contract Documents.
- B. Payment for placement of asphalt concrete pavement at the thickness indicated will be made at the unit price per square yard for such placement as named and at the thickness indicated on the Bid Form which price will constitute full compensation for applying a tack coat and furnishing, placing and compacting all asphalt surface (including asphalt overlay), complete in place to the cross section and thickness shown on the DRAWINGS; including restoration of traffic loop detectors, temporary pavement markings, milling and saw cutting of all pavement and all cleanup of the area disturbed by this construction.

1.39 FURNISH & PLACE 1 INCH TYPE FC-9.5 ASPHALT (FINAL LIFT)
(RESTORATION) (Bid Item No. 51)

- A. Measurement for payment of asphalt concrete pavement within OWNER Right-of-Way, and proposed or existing easements will be based upon the quantity of square yards of such asphalt concrete pavement actually constructed, as detailed in the DRAWINGS, all in accordance with the requirements of the Contract Documents.
- B. Payment for placement of asphalt concrete pavement at the thickness indicated will be made at the unit price per square yard for such placement as named and at the thickness indicated on the Bid Form which price will constitute full compensation for applying a tack coat and furnishing, placing and compacting all asphalt surface (including asphalt overlay), complete in place to the cross section and thickness shown on the DRAWINGS; including restoration of traffic loop detectors, temporary pavement markings, milling and saw cutting of all pavement and all cleanup of the area disturbed by this construction.

1.40 FURNISH & PLACE 12 INCH LIMEROCK BASE (LBR 100) (RESTORATION)
(Bid Item No. 52)

- A. Measurement for payment for furnishing and placing lime rock base material within OWNER Right-of-Way, and proposed or existing easements will be based upon the quantity of square yards of such materials actually compacted in place at the depth indicated, densities passed, and primed all in accordance with the requirements of the Contract Documents.
- B. Payment for furnishing and placing of lime rock base material will be made at the unit price per square yard at the depth indicted on the Bid Form, which price shall constitute full compensation for applying prime coat and furnishing all such material, in place, including all excavation, transportation, handling, cleaning, positioning, grading to meet typical roadway section, and compacting of limerock base to LBR 100 and disposal of waste or unsuitable material.

1.41 FURNISH & PLACE 12 INCH STABILIZED SUBGRADE (LBR 40)
(RESTORATION) (Bid Item No. 53)

- A. Measurement for payment for compaction/stabilization of subgrade within OWNER and FDOT Rights- of-Way, and proposed or existing easements will be based upon the quantity of square yards of such materials actually compacted, all in accordance with the requirements of the Contract Documents.
- B. Payment for compacting/stabilizing of subgrade will be made at the unit price per square yard indicated on the Bid Form, which price shall constitute full compensation for transportation, excavation, handling, cleaning, positioning and compacting of said bedding to a LBR of 40, importing fill material and disposal of excess waste or unsuitable material.

1.42 REMOVE & REPLACE TYPE 'D' CURB, TYPE 'F' CURB & GUTTER, AND VALLEY GUTTER CURB (Bid Item No. 54)

- A. Measurement for payment to remove and re-placement of curb and gutter/valley gutter/drop curb/ D curb will be based upon the quantity of linear feet of such curb and gutter/valley gutter/drop curb/ D curb actually removed and constructed as determined by measurement along the centerline of the curb in place, all in accordance with the requirements of the Contract Documents.
- B. Payment for removal and re-placement of curb and gutter/valley gutter/drop curb/ D curb will be made at the unit price per linear foot of curb indicated on the Bid Form, which shall constitute full compensation for complete installation including excavation, grading, forming, saw cutting of pavement, 4-inch limerock pad, drop curb, removal of existing curbing/curb and gutter, and cleanup of all areas disturbed by this construction.

1.43 REMOVE & REPLACE CONCRETE SIDEWALK (Bid Item No. 55 & 56)

- A. Measurement for payment to remove and re-place existing concrete sidewalk/access driveway will be based upon the actual quantity of square yards of such concrete sidewalks/access drives removed and re-placed, all in accordance with the requirements of the Contract Documents.
- B. Payment for removal and re-placement of concrete sidewalks/access drives will be made at the unit price per square yard indicated on the Bid Form which price shall constitute full compensation for completing said WORK, including all removal and disposal of existing concrete material, earthwork, grading, driveway turnouts, base compaction, construction of the driveway to the same depth and material as the existing one (6-inch min. concrete thickness), base material, sand, furnishing and setting for expansion joint material, disposal of excess material, and densities passed.

1.44 REMOVE & REPLACE SOD (Bid Item No. 57 & 58)

- A. Measurement for payment to remove and re-place sod will be based upon the actual quantity of square yards of such sod removed and re-placed, all in accordance with the requirements of the Contract Documents.
- B. Payment for removal and re-placement of sod will be made at the unit price per square yard indicated on the Bid Form which price shall constitute full compensation for completing said work including but not limited to the removal and disposal of existing sod, installing new sod, Bahia or St. Augustine, topsoil, earthwork, clearing, grading, restoring and regrading existing berms, clearing and grading swales, and disposal of excess material in accordance with the Contract Documents.

1.45 FURNISH & INSTALL TRUNCATED DOMES PER FDOT INDEX 304
(Bid Item No. 59)

- A. The CONTRACTOR's bid unit price per square feet (SF) shall include all labor, materials, equipment, and incidentals necessary for furnishing and installing cast-in-place truncated dome detectable warnings. This item includes but is not limited to: cutting and placement in concrete, finishing concrete, etc. and all necessary for complete and functional installation per the manufacturer's specification.
- B. Payment will be made only for the actual quantity of square feet of cast-in-place truncated dome detectable warnings installed, complete and in place. No payment will be made for excess or waste due to cutting and breakage.
- C. Cast-in-place truncated dome detectable warnings shall conform to FDOT design standards, current edition.

1.46 FURNISH AND INSTALL SOLID TRAFFIC STRIPE, THERMOPLASTIC
(Bid Item No. 60 thru 63)

- A. The CONTRACTOR's bid unit price per linear foot (LF) shall include all labor, materials, equipment, and incidentals necessary for furnishing and placing thermoplastic pavement markings as determined by measurement along the centerline of the pavement markings in place and as detailed in FDOT Standard Specifications Section 711, as shown on the drawings, and as specified herein. This item includes, but is not limited to: temporary striping, temporary layout, final thermoplastic striping (solid and skip striping), removal of existing striping by means of water blasting, providing access to driveways and roadways at all times, protection of existing utilities, structures, trees, shrubs, and lawns, relocation/reinstallation of existing signs in accordance with FDOT Standard Specifications Section 700 as necessary to facilitate installation of crosswalks and/or shifting of existing stop bar locations, and all other work required for the complete installation. This item includes actual length of thermoplastic striping installed for a skip style striping.

1.47 FURNISH & INSTALL NEW R.C.P. SOLID DRAINAGE PIPE
(Bid Item No. 64 & 65)

- A. Measurement for payment for furnishing and installing new storm drainage pipe will be based upon the quantity of linear feet of such pipe actually installed as determined by measurement along the centerline of the pipe in place, not including through structures, all in accordance with the requirements of the Contract Documents.
- B. Payment for furnishing and installing new storm drainage pipe regardless of depth will be made at the unit price per linear foot of pipe at the size/diameter indicated on the Bid Form.
- C. Payment shall include, but is not limited to, new storm drainage piping, connection to existing structures, modifying existing structures, providing all necessary pipe excavation, clearing and grubbing, dewatering, bedding, backfilling, compaction, core drilling, gaskets, sheeting, existing adjacent (perpendicular and parallel) utility support, and temporary relocation of existing utilities as required for a complete and functional installation.

1.48 FURNISH & INSTALL NEW SOLID DRAINAGE STRUCTURES
(Bid Item No. 66 thru 68)

- A. Measurement for payment to furnish and install catch basin inlets, drainage structures, yard drains or Maintenance Access Structures will be based upon the actual quantity, each, of such structures installed, all in accordance with the requirements of the Contract Documents.
- B. Payment for furnishing and installing catch basin inlets, drainage structures or

Maintenance Access Structures will be made at the unit price, each, indicated on the Bid Form which price shall constitute full compensation for the completed installation of the structure including but not limited to excavation, dewatering, backfill and compaction, Maintenance Access Structure frame and covers, catch basin/curb inlet frame and grates, stone below structure, filter fabric, weep hole, brickwork, mortar, construction of the reinforced concrete structure.

1.49 CUT EXISTING 15" R.C.P. DRAINAGE PIPE AND CONNECT NEW 15" DRAINAGE PIPE WITH CONCRETE COLLARS (Bid Item No. 69)

- A. Measurement for payment to connect new storm drainage pipe to existing storm drainage pipe will be based upon the actual quantity, each, of new pipe connected to existing pipe, all in accordance with the requirements of the Contract Documents.
- B. Payment to connect new storm drainage pipe to existing storm drainage pipe will be made at the unit price, each, indicated on the Bid Form which price shall constitute full compensation for the completed connection to existing pipe including but not limited to excavation, dewatering, backfill and compaction, gaskets, saw cutting, coring of existing structure, mortar, concrete collar at new pipe connection, grout, filter fabric, and temporary relocation of existing utilities as required for a complete and functional connection.

1.50 REMOVE EXISTING 15" R.C.P. DRAINAGE PIPE (Bid Item No. 70)

- A. Measurement for payment for removing and disposing existing storm drainage piping will be based upon the quantity of linear feet of such pipe actually removed and disposed of as determined by measurement along the centerline of the pipe in place, not including through structures, all in accordance with the requirements of the Contract Documents.
- B. Payment for removing and disposing existing storm drainage piping will be made at the unit price per linear foot of pipe indicated on the Bid Form.
- C. Payment shall include, but is not limited to, providing all necessary excavation, dewatering, bedding, backfilling, compaction, cutting existing pipe, removal and disposal of all pipe materials and pipe lining, removal and disposal concrete collars, removal and disposal of exfiltration trench washed rock and filter fabric, temporary storm drainage to maintain existing flows, and temporary relocation of existing utilities as required for a complete and functional removal and disposal.

1.51 MISC. ALLOWANCE (Bid Item No. 71)

- A. Bid Item "Misc. Allowance", is a contingency item to be utilized ONLY as authorized by the OWNER. This Item may authorize additional work to the

CONTRACTOR for unforeseen conditions and for items not specifically included in the individual bid items. This item may not be used at all or may be partially used. The disbursement of any/all of this item is totally at the discretion of the ENGINEER/OWNER and shall not be considered "due" the CONTRACTOR.

1.52 BID ALTERNATE 1 - ALL PRIVATE SIDE SEWER INSTALLATION/Restoration
(Bid Item No. 1A thru 36A)

- A. Measurement and payment for all private property sewer installation/restoration items 1A through 36A will be paid based on all work completed as required per Contract Documents for all items per specific property/lot.

END OF SECTION 01024

SECTION 01040

COORDINATION

PART 1 - GENERAL

1.01 PRECONSTRUCTION MEETING

- A. Prior to commencement of Work, a pre-construction meeting will be held in compliance with the applicable provisions of Section 01200, for the purpose of clarifying the administrative procedures for prosecution of the Work, of explaining any requirements of the Contract Documents for which clarifications have been requested and of highlighting the coordination effort required of the CONTRACTOR with other occupiers of the site, if any, with the work of other contractors performing work for the OWNER in the vicinity of the site and with respect to utilities and other existing surface and subsurface installations.

1.02 COORDINATION OF DRAWINGS AND SPECIFICATIONS

- A. Before starting any Work, CONTRACTOR shall review all Drawings and Specifications and immediately report to the ENGINEER, in writing, any errors, discrepancies, and/or omissions discovered.
- B. Where differences are discovered between Drawings and Specifications or within either document itself, CONTRACTOR shall notify ENGINEER and request interpretation or decision before proceeding with the Work. ENGINEER, on behalf of OWNER, will have final decision regarding such item and manner in which the Work is to be installed and such decision will be final. Otherwise, CONTRACTOR shall include the item or arrangement of better quality, greater quantity, or higher cost in Bid Price.
- C. CONTRACTOR shall compare Drawings and verify dimensions, clearances and the like before laying out Work and will be held responsible for conflicts that might have been avoided by such verification.
- D. Drawings are diagrammatic and indicate general arrangement of systems and work included in the Contract. CONTRACTOR shall notify ENGINEER of discrepancies before proceeding.

1.03 COORDINATION OF THE WORK

- A. Coordinate construction activities of the different trades, disciplines or elements of the Work to assure efficient and orderly sequence of installation of construction elements.
- B. Coordinate construction activities of the work elements that are interrelated and

required to connect to and mesh with the operations of other contractors working adjacent to the site. Coordinate work of various interdependent elements whose characteristics require provisions for future installation, connection and placement in service of facilities.

- C. Integrate elements of Work, uncover ill-timed, defective, and non-conforming work, and provide samples for testing.

1.04 COORDINATION OF SUBCONTRACTORS

- A. In the event the CONTRACTOR subcontracts some of the Work to Subcontractors, the CONTRACTOR shall remain solely responsible for performance of the Work of the Contract and for the Subcontractors' compliance with all the requirements of the Contract Documents. CONTRACTOR shall assume full responsibility for administering Work performed by subcontractors in accordance with the Contract Documents.

1.05 COORDINATION OF UTILITY ADJUSTMENTS/INSTALLATIONS

- A. The CONTRACTOR shall be responsible for fully coordinating with utility companies/ agencies any work required in relation to the removal, relocation or other adjustment of utility services existing in the area of construction. Existing utilities and appurtenances shown on the Drawings were located from existing records but no guaranty is made that all existing facilities are shown or that those shown are entirely accurate. The CONTRACTOR shall be responsible for determining the exact location of all underground utilities with the respective franchise utility companies/agencies prior to the commencement of any subsurface work on the project.

END OF SECTION 01040

SECTION 01041
PROJECT COORDINATION

PART 1 - GENERAL

1.01 REQUIREMENTS INCLUDED

- A. ENGINEER will coordinate the work between CONTRACTOR and the OWNER.
- B. The CONTRACTOR shall:
 - 1. Coordinate work of his employees and subcontractors.
 - 2. Expedite his work to assure compliance with schedules.
 - 3. Comply with orders and instructions of ENGINEER.

1.02 RELATED REQUIREMENTS

- A. All applicable sections of the specification.

1.03 CONSTRUCTION ORGANIZATION AND START-UP

ENGINEER shall establish on-site lines of authority and communications:

- A. Schedule and conduct preconstruction meeting and progress meetings as specified in Section 01200.
- B. Establish intra-project communications procedures for:
 - 1. Submittals
 - 2. Reports and records
 - 3. Recommendations
 - 4. Coordination of drawings
 - 5. Schedules
 - 6. Resolution of conflicts
- C. Interpret Contract Documents: Transmit written interpretations to CONTRACTOR and to other concerned parties.
- D. Assist in obtaining permits and approvals: Verify that CONTRACTOR and subcontractors have obtained inspections for Work and for temporary facilities.

- E. Control the use of Site: Through coordination with the OWNER, allocate space for CONTRACTOR's use for field offices, sheds, and work and storage areas.
- F. Inspection and Testing:
 - 1. Inspect work to assure performance in accord with requirements of Contract Documents.
 - 2. Administer special testing and inspections of suspect Work.
 - 3. Reject Work which does not comply with requirements of Contract Documents.
 - 4. Testing Laboratory Services:
 - a. Verify that required laboratory personnel are present.
 - b. Verify that tests are made in accordance with specified standards.
 - c. Review test reports for compliance with specified criteria.
 - d. Recommend and administer any required re-testing.

1.04 CONTRACTOR'S DUTIES

- A. Construction Schedules:
 - 1. Prepare a detailed schedule of basic operations.
 - 2. Monitor schedules as work progresses:
 - a. Identify potential variances between scheduled and probable completion dates for each phase.
 - b. Recommend to OWNER adjustments in schedule to meet required completion dates.
 - c. Document changes in schedule; submit to OWNER, ENGINEER and to involved subcontractors.
 - 3. Observe work of each subcontractor to monitor compliance with schedule.
 - a. Verify that labor and equipment are adequate for the work and the schedule.
 - b. Verify that product procurement schedules are adequate.
 - c. Verify that product deliveries are adequate to maintain schedule.

- d. Report noncompliance to ENGINEER, with recommendation for changes.
- B. Process Shop Drawings, Product Data and Samples: Prior to submittal to ENGINEER, review for compliance with Contract Documents:
 - 1. Field dimensions and clearance dimensions.
 - 2. Relation to available space.
 - 3. Effect of any changes on the work of any subcontractor.
- C. Review Drawings prepared by subcontractors: Prior to submittal to ENGINEER, review for compliance with Contract Documents.
- D. Prepare Coordination Drawings as required to resolve conflicts and to assure coordination of the work of, or affected by, mechanical, electrical, etc., trades, or by special equipment requirements.
 - 1. Submit to ENGINEER.
 - 2. Reproduce and distribute copies to concerned parties after ENGINEER review.
- E. Maintain Reports and Records at Job Site, available to ENGINEER and OWNER.
 - 1. Daily log of progress of work.
 - 2. Records
 - a. Contracts
 - b. Purchase orders
 - c. Materials and equipment records
 - d. Applicable handbooks, codes and standards
 - 3. Maintain file of record documents
- F. Inspection and Testing:
 - 1. Coordinate Testing Laboratory Services:
 - a. See Section 01410-Laboratory Testing Services for CONTRACTOR duties and requirements.

2. Coordinate and Schedule Inspections with Governmental Authorities Having Jurisdiction (AHJ).
 - a. Palm Beach County Building Department.
 - b. Florida Department of Transportation.
 - c. OWNER of West Palm Beach.
 - d. Florida Department of Health.

1.05 CONTRACTOR'S CLOSE-OUT DUTIES

- A. At completion of Work, conduct an inspection to assure that:
 1. Specified cleaning has been accomplished.
 2. Temporary facilities have been removed from site.
- B. Substantial Completion:
 1. Conduct an inspection to develop a list of Work to be completed or corrected.
 2. Assist ENGINEER in inspection.
 3. Supervise correction and completion of work of subcontractors.
 4. CONTRACTOR to provide the OWNER a letter stating that all shop drawings, Requests for Information and Change Orders submitted have been responded and closed out.
 5. CONTRACTOR is required to finalize and/all outstanding Tax Saver Credit prior to receiving his final payment.
 6. CONTRACTOR must submit prior to Substantial Completion a final Tax Saver executed vendor list.
 7. After substantial walk-through has been completed OWNER will coordinate a meeting between the OWNER of West Palm Beach Public Services Department and the CONTRACTOR for on-site training dealing with the installed improvements. CONTRACTOR is to submit three copies to the Public Services Department of any/all manuals and warranties three weeks prior to the training.
 8. Prepare As-builts and Record Drawings, specification corrections, other manuals not dealing with training, and any/all testing work will be sent to Craven Thompson & Associates, Inc. no later than thirty days after

substantial completion walk-through but prior to the final payment. Final payment will not be reviewed until all submittal have been issued.

9. CONTRACTOR will provide copies of all approved inspections as part of the walk-through.

1.06 ENGINEER'S CLOSE-OUT DUTIES

- A. Final Completion: When CONTRACTOR determines that Work is finally complete, conduct an inspection to verify completion of Work.
- B. Administration of Contract closeout:
 1. Receive and review CONTRACTOR's final submittals.
 2. Transmit to OWNER with recommendations for action.

PART 2 - PRODUCTS

Not Used

PART 3 - EXECUTION

Not Used

END OF SECTION 01041

SECTION 01050
FIELD ENGINEERING

PART 1 - GENERAL

1.01 SCOPE

- A. CONTRACTOR shall provide field engineering services as necessary to perform and complete the Work of the Contract, as indicated on Drawings and specified in this Section.
- B. CONTRACTOR shall provide the services of a registered land surveyor to perform project related surveys, proposed improvement layout, and right of way/alley stakeout.

1.02 QUALIFICATIONS OF SURVEYOR

- A. The land surveyor shall be a Professional Engineer or Registered Land Surveyor registered in the State of Florida. CONTRACTOR shall submit to ENGINEER the name, address and evidence of current registration of surveyor or professional ENGINEER.

1.03 SURVEY REQUIREMENTS

- A. The scope of survey work shall include:
 - 1. Protect and, if damaged or destroyed, properly replace survey reference points.
 - 2. Establish project survey control points and set out lines and levels, locate and lay out all site improvements and other work. Including determining the limits of driveway/walkway/sod restoration on private property based upon grading provided within the right-of way.
 - 3. Verify all lay out and record locations, with horizontal and vertical data, for Project Record Documents and submit documentation to verify accuracy of field survey work.
 - 4. Conduct all surveys required for measurements of work for payment purposes. Provide signed and sealed certified quantities for pay estimates to accompany each Pay Request.
 - 5. On completion of work, prepare a certified survey showing finished dimensions, locations, angles and elevations of construction, duly signed and sealed by the surveyor, certifying that elevations and locations of improvements are in conformance with Contract Documents.

6. During the construction process, maintain records of all deviations from the Contract Documents and prepare As-built Drawings showing correctly and accurately all changes and deviations made during construction to reflect the work as it was actually constructed and subsequently surveyed. Also refer to Engineering As-built Requirements within General Notes and Specifications.

1.04 SURVEY REFERENCE POINTS

- A. Existing basic horizontal and vertical control points are designated on Drawings. All elevations are referred to NAVD 1988; Horizontal Control - NAD 83, Florida State Plane Coordinates. Establish all vertical and horizontal controls required for construction.
- B. Locate and protect control points prior to starting site work, and preserve permanent reference points during construction.
 1. Make no changes or relocations of such points without prior written notice to and concurrence of ENGINEER.
 2. Report to ENGINEER when any reference point is lost or destroyed, or requires relocation because of necessary changes in grades or locations.
 3. Replace control points that may be lost or destroyed. Establish replacements based on original survey control.
 4. ENGINEER will identify existing control points and property line corner stakes indicated on Drawings, as required.

1.05 PROJECT SURVEY REQUIREMENTS

- A. Establish a minimum of two permanent bench marks on the project site along with any necessary bench marks to complete vertical and horizontal data for project record documents/as-builts, all referenced to data established by survey control points. Record locations, northings and eastings with horizontal and vertical data, on Project Record Documents.
- B. Establish lines and levels, locate and lay out, by instrument and similar appropriate means.
 1. Proposed Improvements, including but not limited to water mains, water meters, fittings, fire hydrants, sample stations, right of way/alley stakeout; pavement, sidewalk, green area, and alley limerock grading.
 2. Drainage structures, including inlets, manholes, pollution control structures complete with invert and weir elevations, locations of storm sewer connections, levels of manhole frames and covers and other pertinent

survey data.

3. Sanitary Sewer Maintenance Access structures/Manholes, complete with inverts elevations, locations of sanitary sewer connections, levels of manhole frames and covers and other pertinent survey data.

- C. Verify layouts by same methods from time to time.

1.06 RECORDS

- A. Maintain a complete, accurate log of control and survey work as it progresses.
- B. On completion of major site improvements, prepare a certified survey showing finished dimensions, locations, angles and elevations of construction.
- C. On request of ENGINEER, submit documentation to verify accuracy of field survey work.
- D. Submit certificate, duly signed and sealed by the surveyor, certifying that elevations and locations of improvements are in conformance with Contract Documents.

1.07 PROJECT SIGNS

- A. Subject to compliance with local regulations and prior approval of OWNER as to size, design, type and location, CONTRACTOR and Subcontractors may erect temporary signs for purposes of identification. Signs for maintenance and control of traffic may also be required and/or approved.
- B. Furnish, erect, and maintain such signs as may be required by Safety Regulations or as necessary to safeguard life and property.

END OF SECTION 01050

SECTION 01100

SPECIAL PROJECT PROCEDURES

PART 1 - GENERAL

1.01 EXISTING CONDITIONS

- A. This Project is in an area with existing improvements consisting of water, sanitary sewer, franchise utilities and storm drains. The Project is located within the City of West Palm Beach, in Palm Beach County, Florida. The work shall be conducted in a manner that will minimize restriction of access to public and private property and facilities, and minimize disruption of traffic. The CONTRACTOR shall exercise extreme care to prevent damage to and interference with existing improvements and to maintain the adjacent areas and travel routes safe for pedestrian and vehicular traffic at all times.

1.02 EXISTING IMPROVEMENTS/UTILITIES

- A. Existing improvements, including utilities, both surface and subsurface, shown on the Drawings were located from existing records. No guaranty is made that all improvements are shown or that those shown are entirely accurate. It is the CONTRACTOR's responsibility to verify the locations, character and depths of all existing improvements prior to performing any Work. The OWNER and ENGINEER will assume no liability for damages sustained or costs incurred because of the CONTRACTOR's operations in the vicinity of existing improvements. The CONTRACTOR hereby agrees that he shall have no claim for delay or for extra compensation and that he shall have no claims for relief from any obligation or responsibility under the Contract on account of any surface or subsurface improvements or utilities encountered. CONTRACTOR shall notify the ENGINEER of any deviation between existing conditions and the Drawings. The CONTRACTOR shall coordinate all utility related work, of whatever nature, with the utility company or companies whose services are impacted by the proposed construction or any element thereof.

1.03 LAND FOR FIELD OFFICES, STORAGE AND CONSTRUCTION PURPOSES

- A. CONTRACTOR shall obtain and pay all costs in connection with any additional work areas, storage sites, and access to the construction site or temporary right-of-way that may be required for proper completion of the work.
- B. Responsibility for safety and security of the storage site, including protection and safekeeping of equipment and materials at or near the construction site, shall be solely that of the CONTRACTOR and no claims shall be made against the OWNER by reason of any act of an employee or trespasser. CONTRACTOR shall place no equipment or materials upon public or private property until permission has been received. Any agreement between CONTRACTOR and alternate entity for use of land shall be submitted to OWNER for review and approval.

- C. Upon completion of the Contract, CONTRACTOR shall remove from the site and storage area all equipment, field offices, fencing, rubbish, etc., and leave the areas clean and restored to its original condition. CONTRACTOR shall fill, compact and resurface all holes or excavations made for fence installation, as directed by the ENGINEER.

1.04 WATER POLLUTION PREVENTION AND EROSION CONTROL

- A. When required to dispose of water from dewatering and other operations, CONTRACTOR shall obtain and pay for all necessary permits, shall take all actions necessary to prevent contamination of or disturbance to the environment or natural habitat of the properties adjacent to the site, and shall comply with all permit requirements and restrictions as set by the regulatory agencies having jurisdiction. CONTRACTOR shall schedule and control operations so as to confine all runoff water from disturbed surfaces, water from dewatering operations and water in existing ditches that becomes contaminated with lime silt, muck and other deleterious matter from the construction operations.
- B. CONTRACTOR shall provide all temporary materials and operations necessary to attain the required pollution and erosion controls including, but not limited to, temporary seeding, filter blankets, chemicals, temporary dikes and ditches, silt screens, fiber mats, mulches, sod, bituminous spray and other erosion control devices. The pollution control procedures shall include control of lime suspended in water which may flow into canals and ditches and which may require the use of screens, filter blankets and coagulants within such ditches. CONTRACTOR shall maintain all pollution and erosion prevention procedures, materials, equipment and other related items in an approved condition until notified by the ENGINEER to discontinue such maintenance.
- C. Where necessary, CONTRACTOR shall channel runoff water from construction areas and all water from dewatering operations into temporary stilling basins.
- D. The CONTRACTOR shall furnish all labor and equipment and perform all work required for the prevention of environmental pollution during and as a result of the work under this contract. The CONTRACTOR shall be responsible for preparing and complying with the requirements of the National Pollution Prevention Discharge Elimination System (NPDES) and Storm Water Pollution Prevention Plan (SWPPP), including preparation of Storm Water Pollution Prevention Plan (SWPPP) and submittal of the Notice of Intent (NOI) prior to start of construction and submittal of Notice of Termination (NOT) after final project certification and approval. For the purpose of this contract environmental pollution is defined as the presence of chemical, physical, or biological elements or agents which adversely affect human health or welfare; unfavorably alter ecological balances of importance to human life, affect other species of importance to man, or degrade the utility of the environment for aesthetic and recreational purposes. The control of environmental pollution requires

consideration of air, water, land and involves noise, solid waste management and management of radiant energy and radioactive materials, as well as other pollutants.

1.05 COORDINATION WITH TRAFFIC CONTROL AGENCIES

- A. CONTRACTOR shall perform the construction work with minimum interruption of traffic movement on existing streets and roadways. In order to limit such interruption, CONTRACTOR shall coordinate the work with all agencies having jurisdiction and schedule the work so that interruptions are held to a minimum.
- B. In the work schedule submittals, CONTRACTOR shall provide documentation of the CONTRACTOR's coordination with such agencies and shall not deviate from the approved schedule without prior approval. CONTRACTOR shall provide proper maintenance and control of all traffic in the areas of construction during the course of construction and shall furnish and maintain all required traffic control signs and devices, barricades, safety cones, flashers, flambeaus and similar devices.

1.06 PROGRESS SCHEDULE

- A. Immediately after award of Contract and prior to the pre-construction conference, CONTRACTOR shall submit to the OWNER a construction progress schedule showing chronologically all operations contemplated and necessary for the successful completion of the work within the agreed contract time, phases and a schedule of shop drawings and submissions. The schedule shall include a detailed description of the proposed construction elements and procedures, indicating the proposed degree of coordination and compliance with the requirements of the traffic control agencies. The OWNER reserves the right to make changes to the schedule and sequence as necessary to facilitate the work or to minimize any conflict with traffic operations.
- B. Prior to commencement of construction, a pre-construction meeting will be held to review CONTRACTOR's construction progress schedule, proposed sequence of construction and schedule of values, to establish a working understanding between the parties as to the project and other pre-construction activities. At the pre-construction conference, the CONTRACTOR shall review the schedules with the OWNER and ENGINEER. Thereafter, the CONTRACTOR shall add calendar dates and shall modify and/or correct the schedule until satisfactory to the OWNER, at which time it will be approved for use by the CONTRACTOR for planning, organizing, and directing the work of the project.

Additionally, prior to construction, a Public Information Meeting will be held at City Hall where the public will be invited to ask questions about the construction schedule and process. The CONTRACTOR will be required to present the Construction Schedule at this time.

1.07 CONNECTIONS TO EXISTING PIPING/SYSTEMS

- A. Required connections to existing storm water management systems or other piping systems shall be performed in such a manner that no damage and minimal interruption is caused to the existing installations. Any damage caused to existing improvements shall be repaired or replaced at no cost to the OWNER. CONTRACTOR shall coordinate construction operations with the utility companies and notify them at least 48 hours in advance of any activity that may impact their systems.

1.08 HYDRAULIC UPLIFT ON STRUCTURES

- A. CONTRACTOR shall make all necessary provisions to safeguard any structures that may become buoyant during the construction operations due to groundwater or floods and before the structure is put into service. Should there be any possibility of buoyancy of a structure, CONTRACTOR shall take the necessary steps to prevent its buoyancy either by increasing the structure's weight, by filling it with approved material or other acceptable methods. Damage to any structures due to floating or flooding shall be repaired or, if necessary, the structures shall be replaced at no cost to the OWNER.

1.09 UTILITY PROTECTION SHEETING

- A. The CONTRACTOR shall be responsible for properly supporting the sides of all trenches and excavations with timbers or other supports wherever necessary or required to properly safeguard the trenches and protect the OWNER's existing facilities when new underground construction is within 3 feet of existing watermain/forcemain. The cost of all necessary timber, sheeting and bracing whatsoever left in place or removed, shall be included in the unit price bid for the installed improvements.
- B. Portions of the sheeting driven below the elevation of the top of the pipe shall not be disturbed or removed. Sheeting and bracing shall be left in place if so, ordered by the ENGINEER and/or where shown on the Plans to avoid undermining or otherwise endangering the work or adjacent structures. All sheeting left in place shall be cut off or driven at least 30 inches below finished grade, unless otherwise ordered.
- C. Great care shall be exercised in the selection of sheeting and bracing of adequate design, type, size and strength. The adequacy of the sheeting used for all supporting and bracing purposes shall be the responsibility of the CONTRACTOR. The sizes and length of the sheeting used shall conform closely to the needs of the work and oversizing as well as undersizing should be avoided. In placing and driving the sheeting, proper workmanship and equipment shall be used to achieve a true alignment and close contact of the sheeting boards.

- D. Sheeting shall be straight and sound, free from shakes, cracks, large or loose knobs and other defects impairing its strength and durability. It shall be squared to the required dimension throughout its entire length.
- E. If required for the proper execution of the work where running sand, quicksand or other semifluid material difficult to handle is encountered, the sheeting shall be tongue and groove.
- F. The CONTRACTOR may, in lieu of sheeting, bracing and shoring to maintain the allowable trench widths, use a "trench box" ("trench shield" or "mule") provided pipe section are secure downstream by a cable(s) stretched through and secured to the end section of pipe by means of a timber and a cable clamp, all materials being of adequate size and strength. The cable shall be held taut during the process of advancing the "box".

The procedure may be used so long as, in the opinion of the ENGINEER, the work is proceeding satisfactorily. The ENGINEER may revoke permission to use the "trench box" at any time he feels unsatisfactorily or inadequate work is being performed and the CONTRACTOR shall, without appeal, immediately begin using sheeting, bracing and shoring to maintain the allowable trench widths.

At all times, when soil conditions permit, the bottom edge of the "trench box" shall be no lower than the springline of the pipe, so as not to disturb the trench compaction when advancing the "trench box." No compensation will be made for utilizing the trench box.

1.10 SITE RESTORATION

- A. The CONTRACTOR shall remove all excess material and shall clean up and restore the site to its original condition or better. All damage, as a result of WORK under this Contract, done to existing structures, pavement, driveways, paved areas, curbs and gutters, sidewalks, shrubbery, grass, trees, fences, walls, utility poles, utility pipe lines, conduits, drains, catch basins, flagstones, rocked graveled or stabilized areas or driveways, and including all obstructions not specifically named herein, shall be repaired, or replaced, as determined by the ENGINEER. Site restoration shall be done in a timely manner as the WORK progresses.
 - a. Site restoration on Private Property including but not limited to pavement, driveways, paved areas, sidewalks, shrubbery, grass, trees, fences (see b. below) and walls shall be completed within 30 days after being disturbed.
 - b. Fences temporarily removed and reinstalled or relocated to property line in order to install proposed improvements must be restored as temporary or permanent, depending on water service and sanitary sewer lateral connection, within 2 days following completion of a main line piping run. Temporary construction fencing may be utilized at the approval of the

OWNER and ENGINEER at no additional cost to the OWNER. No additional payment will be made for multiple fence removals/reinstallations/relocations in the same location in order to complete proposed improvements and restoration.

1.11 CONSTRUCTION PHASING REQUIREMENTS

- A. The Following are general requirements for construction phasing to minimize resident disruption, yet maximize cost effectiveness of the construction scheduling.
- a. No three adjacent roadways or alleys may be under construction at the same time (i.e. construction shall be on alternating roadways so that a resident will only have to travel on one unpaved roadway in order to exit the neighborhood.). In no case shall more than 50% of project rights-of-ways and alleys be under construction at one time. At least 50% of project rights-of-ways and alleys shall be restored with first and second lift of asphalt (roadways), concrete (sidewalks and driveways), and limerock (alleys), at all times. The CONTRACTOR shall provide access to driveways at the end of the working day.
 - b. After proposed improvement piping is installed, CONTRACTOR shall restore first and second lift of asphalt (roadways), concrete (sidewalks and driveways), and limerock (alleys), within 60 days after installation.
 - c. Construction within the rights-of- way and alley shall be scheduled so that all improvements are completed at once, and the residents are only disrupted for one time period. This excludes water service plumbing WORK on private property which shall be scheduled after mains are tested and accepted for connection by individual services.
 - d. All affected residents and property owners shall be notified in writing a minimum of two (2) weeks prior to any disruption to or construction in road right-of-ways adjacent to their homes. The notification shall also indicate any special parking or traffic conditions that will affect residents.
 - e. All affected residents shall be notified a minimum of forty-eight (48) hours prior to a shut off of water supply. Any water supply interruptions shall be rescheduled to be as short as possible and not exceed six (6) hours.
 - f. At any time, the entire length of two generally north-south Avenues and two generally east-west Streets shall remain unobstructed and open to through-traffic for each section. Access for emergency vehicles shall be maintained at all times to all homes or businesses. Excavation must be back-filled or barricaded at the end of each WORK day to prevent hazardous conditions. If a trench, excavation or structure is to be left

open, it must be covered with a steel plate and barricaded at the end of each WORK day or when WORK will be suspended for more than eight (8) hours.

- g. The CONTRACTOR shall also make provisions with local bus, school bus, garbage collection, mail delivery and other agencies for continuation of service. A traffic maintenance plan indicating proposed street closings, schedules, and alternate routes which has been approved by the ENGINEER, the OWNER, and should be submitted to all affected agencies for coordination and routing purposes.
- h. Materials and equipment shall be stored in a fenced (minimum 6' chain link fence) or otherwise enclosed area during non-working hours. Pipe and material shall not be strung out along installation routes for longer than two (2) weeks prior to installation.

END OF SECTION 01100

SECTION 01112

PERMITS

PART 1 - GENERAL

1.01 SCOPE

- A. Applicable engineering permits have been obtained from the Agencies listed below by the OWNER. The CONTRACTOR is responsible for compliance with any and all permit conditions. In the event that the OWNER must obtain permits in addition to those listed below, the CONTRACTOR shall not have any claim for damages arising from any delay caused by the OWNER'S obtaining said additional permits.
 - 1. Florida Department of Health
 - a. Watermain Extension Permit
 - b. Sewer Collection Permit
- B. The CONTRACTOR shall obtain construction permits from the City of West Palm Beach Building Department (Plumbing Permit). CONTRACTOR shall obtain dewatering permit if dewatering required.
- C. The CONTRACTOR shall prepare, submit, implement & maintain necessary documents to comply with the National Pollution Discharge Elimination System permit program, including all permit fees. These documents include but are not limited to, Notice of Intent, Stormwater Pollution Prevention Plans, Notice of Termination, etc., in accordance with the requirements of Florida Department of Environmental Protection.

END OF SECTION 01112

SECTION 01200
PROJECT MEETINGS

PART 1 - GENERAL

1.01 SUMMARY

- A. Project meetings, including Pre-Construction Conference and Progress Meetings, shall be arranged and conducted in accordance with the administrative and procedural requirements described herein.

1.02 PRE-CONSTRUCTION MEETING(S)/CONFERENCE(S)

- A. The OWNER will schedule a pre-construction meeting at a convenient location no later than 10 days after Notice to Proceed but prior to commencement of construction activities. The purpose of the meeting will be to review responsibilities and personnel assignments, to clarify the administrative procedures for prosecution of the work and to explain and/or clarify any requirements of the Contract Documents that are not understood by the CONTRACTOR. Unless previously finalized, the CONTRACTOR's preliminary schedules will be reviewed at the pre-construction conference to enable the CONTRACTOR to finalize the progress schedule, sequence of construction and schedule of values, to add calendar dates and modify and/or correct the schedules as necessary to obtain OWNER approval.
- B. Agenda: Items to be discussed at the pre-construction conference are all described elsewhere in the Contract Documents but there are items that are of significance in the project and that could affect progress, including such topics as:
 - 1. The project team members and their respective responsibilities.
 - 2. The lines of communication between the various team members.
 - 3. Project construction schedule and sequence of construction.
 - 4. Contract Time(s) and Liquidated Damages.
 - 5. Changes in the Work.
 - 6. Changes in the Time
 - 7. Schedule of Values.
 - 8. Mobilization and staging.
 - 9. Maintenance of Traffic (MOT).

10. Testing and inspections.
11. Submittal of Shop Drawings, Product Data and Samples.
12. Substitutions.
13. Clarifications.
14. Progress meetings.
15. Interim payments to the CONTRACTOR.
16. Retainage and final payment.
17. Project acceptance procedures.
18. Other General Requirements issues.

1.03 PROGRESS MEETINGS

- A. Attend monthly progress meetings held at the project site or location determined by City on a regularly scheduled basis agreed upon by all interested parties at pre-construction meeting.
- B. Attend special meetings called by OWNER or ENGINEER during progress of work.
- C. Progress meetings will be administered by the ENGINEER who will prepare the agenda for the meeting and incorporate items provided by the CONTRACTOR. The following list of suggested agenda items may be reviewed and/or discussed:
 1. Minutes of previous meeting.
 2. Work progress since last meeting.
 3. Field observations, problems, and conflicts.
 4. Problems which impede construction schedule.
 5. Corrective measures and procedures to regain projected schedule.
 6. Revision to construction schedule.
 7. Maintenance of quality standards.
 8. Effects of Contract Scope and/or Time changes.
 9. Other business.

D. Reporting:

1. Immediately after each progress meeting date, copies of the meeting minutes will be distributed to each party present and to other parties who should have been present.
2. The construction schedule shall be revised or updated after each progress meeting where revisions to the schedule have been approved or recognized. The revised schedule shall be issued concurrently with the report of each meeting.

E. Attendees: Qualified representatives of CONTRACTOR, Subcontractors and Suppliers authorized to act on behalf of the entity each represents, as well as the OWNER's professional and administrative project representatives, including the ENGINEER.

END OF SECTION 01200

SECTION 01310

CONSTRUCTION SCHEDULE

PART 1 - GENERAL

1.01 WORK INCLUDED

- A. Immediately after Contract award and prior to final execution of the Contract, the CONTRACTOR shall submit to the ENGINEER for approval a preliminary construction progress schedule for the project in the form of a bar chart. A CPM schedule, consisting of network diagrams, a bar chart and accompanying mathematical analyses, showing the order and interdependence of activities and the sequence in which the work is to be accomplished, may be submitted at the CONTRACTOR's option.

1.02 SCHEDULE CONTENT

- A. The schedule shall show the various activities of work in sufficient detail to demonstrate that the CONTRACTOR has a reasonable and workable plan to complete the project within the Contract Time. The schedule shall indicate the times (number of days) for starting and completing the various stages of the work, including Milestones (e.g., completion of Phase 1 Construction, completion of Phase 2 Construction, completion of the bridge, etc.) specified in the Contract Documents. The schedule shall show the order and interdependence of activities and the sequence in which the work is to be accomplished, as planned by the CONTRACTOR. All activities shall be described so that the work elements are readily identifiable and the progress on each activity can be readily measured. No activity, except Maintenance of Traffic (MOT), shall span more than 30 calendar days without the approval of the ENGINEER. The schedule shall include milestones and phased activities as required by the Contract Documents along with shop drawing submittals and the time required for obtaining permits and licenses.

1.03 SCHEDULE APPROVAL

- A. After reviewing the preliminary schedule, the OWNER and ENGINEER shall meet with the CONTRACTOR at the pre-construction conference or other meeting called to finalize the Progress Schedule and, thereafter, shall add calendar dates and shall modify and/or correct the schedule until satisfactory to the OWNER, at which time it will be approved for use by the CONTRACTOR for planning, organizing, and directing the work of the project and for determining and reporting progress. Approval of the Progress Schedule will be dependent upon satisfactorily identifying work items, dates and durations in conformance with the terms of the Contract and the Contract Time the OWNER has established. In conjunction with submittal of the Progress Schedule, a schedule of shop drawing and sample submittals shall be presented in accordance with Section 01340.

- B. No Request for Payment will be accepted or processed and no interim payment will be made to the CONTRACTOR until the Progress Schedule is acceptable to and approved by the OWNER.

1.04 SCHEDULE UPDATES/REVISIONS

- A. If the Contract Time has been changed substantially as a result of time extensions or Supplemental Agreements, the CONTRACTOR shall prepare a revised schedule and written report. The report shall indicate project percent completion, measured in work scope and costs, based on the most recent update of the schedule, and will be the basis for subsequent measurement of job progress and interim payments.
- B. The bar chart shall show regularly scheduled monthly progress meetings which will be held in the week prior to the scheduled progress payment application cut-off date so that the basis for determining job progress will coincide with that on which the monthly determination of Contract percent completion is based.

1.05 SCHEDULE COMPLIANCE

- A. The CONTRACTOR shall prosecute the work in accordance with the latest approved Progress Schedule. In the event that progress of critical items are delayed due to no fault of the OWNER, the CONTRACTOR shall prepare a written plan describing the methods the CONTRACTOR will use to complete the project within the Contract Time. All additional costs associated therewith will be borne solely by the CONTRACTOR without additional cost to the OWNER. The CONTRACTOR shall submit for approval such supplementary schedules as may be required by the OWNER to demonstrate the manner in which the scheduled progress will be regained.

END OF SECTION 01310

SECTION 01320

AUDIO VIDEO DOCUMENTATION

PART 1 - GENERAL

1.01 SCOPE OF WORK

- A. Prior to commencing Work in each area of the project, the CONTRACTOR shall have a continuous color audio-video DVD recording taken of the entire work area and all structures and equipment within the project site to serve as a record of pre-construction conditions. Note that compliance with Paragraph 1.03, C below may require that the audio video documentation of the overall project area be conducted in multiple parts at different stages during the Contract Times to ensure that preconstruction conditions are accurately documented.

1.02 RELATED SECTIONS

- A. Section 01340: Submittals
- B. Section 01720: Project Record Documents

1.03 QUALITY ASSURANCE

- A. The CONTRACTOR shall engage the services of a professional videographer. The color audio-video DVDs shall be prepared by a responsible commercial firm skilled and regularly engaged in the business of preconstruction color audio-video DVD documentation.
- B. The OWNER'S representative shall be present during audio-video documentation. Provide the OWNER a minimum of five days' notice prior to documentation.
- C. DVD recordings shall be made not greater than 45 days prior to starting construction in any particular area of the project site.
- D. No construction may begin prior to review and approval of the preconstruction video. The ENGINEER shall have the authority to reject all or any portion of a video DVD not conforming to the specifications and order that it be redone at no additional charge.
- E. The CONTRACTOR shall reschedule unacceptable coverage within five days after being notified. The ENGINEER shall designate those areas, if any, to be omitted from or added to the audio-video coverage.
- F. DVD recordings and written records shall become the property of the OWNER.

PART 2 - PRODUCTS

2.01 AUDIO-VIDEO DVDS

- A. Audio-video DVDs shall be new. Reprocessed DVDs shall not be acceptable.

PART 3 - EXECUTION

3.01 EQUIPMENT

- A. All equipment, accessories, materials, and labor to perform this service shall be furnished by the CONTRACTOR.
- B. The complete audio-video system shall reproduce bright, sharp, clear pictures with accurate colors, and shall be free from distortion, tearing, rolls, or any other form of imperfection. The audio portion of the recording shall reproduce the commentary of the camera operator with proper volume, clarity, and be free from distortion and interruptions.
- C. If conventional wheeled vehicles are used, the distance from the camera lens to the ground shall not be more than ten (10) feet. In some instances, audio-video DVD coverage may be required in areas not accessible by conventional wheeled vehicles. Such coverage shall be obtained by walking or special conveyance provided by the CONTRACTOR.
- D. The color video camera used in the recording system shall have a horizontal resolution of 350 lines at center, a luminance signal-to-noise ratio of 45 dB, and a minimum illumination requirement of one (1) foot-candle.

3.02 RECORDED INFORMATION – AUDIO

- A. Each DVD shall begin with the current date, project name and municipality, and be followed by the general location (i.e., viewing side and direction of progress). The audio track shall consist of an original live recording. The recording shall contain the narrative commentary of the videographer, recorded simultaneously with his fixed elevation video record of the zone of influence of construction.
- B. The OWNER and ENGINEER reserve the right to supplement the audio portion of the taping as deemed necessary. A representative of the OWNER or ENGINEER shall be selected to provide such narrative.

3.03 RECORDED INFORMATION – VIDEO

- A. All video recordings shall, by electronic means, display on the screen the correct time of day, the month, day, and year of the recording. This time and date information shall be continuously and simultaneously generated with the actual recording.

- B. Each video DVD shall have a log of that video DVD's contents. The log shall describe the various segments of coverage contained on that DVD in terms of the names of buildings, structures, equipment, work areas, coverage beginning and end, directions of coverage, video unit counter numbers, times, etc.

3.04 LIGHTING

- A. All audio-video recording shall be done during time of good visibility. No recording shall be done during precipitation, mist, or fog. The recording shall be done when sufficient sunlight or ambient light is present to properly illuminate the subjects of recording and to produce bright, sharp video recordings of those subjects.

3.05 SPEED OF TRAVEL

- A. The rate of speed in the general direction of travel used during vehicle recording shall not exceed 44 feet per minute. Panning, zoom-in, and zoom-out rates shall be sufficiently controlled to maintain a clear view of the subjects.

3.06 AREA OF COVERAGE

- A. Coverage shall include all features located within the project area supported by appropriate audio coverage. Such coverage shall include, but not be limited to pavement, sodding and landscaping, sidewalks, curbs, fences, signs, headwalls, building structures, equipment, piping, electrical infrastructure, etc.

END OF SECTION 01320

SECTION 01330

SHOP DRAWINGS, PRODUCT DATA AND SAMPLES

PART 1 - GENERAL

1.01 REQUIREMENTS INCLUDED

- A. Submit Shop Drawings, Product Data and Samples required by the Contract Documents.

1.02 RELATED REQUIREMENTS

- A. All applicable sections of the Specifications.
- B. Conditions of the Contract.
- C. Designate in the construction schedule, or in a separate coordinated schedule, the dates for submission and the dates that reviewed Shop Drawings, Product Data and Samples will be needed.

1.03 SHOP DRAWINGS

- A. Drawings shall be presented in a clear and thorough manner.
 - 1. Details shall be identified by reference to OWNER's Project Number, sheet, detail, intended uses and schedule numbers shown on Contract Drawings.

1.04 PRODUCT DATA

- A. Preparation:
 - 1. Clearly mark each copy to identify pertinent products or models.
 - 2. Show performance characteristics and capacities.
 - 3. Show dimensions and clearances required.
 - 4. Show wiring or piping diagrams and controls.
- B. Manufacturer's standard schematic drawings and diagrams:
 - 1. Modify Drawings and diagrams to delete information which is not applicable to the WORK.
 - 2. Supplement standard information to provide information specifically applicable to the WORK.

1.05 SAMPLES

- A. Office samples shall be of sufficient size and quantity to clearly illustrate:

1. Functional characteristics of the product with integrally related parts and attachment devices.
2. Full range of color, texture and pattern.

1.06 CONTRACTOR RESPONSIBILITIES

- A. Review Shop Drawings, Product Data and Samples prior to submission.
- B. Determine and verify:
 1. Field measurements.
 2. Field construction criteria.
 3. Catalog numbers and similar data.
 4. Conformance with specifications.
- C. Coordinate each submittal with requirements of the WORK and of the Contract Documents.
- D. Notify the ENGINEER in writing, at time of submission, of any deviations in the submittals from requirements of the Contract Documents.
- E. Begin no fabrication or WORK which requires submittals until return of submittals with ENGINEER's approval.

1.07 SUBMISSION REQUIREMENTS

- A. CONTRACTOR shall furnish to the ENGINEER for review, 1 copy of each shop drawing submittal (pdf format is acceptable). The term "Shop Drawing" as used herein shall be understood to include detail design calculations, shop drawings, fabrication and installation drawings, erection drawings, lists, graphs, catalog sheets, data sheets, and similar items.
- B. Normally, a separate transmittal form shall be used for each specific item or class of material or equipment for which a submittal is required. Transmittal of a submittal of various items using a single transmittal form will be permitted only when the items taken together constitute a manufacturer's "package" or are so functionally related that expediency indicates review of the group or package as a whole. A multiple-page submittal shall be collated into sets, and each set shall be stapled or bound, as appropriate, prior to transmittal to the ENGINEER.
- C. Except as may otherwise be indicated herein, the ENGINEER will return each submittal to the CONTRACTOR with its comments noted thereon, within fifteen (15) calendar days following their receipt by the ENGINEER. It is considered reasonable that the CONTRACTOR shall make a complete and acceptable submittal to the ENGINEER by the second submission of a submittal item. The OWNER reserves the right to withhold monies due the CONTRACTOR to cover

additional costs of the ENGINEER's review beyond the second submittal. The ENGINEER's maximum review period for each submittal, including all resubmittals, will be 15 days per submittal. In other words, for a submittal that required two resubmittals before it is complete, the maximum review period for that submittal could be 45 days.

- D. If a submittal is returned to the CONTRACTOR marked "NO EXCEPTIONS TAKEN", formal revision and resubmission of said submittal will not be required.
- E. If a submittal is returned to the CONTRACTOR marked "NOTE COMMENTS," formal revision and resubmission of said submittal will not be required.
- F. If a submittal is returned to the CONTRACTOR marked "RESUBMIT" the CONTRACTOR shall revise said submittal and shall resubmit the required number of copies or pdf of said revised submittal to the ENGINEER.
- G. If a submittal is returned to the CONTRACTOR marked "REJECTED", the CONTRACTOR shall revise said submittal and shall resubmit the required number of copies or pdf of said revised submittal to the ENGINEER.
- H. Fabrication of an item shall be commenced only after the ENGINEER and City of West Palm Beach have reviewed the pertinent submittals and returned copies to the CONTRACTOR marked either "NO EXCEPTIONS TAKEN" or "NOTE COMMENTS." Corrections indicated on submittals shall be considered as changes necessary to meet the requirements of the Contract Documents and shall not be taken as the basis for changes to the contract requirements.
- I. All CONTRACTOR shop drawing submittals shall be carefully reviewed by an authorized representative of the CONTRACTOR, prior to submission to the ENGINEER. Each submittal shall be dated, signed, and certified by the CONTRACTOR, as being correct and in strict conformance with the Contract Documents. In the case of shop drawings, each sheet shall be so dated, signed, and certified. No consideration for review by the ENGINEER of any CONTRACTOR submittals will be made for any items which have not been so certified by the CONTRACTOR. All non-certified submittals will be returned to the CONTRACTOR without action taken by the ENGINEER, and any delays caused thereby shall be the total responsibility of the CONTRACTOR.
- J. The ENGINEER's review of CONTRACTOR shop drawing submittals shall not relieve the CONTRACTOR of the entire responsibility for the correctness of details and dimensions. The CONTRACTOR shall assume all responsibility and risk for any misfits due to any errors in CONTRACTOR submittals. The CONTRACTOR shall be responsible for the dimensions and the design of adequate connections and details.
- K. **Shop Drawing Distribution:** Shop drawings shall be reviewed by the ENGINEER and marked either as "NO EXCEPTIONS TAKEN", "NOTE

COMMENTS", "RESUBMIT", or "REJECTED". The distribution of processed shop drawings shall be as follows:

1. Shop drawings marked "NO EXCEPTIONS TAKEN" or "MAKE CORRECTIONS NOTED".

Scanned pdf returned to CONTRACTOR

Scanned pdf transmitted to the OWNER

Scanned pdf to remain with the ENGINEER

2. Shop drawings marked "RESUBMIT" or "REJECTED".

Scanned pdf returned to CONTRACTOR

Scanned pdf remain with the ENGINEER

L. Submittals shall contain:

1. The date of submission and the dates of any previous submissions.
2. The Project title and Project number.
3. Contract identification.
4. The names of:
 - a. CONTRACTOR
 - b. Supplier
 - c. Manufacturer
5. Identification of the product, with the specification section number.
6. Field dimensions, clearly identified as such.
7. Relation to adjacent or critical features of the WORK or materials.
8. Applicable standards, such as ASTM or Federal Specification numbers.
9. Identification of deviations from Contract Documents.
10. Identification of revisions on resubmittals.
11. An 8" x 3" blank space for CONTRACTOR and ENGINEER's stamps.
12. CONTRACTOR's stamp, initialed or signed, certifying to review of submittal, verification of products, field measurements and field construction criteria, and coordination of the information within the submittal with requirements of the WORK and of Contract Documents.

1.08 RESUBMISSION REQUIREMENTS

- A. Make any corrections or changes in the submittals required by ENGINEER and resubmit until approved.
- B. Shop Drawings and Product Data:
 - 1. Revise initial Drawings or data, and resubmit as specified for the initial submittal.
 - 2. Indicate any changes which have been made other than those requested by the ENGINEER.
- C. Samples: Submit new samples as required for initial submittal.

1.09 DISTRIBUTION

- A. Distribute reproduction of Shop Drawings and copies of Product Data which carry the ENGINEER's stamp of approval to:
 - 1. Job site file.
 - 2. Record Documents file.
 - 3. Other affected CONTRACTORS.
 - 4. Subcontractors
 - 5. Supplier or Fabricator.
- B. Distribute samples which carry the ENGINEER's stamp of approval as directed by the ENGINEER.

1.10 ENGINEER DUTIES

- A. Review submittals with reasonable promptness and in accord with schedule.
- B. Affix stamp and initials or signature, and indicate requirements for resubmittal, or approval of submittal.
- C. Return submittals to CONTRACTOR for distribution, or for resubmission.

PART 2 - PRODUCTS (Not Applicable)

PART 3 - EXECUTION (Not Applicable)

END OF SECTION 01330

SECTION 01340

SUBMITTALS

PART 1 - GENERAL

1.01 WORK INCLUDED

- A. This Section specifies procedural requirements for non-administrative submittals including shop drawings, calculations, manufacturer's catalog cuts, product data, schematics, equipment and materials lists and schedules, coordination drawings and samples and other work-related submittals as necessary to amplify, expand, coordinate information, and satisfy requirements contained in the Contract Documents.

1.02 DATES FOR SUBMISSION AND RETURN

- A. Designate in the construction progress schedule, or in a separate coordinated schedule, dates for delivery of submittals to the ENGINEER for review and action.

1.03 SHOP DRAWINGS, PRODUCT DATA, ETC.

- A. Submit one reproducible, reverse transparency (sepia or equivalent) together with two prints to be retained by the ENGINEER for each required shop drawing, as follows:
 - 1. Identify each drawing with the following information placed on each drawing:
 - a. Project name, OWNER's Project number and Date drawing prepared.
 - b. Name and address of CONTRACTOR.
 - c. Name and address of Subcontractor.
 - d. Name of manufacturer.
 - e. Number and title of appropriate Specifications Section.
 - f. Drawing number and detail references, as appropriate.
 - 2. Leave a blank space six inches wide by four inches high in the lower right corner of the first sheet of the shop drawings for the ENGINEER's shop drawing review stamp.
- B. Submit four copies of each catalog cut or product data sheet where reproduction can be accomplished by a direct copy process.
- C. Submit samples and such other required submittals for review as indicated in the specific Specification Section for the item.
- D. Attach a copy of the CONTRACTOR's transmittal letter to each required shop drawing, manufacturer's catalog cut or other product data. When submitting reverse transparencies, provide six copies of the transmittal forms, one to accompany each

such submittal.

1.04 SUBMITTAL IDENTIFICATION

- A. Submit only one item or system per letter of transmittal properly identified to include the appropriate specification section and paragraphs.
- B. When catalogs, product data, diagrams or charts are submitted with more than one type of product manufactured, identify the particular item, including options, that is intended for use in that phase of work.
- C. Identify resubmittal with original shop drawing number and the letter A, B, etc. according with resubmittal order, and direct specific attention to revisions and corrections made, other than those requested on previous submissions.
- D. Identify details by reference to sheet and detail or schedule shown on Drawings and to Specifications Section.

1.05 SUBMITTAL COMPLETENESS

- A. Submit catalog sheets, product data, shop drawings and where specified, submit calculations, material samples, test data, warranties and guarantees all at same time for each item.
- B. Submit shop drawings and samples in technically related submittal groups as for the various disciplines (Architectural, Structural, Electrical, HVAC, Plumbing, etc.). Submit in complete submittal groups where possible.

1.06 SHOP DRAWINGS

- A. Submit shop drawings, including drawings, diagrams and schedules, as reproducible transparencies and blue line prints.
- B. Distribute copies of the transparencies stamped by the ENGINEER. Submit as multiple copies shop drawing material that cannot be submitted in sepia or other transparent form. Submit same number of copies as required for final distribution of reviewed submittals.

1.07 COORDINATION DRAWINGS

- A. Submit coordination drawings for integration of different construction elements. Show sequences and relationships of separate components to avoid conflicts in use of space.

1.08 CALCULATIONS

- A. Identify calculations by the name and seal of the registered ENGINEER preparing them. Include all assumptions, formulae and constants. Identify relation to design

requirements.

1.09 SAMPLES

- A. Submit product samples of sufficient size and quantity to illustrate functional characteristics, with integral parts and attachment devices, and full range of color, texture and pattern.

1.10 CONTRACTOR RESPONSIBILITIES

- A. Review shop drawings, catalog cuts, product data and samples prior to submission. Determine and verify:
 - 1. Field measurements.
 - 2. Field construction criteria.
 - 3. Catalog numbers and similar data.
 - 4. Conformance with Specifications.
 - 5. Conformance with drawings and details.
- B. Coordinate each submittal with requirements of Work and of Contract Documents. Transmit each submittal sufficiently in advance of performance of related construction activities to avoid delay.
- C. Notify the ENGINEER in writing at time of submission of any deviations in submittals from requirements of Contract Documents, but do not use the submittal process as a means for substituting products.
- D. Do not begin fabrication or Work that requires submittals until after receipt of submittals carrying favorable action by the ENGINEER.
- E. Coordinate transmittal of different types of submittals for related elements of the Work so that processing will not be delayed by the need to review submittals concurrently for coordination. The ENGINEER reserves the right to withhold action on a submittal requiring coordination with other submittals until related submittals are received.
- F. Submit shop drawings in sufficient time to allow adequate study, discussion and any necessary correction prior to beginning the Work they cover. No extension of Contract time will be authorized because of failure to transmit submittals to the ENGINEER sufficiently in advance of the Work to permit processing.
- G. Prior to sending in any submittals required by the Contract, including those of Subcontractors and Suppliers, review and check each submission for compliance with the Contract requirements and for coordination of the Work as it affects other trades, and stamp and sign approval on each submittal. By approving and submitting each submittal, the CONTRACTOR thereby represents that he has determined and verified all field measurements, field construction criteria, materials,

catalog numbers and similar data, or will do so, and that he has checked and coordinated each submittal with the requirements of the Work and of the Contract Documents.

- H. Review, Correction and Final Approval by CONTRACTOR: After reviewing the ENGINEER's comments, make any corrections as appropriate, and resubmit the corrected submittals until no further comment is made by the ENGINEER.
1. Endorse by stamp with date of final approval of the submittal after all reviews by the ENGINEER have been made and all of the ENGINEER's comments have been incorporated or otherwise satisfactorily acted upon.
 2. Commence no portion of the Work requiring a submittal until the submittal has CONTRACTOR's final approval stamp and endorsement.

1.11 ENGINEER'S REVIEW

- A. The ENGINEER will not review submittals that do not carry the CONTRACTOR's review stamp and approval.
- B. The ENGINEER will review submittals only for conformance with the design concept of the Project and with the information given in the Contract Documents.
- C. The ENGINEER's review comment relating to a separate item will not indicate review of an assembly in which the item functions.
- D. The ENGINEER's review of submittals will not relieve the CONTRACTOR from responsibility for any deviation.
- E. The ENGINEER's review of submittals will not relieve the CONTRACTOR from responsibility for errors or omissions in the CONTRACTOR's (or his subcontractor's) preparation of the submittals.
- F. The ENGINEER will note that each submittal has been reviewed and will return the submittal to the CONTRACTOR with comments pertaining to design concept of the Project and information given in the Contract Documents.
- G. Prior to receipt by CONTRACTOR of ENGINEER's review comments on required submittals, any Work done or materials ordered for the Work involved will be at the CONTRACTOR's risk.

END OF SECTION 01340

SECTION 01410

TESTING LABORATORY SERVICES

PART 1 - GENERAL

1.01 TESTING LABORATORY

- A. Unless otherwise specified, CONTRACTOR shall engage and pay for the services of an independent testing laboratory to perform the specified testing and inspection activities. See 1.04 D below for tests paid for by CONTRACTOR. However, neither the engagement of a testing laboratory and performance of the required inspections and tests, nor the failure of such inspections and tests to disclose deficiencies, shall relieve CONTRACTOR's obligations to perform the Work in full compliance with the requirements of the Contract.
- B. Laboratory selection shall be subject to approval by the OWNER. The CONTRACTOR must engage and pay for the services of one of the following three (3) independent testing laboratories: Terracon, Tierra, or Radise. The CONTRACTOR shall not change testing laboratories without prior approval by the OWNER.

1.02 LIMITATIONS OF AUTHORITY OF TESTING LABORATORY

- A. Laboratory is not authorized to:
 - 1. Release, revoke, alter or enlarge on requirements of Contract Documents.
 - 2. Approve or accept any portion of the work.
 - 3. Perform any duties of the CONTRACTOR.

1.03 LABORATORY DUTIES

- A. Cooperate with ENGINEER and CONTRACTOR; provide qualified personnel after due notice.
- B. Perform specified inspections, sampling and testing of materials and methods of construction:
 - 1. Comply with specified standards.
 - 2. Ascertain compliance of materials with requirements of Contract Documents.
- C. Promptly notify ENGINEER and CONTRACTOR of observed irregularities of deficiencies of work or products.
- D. Promptly submit written report of each test and inspection; one copy each to ENGINEER, OWNER, CONTRACTOR, and one copy to Record Document File. Each report shall include:

1. Date issued.
2. Project title, number and Parcel number.
3. Testing laboratory name, address and telephone number.
4. Name and signature of laboratory inspector.
5. Date and time of sampling or inspection.
6. Record of temperature and weather conditions.
7. Date of test.
8. Identification of fill product and specification section.
9. Location of sample or test in the project.
10. Type of inspection or test.
11. Results of tests and compliance with Contract Documents.
12. Interpretation of test results, when requested by ENGINEER.

E. Perform additional tests as required by the ENGINEER.

1.04 CONTRACTOR'S RESPONSIBILITIES

- A. CONTRACTOR shall cooperate with and provide services to the inspection and testing personnel, including assistance in accessing the Work, taking and delivering of samples, providing access to manufacturer's operations, if required, furnish incidental labor and facilities and other assistance as needed to facilitate performance of the required services.
- B. CONTRACTOR shall notify laboratory sufficiently in advance of operations to allow for laboratory assignment of personnel and scheduling of tests.
- C. CONTRACTOR shall furnish copies of all test reports on products, and the results of all inspections and tests conducted by the laboratory to the ENGINEER as required.
- D. The following tests, if applicable, will be paid for by the CONTRACTOR.
 - a. Density (every 150 feet of pipeline)
 - b. Proctor
 - c. LBR
 - d. Carbonate Content
 - e. Gradation
 - f. Plastic Index and Liquid Limit
 - g. Organic Content
 - h. Concrete Compressive Strength and Slump
 - i. Asphalt Extraction
 - j. Bacteriological Testing (only passing test results will be paid for by

OWNER)

1.05 TESTING COST PAYMENT

- A. Upon delivery by the CONTRACTOR to the OWNER of the laboratory's "paid" invoices for tests that signify conformance with the Contract Documents, the OWNER will include payment therefore in the CONTRACTOR's next interim pay estimate. CONTRACTOR should note that OWNER will pay the costs of only such tests that indicate conformance with specifications requirements. OWNER will neither be liable nor make payment for tests specified in Contract Documents that register non-compliance with specified requirements.

1.06 TESTING COSTS PAID FOR BY CONTRACTOR

- A. CONTRACTOR shall pay for all tests specified in Contract Documents that are conducted by and invoiced by the independent testing laboratory and shall forward to the OWNER the laboratory receipts or paid invoices for all specified tests that signify compliance with the Contract Documents for inclusion in the next interim payment. The CONTRACTOR shall also pay to the testing laboratory the costs of all tests and inspections that register non-compliance with specified requirements and shall provide to the OWNER evidence of such payments along with those that were satisfactory but shall clearly distinguish between them. The CONTRACTOR shall include the testing laboratory's final release of lien in the CONTRACTOR's Final Application for Payment.
- B. The CONTRACTOR shall pay for re-testing and inspections of laboratory tests (see 1.04 D) that register non-compliance with specified requirements.
- C. The CONTRACTOR shall pay for tests not specified in Contract Documents, but determined by CONTRACTOR to be of his benefit and ordered by him.
- D. The CONTRACTOR shall pay the costs of all tests necessary to satisfy ENGINEER that substitute materials or equipment meets the specified requirements.

END OF SECTION 01410

SECTION 01420
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 that the WORK is advertised for 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 or shown on the Drawings shall be waived because of any provision of, or omission from, said standards or requirements.
- C. **Specialists, Assignments:** In certain instances, specification text requires (or implies) that specific work is to be assigned to specialists or expert entities, who must be engaged for the performance of that work. Such assignments shall be recognized as special requirements over which the CONTRACTOR has no choice or option. These requirements shall not be interpreted so as to conflict with the enforcement of building codes and similar regulations governing the WORK; also, they are not intended to interfere with local union jurisdiction settlements and similar conventions. Such assignments are intended to establish which party or entity involved in a specific unit of work is recognized as "expert" for the indicated construction processes or operations. Nevertheless, the final responsibility for fulfillment of the entire set of contract requirements remains with the CONTRACTOR.

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 applicable codes and the applicable requirements of the following documents.
- B. References herein to "Building Code" shall mean "Florida Building Code". Reference to "Uniform Building Code" shall mean Uniform Building Code of the International Conference of Building Officials (ICBO). Similarly, references to "Mechanical Code" or "Uniform Mechanical Code," "Plumbing Code" or "Uniform Plumbing Code," "Fire Code" or "Uniform Fire Code," shall mean Uniform Mechanical Code, Uniform Plumbing Code and Uniform Fire Code of the International Conference of the Building Officials (ICBO). "Electric Code" or "National Electric Code (NEC)" shall mean the National Electric Code of the National Fire Protection Association (NFPA). The latest edition of the codes as

approved by the Municipal Code and used by the local agency as of the date that the WORK is advertised for bids, 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 ENGINEER for clarification and directions prior to ordering or providing any materials or furnishing labor. The CONTRACTOR shall bid for the most stringent requirements.
- D. 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. **Applicable Standard Specifications:** References in the Contract Documents to "Standard Specifications" shall mean Florida Department of Transportation Standard Specifications for Road and Bridge Construction, Latest Edition.
- F. 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.
- G. 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.
- H. References to "Minimum Standards" shall mean the minimum standards required by the authority having jurisdiction over the respective area or facilities.

1.03 REGULATIONS RELATED TO HAZARDOUS MATERIALS

- A. The CONTRACTOR is responsible that all work included in the Contract Documents, regardless if shown or not, shall comply with all EPA, OSHA, RCRA, NFPA, and any other Federal, State, and Local Regulations governing the storage and conveyance of hazardous materials, including petroleum products.
- B. Where no specific regulations exist, all chemical, hazardous, and petroleum product piping and storage in underground locations must be installed with double containment piping and tanks, or in separate concrete trenches and vaults, or with an approved lining which cannot be penetrated by the chemicals, unless waived in writing by the OWNER.

PART 2 - PRODUCTS

(Not Applicable)

PART 3 - EXECUTION

(Not Applicable)

END OF SECTION 01420

SECTION 01510
TEMPORARY UTILITIES

PART 1 - GENERAL

1.01 WORK INCLUDED

- A. Provide and maintain temporary utilities required for construction for the duration of the project and remove on completion of Work.

1.02 REQUIREMENTS OF REGULATORY AGENCIES

- A. Comply with National Electric Code.
- B. Comply with Federal, State and Local codes and regulations and with utility company requirements.

PART 2 - PRODUCTS

2.01 MATERIALS, GENERAL

- A. Use materials, new or used, that are adequate in capacity for the required usage, that do not create unsafe conditions, and that do not violate requirements of applicable codes and standards.

2.02 TEMPORARY ELECTRICITY

- A. Arrange with utility company to provide the service required and pay all costs for service and for power used.
- B. Install circuit and branch wiring, with area distribution boxes located so that power is available throughout the construction by the use of construction-type power cords.
 - 1. Provide power centers for miscellaneous tools and equipment as required.
 - 2. Provide power for construction equipment.
 - 3. Provide power for testing and checking equipment.
 - 4. Provide power for welding units and for other equipment having special power requirements.
- C. Provide adequate electrical service distribution for construction use by all trades during construction period. Notify utility company if unusually heavy loads, such as welding and other special power requirements, will be connected. Provide special circuits for heavy load requirements.

- D. Maintain strict supervision of use of temporary services. Enforce conformance with applicable standards and safe practices. Prevent abuse of services.
- E. Comply with the National Electrical Code, National Electrical Safety Code, National Fire Protection Association and all applicable Federal, state and local codes and utility company regulations.

2.03 TEMPORARY/CONSTRUCTION WATER

- A. All potable water used for construction shall be obtained through a metered water service, except for water used for the cannon flushing of the water main and for the sampling water associated with bacteriological testing. Arrange with utility service company, provide water for construction purposes, pay all costs for installation, maintenance and removal, and service charges for water used.
- B. To use construction water from the OWNER's potable water distribution system, the CONTRACTOR shall apply for a construction water meter at the West Palm Beach Utility Department Customer Service Office and pay for the meter deposit. The meter deposit will be refunded upon return of the meter in good condition.
- C. The CONTRACTOR will be allowed a reasonable amount of water for construction activities free of charge. The only payment due will be the monthly minimum fee for the construction meter service.
- D. Any costs associated with the construction water meter shall be included in the Mobilization line item.
- E. Install branch piping with taps located so that water is available throughout the construction by the use of hoses.
- F. Provide potable water service with approved backflow prevention devices for construction personnel
- G. Provide portable containers to dispense drinking water, with temperature maintained between 45 degrees F and 55 degrees F.

2.04 TEMPORARY SANITARY FACILITIES

- A. Provide sanitary facilities in compliance with laws and regulations.
- B. Provide enclosed toilet facilities for construction personnel. Place in location secluded from public and convenient for use of personnel in relation to work areas.
- C. Provide general employee washing facilities, similarly located.
- D. Maintain strict supervision of use of facilities, enforce conformance with applicable standards, maintain, service and clean facilities and enforce proper use of sanitary

facilities.

PART 3 - EXECUTION

3.01 GENERAL

- A. Coordinate locations of temporary sanitary facilities with OWNER.
- B. Maintain and operate systems to assure continuous services.
- C. Modify and extend systems as work progress requires.

3.02 TEMPORARY WATER

- A. Locate piping and outlets to avoid interference with traffic and other work and storage areas and do not run piping on floor or on ground.

3.03 TEMPORARY ELECTRICITY

- A. Install temporary service and distribution either overhead or underground.
- B. Locate to avoid interference with traffic and other work and storage areas.
- C. Do not run branch circuits on floor or on ground.
- D. Wire all safety devices required for operation of equipment.
- E. Check operation of safety devices.

3.04 TEMPORARY SANITARY FACILITIES

- A. Erect portable toilets securely and anchor to prevent dislocation. Service toilets as often as necessary to prevent accumulation of wastes and creation of unsanitary conditions. Provide faucet for washing.

3.05 REMOVAL

- A. Completely remove temporary materials and equipment when their use is no longer required.
- B. Clean and repair damage caused by temporary installations or use of temporary facilities.

END OF SECTION 01510

SECTION 01561

PROTECTION OF EXISTING FACILITIES

PART 1 - GENERAL

1.01 GENERAL

- 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 the 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 ENGINEER.
- 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 the rights-of-way involved until notified by the ENGINEER 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, if required by said party, and shall remove, shore, support or otherwise protect such pipeline, transmission line, ditch, fence, or structure or replace the 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, except as provided for temporary suspension of the WORK in the General Conditions of the Contract.

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. All survey markers or points disturbed by the CONTRACTOR shall be accurately restored after all street or roadway resurfacing has been completed.

1.04 RESTORATION OF PAVEMENT/SIDEWALKS

- 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.
- B. **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.
- C. **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.
- D. **Restoration of Sidewalks or Private Driveways:** Wherever sidewalks or private roads have been removed for purposes of construction, the CONTRACTOR shall place suitable temporary sidewalks or roadways 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 roadways until the final restoration thereof has been made. The CONTRACTOR shall replace any damage to existing sidewalks that are to remain at no cost to the City.

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 CONTRACTOR 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 ENGINEER 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 indicated, the CONTRACTOR shall, at the CONTRACTOR's expense, remove and, without unnecessary delay, temporarily replace or relocate such utility or improvement in a manner satisfactory to the ENGINEER 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 Indicated:** Existing utility lines that are indicated 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 or replaced by the CONTRACTOR.
- F. **Underground Utilities Not Indicated:** In the event that the CONTRACTOR damages any existing utility lines that are not indicated or the locations of which are not made known to the CONTRACTOR by Florida One Call prior to excavation, a written report thereof shall be made immediately to the ENGINEER. If directed by the ENGINEER, repairs shall be made by the

CONTRACTOR under the provisions for changes and extra work contained in the General Conditions of the Contract. The CONTRACTOR shall be responsible for all repair or relocation costs for any failure by the CONTRACTOR to contact appropriate utilities for locations prior to digging.

- G. **Approval of Repairs:** All repairs to a damaged utility or improvement are subject to inspection and approval by an authorized representative of the utility or improvement OWNER and the ENGINEER before being concealed by backfill or other work.
- H. **Maintaining in Service:** All oil and gasoline pipelines, power, and telephone or the 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 ENGINEER 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.
- I. **Existing Water Services:** CONTRACTOR shall protect and provide temporary support for existing water services. Any water service damaged by the CONTRACTOR, shall be replaced at the CONTRACTOR's expense, with a new water service complete with new water main tap.

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 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 and/or the OWNER. Tree trimming and replacement shall be accomplished in accordance with the following paragraphs. All trees to remain in right-of-way shall be protected and fenced with orange barricade fencing.
- B. **Trimming:** Symmetry of the tree shall be preserved; no stubs or splits or torn branches left; clean cuts shall be made close to the 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 its 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 a compensatory payment acceptable to the tree OWNER, subject to the approval of the jurisdictional agency or OWNER. The size of the trees shall be not less than 1-inch diameter nor less than 6 feet in height.

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 3 days nor more than 7 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 contact 811 at least 2 days, but no more than 14 days, prior to such excavation.

PART 2 - PRODUCTS

2.01 MATERIALS, GENERAL

- A. Materials may be new or used, suitable for the intended purpose, but must not violate requirements of applicable codes and standards.

2.02 FENCING

- A. Materials to CONTRACTOR's option, minimum fence height is 6 feet.

2.03 BARRIERS

- A. Materials to CONTRACTOR's option, as appropriate to serve required purpose.

PART 3 - EXECUTION

3.01 GENERAL

- A. Install facilities of a neat and reasonable uniform appearance, structurally adequate for required purposes.
- B. Maintain barriers during entire construction period.
- C. Relocate barriers as required by progress of construction.

3.02 TREE AND PLANT PROTECTION

- A. Preserve and protect existing trees and plants adjacent to work areas.
- B. Consult with OWNER's Representative and remove agreed-on roots and branches which interfere with work:
 - 1. Employ qualified tree surgeon to remove branches, and to treat cuts.
- C. Protect root zones of trees and plants:
 - 1. Do not allow vehicular traffic and parking.
 - 2. Do not store materials or products.
 - 3. Prevent dumping of refuse or chemically injurious materials or liquids.
 - 4. Prevent puddling or continuous running water.
- D. Carefully supervise all work to prevent damage.
- E. Replace trees and plants which are damaged or destroyed due to work operations under this contract.

3.03 REMOVAL

- A. Completely remove barricades, including foundations, when construction has progressed to the point that they are no longer needed, and when approved by OWNER's Representative.
- B. Clean and repair damage caused by installation, fill and grade areas of the site to required elevations and slopes, and clean the area.

END OF SECTION 01561

SECTION 01570
MAINTENANCE OF TRAFFIC

PART 1 - GENERAL

1.01 DESCRIPTION OF WORK

- A. Provide all items necessary to protect, warn and/or maintain vehicular and pedestrian traffic during the course of construction.
- B. The CONTRACTOR shall arrange for the services of a Work Site Traffic Supervisor (WTS) as certified by the American Traffic Safety Services Association (ATSSA), or a Florida-licensed Professional Engineer (traffic), and be in accordance with FDOT Standard Specifications, Section 102 to prepare a detailed Temporary Traffic Control Plan (TTCP)/ Maintenance of Traffic Plan (MOT) for permit approval by the City of West Palm Beach, Florida Department of Transportation (FDOT), and Palm Beach County Traffic Engineering and other governmental agencies having jurisdiction prior to the start of construction activities. See FDOT Utility permit and Palm Beach County Right of Way Construction Utility permit included in Appendix D for specific conditions and requirements.
- C. The Temporary Traffic Control Plan (TTCP)/Maintenance of Traffic (MOT) Plan and all traffic warning and control devices shall conform to the applicable provisions of the latest editions of the national "Manual On Uniform Traffic Control Devices" (MUTCD), the 600 series of the Florida Department of Transportation's "Roadway and Traffic Design Standards", and Palm Beach County's Minimum Standards Applicable to Public Rights of Way Under Palm Beach County Jurisdiction".
- D. There will be no separate payment for the fee for Engineering Services, if required.

1.02 TRAFFIC PLAN

- A. The CONTRACTOR shall submit the detailed TTCP/MOT Plans to the ENGINEER and City of West Palm Beach, Palm Beach County Traffic Engineering and FDOT for review and permit approval, at the Pre-Construction Meeting. The detailed TTCP/MOT Plans must identify at a minimum; each phase of the work, traffic flows during each phase, the proposed location of construction signs, channelizing devices, temporary pavement markings and symbols, lighting devices, barrier walls, modifications to traffic signals and all other required devices as applicable. No work within the public right-of-way shall commence until the detailed TTCP/MOT Plans have been approved in writing by all governmental agencies having jurisdiction. Upon the start of construction, the CONTRACTOR shall comply with all provisions of the detailed TTCP/MOT Plans. In the event of non-compliance by the CONTRACTOR, the CONSULTANT will

have the authority to order the CONTRACTOR to cease construction operations without compensation of time or money until the violations have been corrected.

- B. The CONTRACTOR shall develop, or have developed, a Temporary Traffic Control Plan (TTCP)/Maintenance of Traffic (MOT) for implementation during the entirety of the project, and to be submitted to the ENGINEER or OWNER for approval. The TTCP shall meet the requirements of Index 600 of the latest edition of the Florida Department of Transportation Design Standards. The TTCP have separate sheets for each phase of construction (if applicable). The CONTRACTOR shall take responsibility for identifying and assessing any potential impacts to any utilities that may be caused by the TTCP; the CONTRACTOR shall be responsible for notifying the OWNER in writing if any such potential impacts to utilities. The TTCP shall include stand-alone maintenance of traffic (MOT) plans developed and submitted for each project work area and phase of construction. The TTCP shall meet the following requirements:
1. The TTCP shall developed to prioritize safety of workers, motorists, and pedestrians under all conditions, including working hours and non-working hours, from the time of CONTRACTOR's mobilization to the site until completion of the project.
 2. The TTCP shall include certification(s) of the preparer(s), as well as contact information including a 24-hour-per-day contact phone number for the WTS.
 3. The TTCP shall include the following information: north arrow, type and location of all signs, lights, barricades, striping, barriers, traffic signals, and identification of all side streets, change-overs, sidewalks, pavement markings, school zones, crosswalks, bus stops, and railroad crossings.
 4. Drawings must be accurately dimensioned.
 5. Portable Changeable Message Signs (PCMS) and/or Variable Message Signs (VMS) shall be used for messages and identified in the TTCP. A minimum of two message signs shall be placed within the right-of-way no later than two weeks prior to beginning construction activities in an area. After construction activities commence, the CONTRACTOR may replace the PCMS with post mounted signs. No additional compensation will be provided for PCMS signs after the start of construction.
 6. The TTCP shall show the location and geometry of transitions, detours, and diversions.
 7. No change-overs shall be allowed on Monday or Friday, the day before a holiday, or during morning or evening peak traffic. Change-overs should not be located at signalized intersections.
 8. No lane closures shall be allowed during holidays.

9. TTCP shall be submitted for approval to the agency(ies) having jurisdiction over the roadway and right-of-way.
 10. In no case may the CONTRACTOR begin work in an area until the TTCP for that area has been approved by the ENGINEER, OWNER, and jurisdictional agency. Field modifications may be made only with the approval of all three reviewing entities.
- C. The detailed TTCP/MOT Plan shall include provisions for pedestrian traffic as well as vehicular (including bus) traffic.
- D. The TTCP/MOT shall show and describe proposed location and time durations of the following as applicable:
1. Public vehicular traffic routing.
 2. Traffic blockage and lane closings anticipated due to construction operations.
 3. Staging/storage areas and haulage routes.
 4. Allowable on-street parking in vicinity of work site.
 5. Access to buildings adjacent to work site.
 6. Driveways which will be blocked by construction operations.
 7. Temporary commercial and industrial loading and unloading zones.
 8. Temporary traffic control and channelizing devices and markings.
 9. Individual street closings with locations and time durations.
 10. Detour facilities.

PART 2 - PRODUCTS

2.01 TRAFFIC CONTROL AND CHANNELIZING DEVICES

- A. Provide devices complying with the standards referenced above as applicable.

PART 3 - EXECUTION

3.01 MAINTENANCE OF TRAFFIC

- A. The CONTRACTOR, at all times, shall conduct the work in such a manner as to ensure the least obstruction to traffic as is practical. The safety and convenience of the general public and of the businesses adjacent to the work shall be provided for in a satisfactory manner, as determined by the ENGINEER and the City of West Palm Beach.
- B. Sidewalks, gutters, drains, fire hydrants and private drives shall, insofar as practical, be kept in good condition for their intended uses. Fire hydrants on or

adjacent to the work shall be kept accessible to fire apparatus at all times, and no material or obstruction shall be placed within ten (10) feet of any such hydrant.

- C. Construction materials temporarily stored within the road right-of-way shall be placed so as to cause as little obstruction to the general public as is reasonably possible.
- D. Streets shall not be closed, except in accordance with the approved TTCP/MOT Plans, and whenever the street is not closed, the work must be conducted with the provision for a safe passageway for vehicular and pedestrian traffic at all times. The CONTRACTOR shall make all necessary arrangements with the OWNER, the ENGINEER, PBCTED, and FDOT concerning maintenance of traffic and selection of detours required. CONTRACTOR is responsible for coordinating refuse and other services as necessary.
- E. All existing regulatory and information signs and traffic signals shall be maintained by the CONTRACTOR for as long as deemed necessary by the CONSULTANT. If any signs or signals are damaged or lost during the construction period, such signs and signals shall be repaired or replaced by the CONTRACTOR at CONTRACTOR's expense.

3.02 DIVERSION/DETOURING OF TRAFFIC

- A. When permission has been granted to close an existing roadway, the CONTRACTOR shall furnish and erect signs, channelizing devices, lights, flags and other protective devices, which shall conform to the requirements above and be subject to the approval of the OWNER and the ENGINEER. The CONTRACTOR shall furnish and maintain proper protective devices at such locations for the entire time of closure as the CONSULTANT may direct.
- B. The CONTRACTOR shall furnish a sufficient number of protective devices to protect and divert the vehicular and pedestrian traffic from working areas closed to traffic, or to protect any new work. Failure to comply with this requirement will result in the OWNER and/or ENGINEER shutting down the work, until the CONTRACTOR provides the necessary protection.
- C. Any time traffic is diverted for a period of time that will exceed one work day temporary pavement markings will be required. Existing pavement markings that conflict with the new work zone traffic pattern must be obliterated. Painting over existing pavement markings (black out) is not permitted.
- D. The CONTRACTOR may be required to reposition existing traffic signal heads in order to maintain traffic flows at diverted intersections. If this should be necessary, the CONTRACTOR must submit a plan for approval showing the course of work, and the planned repositioning. OWNER of West Palm Beach Engineering Department must approve the plan prior to implementation. No separate payment for repositioning the existing traffic signal heads will be made.

END OF SECTION 01570

SECTION 01571
TEMPORARY CONTROLS

PART 1 - GENERAL

1.01 REQUIREMENTS INCLUDED

- A. Provide and maintain methods, equipment, and temporary construction, as necessary, to provide controls over environmental conditions at the construction site and related area under CONTRACTOR's control; remove physical evidence of temporary facilities at completion of work.

1.02 RELATED REQUIREMENTS

- A. All applicable sections of the Specifications.
- B. Conditions of the Contract.

1.03 NOISE CONTROL

- A. Provide all necessary requirements for noise control during the construction period.
 - 1. Noise procedures shall conform to all applicable OSHA requirements and local ordinances having jurisdiction on the work.
 - 2. Noise levels during night time hours shall not exceed 55 db measured at the property line of a residence.

1.04 DUST CONTROL

- A. Provide positive methods and apply dust control materials to minimize raising dust from construction operations, and provide positive means to prevent airborne dust from dispersing into the atmosphere.

1.05 WATER CONTROL

- A. Provide methods to control surface water to prevent damage to the project, the site, or adjoining properties.
 - 1. Control fill, grading and ditching to direct surface drainage away from excavations, pits, tunnels and other construction areas; and to direct drainage to proper runoff.
- B. Provide, operate and maintain hydraulic equipment of adequate capacity to control surface and water.

- C. Dispose of drainage water in a manner to prevent flooding, erosion, or other damage to any portion of the site or to adjoining areas.

1.06 PEST CONTROL

- A. Provide pest control as necessary to prevent infestation of construction or storage area.
 - 1. Employ methods and use materials which will not adversely affect conditions at the site or on adjoining properties.
 - 2. Should the use of pesticides be considered necessary, submit an informational copy of the proposed program to OWNER with a copy to ENGINEER. Clearly indicate:
 - a. the area or areas to be treated.
 - b. the pesticide to be used, with a copy of the manufacturer's printed instructions.
 - c. the pollution preventative measures to be employed.
- B. The use of any pesticide shall be in full accordance with the manufacturer's printed instructions and recommendations.

1.07 RODENT CONTROL

- A. Provide rodent control as necessary to prevent infestation of construction or storage area.
 - 1. Employ methods and use materials which will not adversely affect conditions at the site or on adjoining properties
 - 2. Should the use of rodenticide be considered necessary, submit an informational copy of the proposed program to OWNER with a copy to OWNER's Representative. Clearly indicate:
 - a. the area or areas to be treated.
 - b. the rodenticide to be used, with a copy of the manufacturer's printed instructions.
 - c. the pollution preventative measures to be employed.
- B. The use of any rodenticide shall be in full accordance with the manufacturer's printed instructions and recommendations.

1.08 DEBRIS CONTROL

- A. Maintain all areas under CONTRACTOR's control free of extraneous debris.
- B. Initiate and maintain a specific program to prevent accumulation of debris at construction site, storage and parking area, or along access roads and haul routes.
 - 1. Provide containers for deposit of debris as specified in the Contract Documents.
 - 2. Prohibit overloading of trucks to prevent spillage on access and haul routes.
 - a. Provide periodic inspection of traffic areas to enforce requirements.
- C. Schedule periodic collections and disposal of debris as specified in the Contract Documents.
 - 1. Provide additional collections and disposal of debris whenever the periodic schedule is inadequate to prevent accumulation.

1.09 POLLUTION CONTROL

- A. Provide methods, means and facilities required to prevent contamination of soil, water or atmosphere by the discharge of noxious substances from construction operations.
- B. Provide equipment and personnel, perform emergency measures required to contain any spillage, and to remove contaminated soils or liquids.
 - 1. Excavate and dispose of any contaminated earth off-site in accordance with regulatory requirements and replace with suitable compacted fill and topsoil.
- C. Take special measures to prevent harmful substances from entering public waters.
 - 1. Prevent disposal of wastes, effluents, chemicals, or other such substances adjacent to streams or in sanitary or storm sewers.
- D. Provide systems for control of atmospheric pollutants.
 - 1. Prevent toxic concentrations of chemicals.
 - 2. Prevent harmful dispersal of pollutants into the atmosphere.

1.10 EROSION CONTROL

- A. Plan and execute construction and earthwork, by methods to control surface drainage from cuts and fills, and from borrow and waste disposal areas to prevent erosion and sedimentation.
 - 1. Hold the areas of bare soil exposed at one time to a minimum.
 - 2. Provide temporary control measures such as berms, dikes and drains.
 - 3. Provide silt screens as required to prevent surface water contamination.
- B. Construct fills and waste areas by selective placement to eliminate surface silts which will erode.
- C. Periodically inspect earthwork to detect any evidence of the start of erosion, apply corrective measures as required to control erosion.

PART 2 - PRODUCTS (Not Applicable)

PART 3 - EXECUTION (Not Applicable)

END OF SECTION 01571

SECTION 01600

MATERIALS AND EQUIPMENT

PART 1 - GENERAL

1.01 MATERIALS, PRODUCTS AND EQUIPMENT INCORPORATED IN THE WORK

- A. Provide material, products and equipment that conform to the Specifications and Drawings.
- B. Manufactured and fabricated products shall comply with referenced standards, and the approved shop drawings. Like parts of duplicate units shall be manufactured to standard sizes and gauges to make them interchangeable. Similar items by one manufacturer shall match.
- C. Use materials, products and items of equipment only for the purposes for which they are designed and specified.

1.02 MANUFACTURER'S INSTRUCTIONS

- A. When Contract Documents require that installation of work shall comply with manufacturer's printed instructions, provide copies of such instructions to parties involved in installation, including two copies to ENGINEER. Maintain one set of complete instructions at job site during installation and until completion. Handle, install, connect and adjust products in accordance with manufacturer's instructions and the specifications.

1.03 TRANSPORTATION AND HANDLING

- A. Arrange deliveries of products in accordance with construction schedules. Avoid conflict with work and site conditions. Immediately upon delivery, inspect shipments to assure compliance with requirements of Contract Documents and approved submittals and that products are properly protected and undamaged.

1.04 STORAGE AND PROTECTION

- A. Interior Storage: Store products in accordance with manufacturer's printed instructions, with seals and labels intact and legible.
- B. Exterior Storage:
 - 1. Store fabricated products above ground, on blocking or skids to prevent soiling or staining. Cover products which are subject to deterioration with waterproof covers, provide adequate ventilation to avoid condensation.

2. Store loose granular materials in a well-drained area on solid surfaces to prevent mixing with foreign matter.
 - C. Protect materials and products while in storage and arrange storage to provide easy access for inspection. Make inspections of stored products to assure that products are maintained under specified conditions and are free from damage or deterioration.
 - D. Protection After Installation: Protect installed products from damage from traffic and construction operations. Remove coverings when no longer needed.
- 1.05 SPECIFIED PRODUCTS, PRODUCT OPTIONS AND SUBSTITUTIONS
- A. Products Listed: Immediately after Contract award, submit to ENGINEER a complete list of products that the CONTRACTOR proposes to provide, with name of manufacturer and installing subcontractor.
 - B. CONTRACTOR's Options:
 1. Where products are specified by reference standard only, select any product which complies with the requirements of the standard.
 2. Where the Specifications require compliance with indicated performance requirements, select any product that complies with the specified performance requirements, provided no product names are indicated.
 3. Where products are specified by naming several products or manufacturers, select any one of the products or manufacturers named.
 4. For products specified by naming one or more products and/or manufacturers, followed by the words "or equal" or similar language, any product submitted as such an equal will be treated as a substitution.
 5. For products specified by naming only one product and manufacturer, or where "no substitution" is indicated, there is no option.
 - C. Product Substitutions: For a period of 30 days after Contract award date, ENGINEER will consider written requests from CONTRACTOR for substitution of products.
 - D. Submit a Request for Substitution of Product only after the CONTRACTOR:
 1. Has investigated the proposed product and determined that it is equal to or superior to specified product, furnishes a certification to that effect and waives all rights to additional payment or time that may subsequently become necessary due to the failure of the substituted product to perform adequately.

2. Agrees to provide same warranties or bonds for product substitution as for product specified.
3. Agrees to be responsible for coordinating and paying for any necessary changes to other work required by approved substitutions or product options which he selects and shall pay all such costs including the costs of the services of the design professional to revise the Contract Documents, if such revisions are required.
4. Waives all claims for additional costs due to substitution which may subsequently become apparent.
5. Is offering either a substantial credit to the OWNER for acceptance of the substitution or a convincing justification that the product to be provided as the substitution is substantially superior in quality, performance, compatibility with adjacent products, durability, vandal-resistance or in other important ways.

E. ENGINEER's Action:

1. ENGINEER will review requests for substitutions with reasonable promptness and notify CONTRACTOR in writing of OWNER's decision to accept or reject requested substitutions. Only the OWNER may accept a substitution.
2. Substitution requests made by means of shop drawings or product data submittal will not be considered.
3. After the period of 30 days has elapsed, the only substitution requests which will be considered are those which are made necessary by the removal of the specified products from the market or by other similar, unavoidable circumstances beyond the control of the CONTRACTOR.

END OF SECTION 01600

SECTION 01630

PRODUCT OPTIONS AND SUBSTITUTIONS

PART 1 - GENERAL

1.01 REQUIREMENTS INCLUDED

- A. CONTRACTOR's options in selection of products.
- B. Products list.
- C. Requests for substitution of products.

1.02 CONTRACTOR'S OPTIONS

- A. Products Specified by Reference Standards or by Description Only: Any product meeting those standards.
- B. Products Specified by Naming One or More Manufacturers with a Substitution Paragraph: Submit a request for substitution for any manufacturers not specifically named.
- C. Products Specified by Naming Several Manufacturers: Products of named manufacturers meeting specifications; no options, no substitutes.
- D. Products Specified by Naming Only One Manufacturer: No option; no substitutions allowed.

1.03 PRODUCTS LIST

- A. Within fifteen (15) days after Notice of Award, transmit one (1) copy (pdf is acceptable) of a list of products which are proposed for installation, including name of manufacturers.
- B. Tabulate products by Specifications Section Number, title and Article Number.
- C. For products specified only by reference standards, give manufacturer, trade name, model or catalog designation, and reference standards.
- D. ENGINEER will reply in writing within ten (10) days stating whether there is reasonable objection to listed items. Failure to object to a listed item shall not constitute a waiver of requirements of Contract Documents.

1.04 LIMITATIONS ON SUBSTITUTIONS

- A. During bidding period, Instructions to Bidders govern times for submitting requests for substitutions under requirements specified in this section.

- B. Requests for substitutions of products will be considered only within fifteen (15) days after date of OWNER-CONTRACTOR Agreement. Subsequent requests will be considered only in case of product unavailability or other conditions beyond control of CONTRACTOR.
- C. Substitutions will not be considered when indicated on shop drawings or product data submittals without separate formal request, when requested directly by subcontractor or supplier, or when acceptance will require substantial revision of Contract Documents.
- D. Substitute products shall not be ordered or installed without written acceptance.
- E. Only one (1) request for substitution for each product will be considered. When substitution is not accepted, provide specified product.
- F. ENGINEER will determine acceptability of substitutions.

1.05 REQUESTS FOR SUBSTITUTIONS

- A. Submit separate request for each substitution. Document each request with complete data substantiating compliance of proposed substitution with requirements of Contract Documents.
- B. Identify product by specification Section and Article Numbers. Provide manufacturer's name and address, trade name of product, and model or catalog number. List fabricators and suppliers as appropriate.
- C. Attach product data as specified in Section 01330.
- D. List similar projects using product, dates of installation, and names of ENGINEER and OWNER.
- E. Give itemized comparison of proposed substitution with specified product, listing variations, and reference to Specifications section and Article numbers.
- F. Give quality and performance comparison between proposed substitution and the specified product.
- G. Give cost data comparing proposed substitution with specified product, and amount of net change to Contract Sum.
- H. List availability of maintenance services and replacement materials.
- I. State effect of substitution on construction schedule, and changes required in other work of products.

1.06 CONTRACTOR REPRESENTATION

- A. Request for substitution constitutes a representation that CONTRACTOR has investigated proposed product and has determined that it is equal to or superior in all respects to specified product or that the cost reduction offered is ample justification for accepting the offered substitution.
- B. CONTRACTOR will provide same warranty for substitution as for specified product.
- C. CONTRACTOR will coordinate installation of accepted substitute, making such changes as may be required for work to be complete in all respects.
- D. CONTRACTOR certifies that cost data presented is complete and includes all related costs under this Contract.
- E. CONTRACTOR waives claims for additional costs related to substitution which may later become apparent.

1.07 SUBMITTAL PROCEDURES

- A. Submit one (1) copy of request for substitution.
- B. ENGINEER will review CONTRACTOR's requests for substitutions with reasonable promptness.
- C. During the bidding period, ENGINEER will record acceptable substitutions in Addenda.
- D. After award of Contract, ENGINEER will notify CONTRACTOR, in writing, of decision to accept or reject requested substitutions in Addenda.
- E. For accepted products, submit shop drawings, product data, and samples in accordance with and Section 01330.

PART 2 - PRODUCTS (Not Applicable)

PART 3 - EXECUTION (Not Applicable)

END OF SECTION 01630

SECTION 01700
CONTRACT CLOSEOUT

PART 1 - GENERAL

1.01 SCOPE OF WORK

- A. The Work of Contract Closeout consists of completion of project requirements that must be fulfilled near the end of the Contract Time in preparation for final acceptance and occupancy of the project by the OWNER as well as final payment to the CONTRACTOR and normal termination of the Contract.

1.02 SUBSTANTIAL COMPLETION

- A. See General Conditions 15.03 Substantial Completion.

1.03 FINAL CONSTRUCTION INSPECTION

- A. See General Conditions 15.05 Final Inspection.

When Work is complete, including the substantial completion punchlist items, CONTRACTOR shall notify ENGINEER in writing that the Work is completed and ready for final construction inspection. ENGINEER, accompanied by the OWNER and CONTRACTOR, will make a final construction inspection to verify status of completion with reasonable promptness and when satisfied that the Work is acceptable under the Contract Documents, they will so advise OWNER and CONTRACTOR.

- B. If, during construction operations or during construction reviews for substantial or final completion, the ENGINEER should fail to reject defective Work or materials, such failure to reject shall in no way prevent his later rejection when such defect is discovered, or obligate OWNER to final acceptance. CONTRACTOR shall make no claim for losses suffered due to any necessary removals or repairs of such defects.

1.04 CONTRACTOR'S CLOSEOUT SUBMITTALS

- A. Upon receipt of notice of acceptability from ENGINEER, CONTRACTOR shall assemble, for submittal along with the Final Application for Payment, evidence of compliance with requirements of governing authorities and Contract Documents, as follows:
 - 1. Project Record Documents including As-built Drawings and Specifications, Addenda, Construction Schedule, Change Orders and other modifications of the Contract, Approved Shop Drawings, Product Data and Samples, and Field Test records.

2. Operating and Maintenance Instructions: Submit instructions and/or manuals for operating equipment and systems as prepared in accordance with the requirements of the applicable equipment specifications sections.
 3. Warranties and Bonds: As applicable and in accordance with the requirements of the individual sections of the specifications.
 4. Evidence of payment to subcontractors, testing laboratories, material men and equipment suppliers and releases of liens therefrom.
- B. During the construction process, CONTRACTOR shall maintain records of all deviations from the Plans and Specifications and prepare Record Drawings showing correctly and accurately all changes and deviations made during construction to reflect the Work as it was actually constructed. The record drawings shall identify all underground piping and ductwork with elevations and dimensions and locations of valves, pull boxes, etc., changes in location, horizontal and vertical locations of underground utilities and appurtenances, referenced to permanent surface improvements, actual installed pipe material, class, etc. CONTRACTOR shall prepare these drawings to conform to recognized standards of drafting, to be neat, legible and on standard size project plan sheets. As a prerequisite for monthly progress payments, CONTRACTOR shall submit, simultaneously with the progress payment request, a copy of the currently updated Record Drawings for review by the ENGINEER. Final payment to the CONTRACTOR will not be made until the completed set of record drawings, signed and sealed by a professional engineer or land surveyor registered in the State of Florida and approved by the ENGINEER as to form and accuracy has been delivered to the OWNER.

1.05 FINAL ADJUSTMENTS OF ACCOUNTS

- A. CONTRACTOR shall submit a final statement of accounting along with the Final Application for Payment to ENGINEER, reflecting all adjustments to Contract Sum and the ENGINEER, upon verifying the claim, will submit the approved document to OWNER for payment.

END OF SECTION 01700

SECTION 01720

PROJECT RECORD DOCUMENTS

PART 1 - GENERAL

1.01 REQUIREMENTS INCLUDED

- A. Maintain at the site for the OWNER on record copy of:
1. Drawings (Contract Drawings and updated Record Drawings).
 2. Specifications.
 3. Addenda.
 4. Change Orders and other Modifications to the Contract.
 5. ENGINEER's Field Orders or written instructions.
 6. Approved Shop Drawings, Working Drawings and Samples.
 7. Field Test records.
 8. Construction photographs.
 9. Field engineering records for compliance with field engineering submittals.
 10. Updated Project Schedule.

1.02 SURVEYED RECORD DRAWINGS AND METER DATA

- A. The CONTRACTOR shall maintain a survey, prepared by a Florida-registered professional surveyor and mapper (PSM) or professional land surveyor (PLS), of all installed utility components, including but not limited to the following:
1. Survey reference points and control.
 2. Alignment and elevations of all new water mains and service laterals.
 3. The location (northing and eastings), elevation, size, and type of all valves, fittings, hydrants, tie-ins to existing mains, air release valves, RPZ/PVB backflow preventers, double detector check valves, line stops, insertion valves, corporation stop at saddle connections to new water mains, dual check valve, and other appurtenances.
 4. The locations (northing and eastings) of all new meters and meter boxes.

5. The locations (northing and eastings), where exposed during construction, of existing water mains to be abandoned including the extent and method of abandonment.
 6. Indicate the locations of existing Asbestos Cement pipe to be grout filled and/or abandoned in place including location (northing and eastings) of limits/extents of grout fill and abandonment.
 7. Indicate the locations of existing facilities removed and disposed of including location (northing and eastings) of limits/extents of removal.
 8. Indicate the locations (northing and eastings) of existing water mains where they are cut and abandoned in place including pictures of cut and plugged existing water main.
 9. Indicate the locations and top of pipe elevations of all water services on private property and the tie-in connection point location (northing and eastings) at the building/home.
 10. The locations (northing and eastings) and elevations of surface features (e.g., driveways, sidewalks, pavement, drainage swales, structures, etc.) installed during construction.
 11. Water main top of pipe elevations and locations (northing and eastings) at vertical deflection points and every fifty (50) linear feet.
 12. Crossing information between proposed water main and existing and proposed sewer main, force main, drainage, water main, and franchise utilities.
 13. All test hole or soft dig information obtained on existing utilities providing precise horizontal and vertical locations.
- B. Survey data and locations shall be collected and provided within record drawings using coordinates (northing and eastings) and elevation datum used in the Contract Drawings.
- C. The certification and final surveyed computer-generated record drawings shall be certified by the PLS/PSM for certification purposes through Authorities Having Jurisdiction and at the completion of construction (progress submittals shall be submitted with each Application for Payment, as noted below).
- D. In addition to the surveyed record drawings, the CONTRACTOR shall collect all data listed in the form(s) provided at the end of this section for existing and new water meters, air release valves, corporation stops, manholes, hydrants and underground isolation valves. The data shall be collected using the form(s)

provided. Completed form(s) shall be available for review by the ENGINEER monthly as a pre-condition to monthly progress payment.

1.03 MAINTENANCE OF DOCUMENTS AND SAMPLES

- A. Store Documents and samples in CONTRACTOR's field office apart from Documents used for construction.
 - 1. Provide files and racks for storage of Documents.
 - 2. Provide locked cabinet or secure storage space for storage of samples.
- B. File Documents and samples in accordance with CSI/CSC format.
- C. Maintain Documents in a clean, dry, legible condition and in good order. Do not use Record Documents for construction purposes.
- D. Make Documents and samples available at all times for inspection by the ENGINEER.
- E. As a prerequisite for monthly progress payments, the CONTRACTOR is to make available the currently updated Record Documents for review by the ENGINEER and the OWNER. This shall include a non-certified copy of the surveyed record drawings through the period closing date of the Application for Payment.

1.04 MARKING DEVICES

- A. Provide felt tip marking pens for recording information in the color code designated by the ENGINEER.

1.05 RECORDING

- A. Label each document "PROJECT RECORD" in neat large printed letters.
- B. Record information concurrently with construction progress.
 - 1. Do not conceal any work until required information is recorded.
- C. Record Drawings: Record drawings shall be prepared using the survey required under Paragraph 1.02.
- D. Specifications and Addenda: Legibly mark each Section to record:
 - 1. Manufacturer, trade name, catalog number, and Supplier of each Product and item of equipment actually installed.
 - 2. Changes made by Field Order or by Change Order.

E. Shop Drawings (after final review and approval):

1. Two (2) sets of Record Shop Drawings for each process equipment, piping, (including casings) electrical system and instrumentation system.

1.06 SUBMITTAL

- A. Submit initial Record Documents listed in Paragraph 1.01A to the ENGINEER with Request for Substantial Completion. Also deliver a CD or other storage device containing the Record Drawings in an AutoCAD, latest version, file format.
- B. Submit final Record Documents to ENGINEER for the OWNER with claim for Final Completion and Readiness for Final Payment.
- C. Accompany submittal with transmittal letter in duplicate, containing:
 1. Date.
 2. Project title and number.
 3. CONTRACTOR's name and address.
 4. Title and number of each Record Document.
 5. Signature of CONTRACTOR or his authorized representative.

PART 2 - PRODUCTS

(NOT USED)

PART 3 - EXECUTION

(NOT USED)

END OF SECTION 01720

SECTION 02210

SUBSURFACE INVESTIGATION

PART 1 - GENERAL

1.01 RELATED DOCUMENTS

- A. All applicable provisions of the bidding and Contract Requirements, and Division 1 - General Requirements shall govern the work under this section.

1.02 WORK INCLUDED

- A. Provide all labor, materials, necessary equipment and services to complete the subsurface investigation work, as required for the satisfactory completion of the WORK.
- B. The subsurface investigation for conditions of the project site is the sole responsibility of the CONTRACTOR which includes contacting 811 and coordination with franchise utilities.
- C. In preparing their Bid, the CONTRACTOR shall note the following:
 - 1. Location of existing buried utilities shown on engineering plans are based upon best available records provided to the ENGINEER and are approximate locations.
 - 2. CONTRACTOR shall understand that proposed buried mains/piping/service improvements as part of this project are to be installed in areas with numerous existing buried utilities that are may not be shown in the exact location indicated on the plans. Therefore, CONTRACTOR shall anticipate within their bid, crew time to field verify exact location of existing utilities.
 - 3. CONTRACTOR shall make all subsurface or surface investigations necessary to provide proper background and knowledge to determine the nature and extent of work required.
- D. OWNER or ENGINEER has provided available subsurface information in Appendix A-Testholes and makes no warranties or guarantees concerning the existing underground utilities or nature of materials to be encountered on the site.

1.03 RELATED WORK

- A. Section 02230 - Site Clearing.
- B. Section 02300 - Earthwork.

1.04 MEASUREMENT AND PAYMENT

- A. There shall be no special measurement or payment for the work under this section; it shall be included in the lump sum price for bid item - Mobilization.

PART 2 - PRODUCTS (Not Applicable)

PART 3 - EXECUTION (Not Applicable)

END OF SECTION 02210

SECTION 02220

CONSTRUCTION VIDEOGRAPHY

PART 1 - GENERAL

1.01 GENERAL

- A. Employ professional videographer to take construction record digital images of both sides of existing and proposed fences/walls prior to construction and periodically, monthly at a minimum, during course of the work.

1.02 RELATED REQUIREMENTS

- A. Section 01010: Summary of Work.

1.03 VIDEOGRAPHY REQUIRED

- A. Digital images may be used in lieu of photography.
 - 1. Provide digital images taken on cutoff date for each scheduled application for Payment.
 - 2. Provide digital images taken at each major stage of construction.
 - 3. Provide digital images taken of change order work.
 - 4. Provide five (5) prints or three (3) sets of digital media, of each view.
- B. Original Digital Media:
 - 1. Remain property of videographer.
 - 2. Require that videographer maintain digital media for a period of two years from Date of Substantial Completion of entire Project.
 - 3. Videographer shall agree to furnish additional digital media to OWNER and the ENGINEER at commercial rates applicable at time of purchase.

1.04 COSTS OF PHOTOGRAPHY / VIDEOGRAPHY

- A. CONTRACTOR shall pay costs for specified videography and digital copies.
 - 1. Parties requiring additional videography or additional digital copies will pay videographer directly.

PART 2 - PRODUCTS

2.01 PRINTS

A. Color:

1. Media:
 - a. Compact Disk:
 - b. DVD
2. Resolution:
 - a. 480 X 640, 24-bit color, VGA, for general site conditions, panoramas and orientation references; 600 X 800, 24-bit color, SVGA as detail requires.
3. Compatibility:
 - a. If digital images are in a proprietary format, videographer shall bundle appropriate, Windows compatible, viewing software with all still and motion pictures.

B. Identify each digital file on label, listing:

1. Name of Project and City of West Palm Beach Project number to include any Bid Pack number reference.
2. Specific Location.
3. Date and time of recording.
4. Name and address of videographer.
5. Videographer's identification list of images. This list shall include file names / frame numbers (as appropriate) for the media.

PART 3 - EXECUTION

3.01 TECHNIQUE

- #### A. Factual presentation.
- #### B. Correct exposure and focus.
1. High resolution and sharpness.

2. Maximum depth-of-field.
3. Minimum distortion.

3.02 VIEWS REQUIRED

- A. Videograph from locations to adequately illustrate condition of construction and state of progress.
- B. Digital Images shall include aerial photograph / digital images showing the entire construction area.

3.03 DELIVERY OF PRINTS / DIGITAL MEDIA

- A. Deliver of digital images to the ENGINEER to accompany each Application for Payment.
- B. Distribution of DIGITAL MEDIA, as soon as processed, is anticipated to be as follows:
 1. OWNER (one set).
 2. ENGINEER (one set).
 3. CONTRACTOR (one set).

3.04 MEASUREMENT AND PAYMENT

- A. There shall be no special measurement or payment for the work under this section; it shall be included in the lump sum price bid for item 'Mobilization'.

END OF SECTION 02220

SECTION 02221

DEMOLITION

PART 1 - GENERAL

1.01 RELATED DOCUMENTS

- A. All applicable provisions of the Bidding and Contract Requirements, and Division 1 - General Requirements shall govern the WORK under this section.

1.02 SUMMARY

- A. This Section includes demolition and removal of the following:
 - 1. Buildings and structures; and,
 - 2. Site improvements.
- B. See Section 02230, Site Clearing, for site clearing and removal of above- and below-grade improvements not part of building demolition.

1.03 WORK INCLUDED

- A. Provide all labor, materials, necessary equipment and services to complete the site demolition WORK, as indicated on the Drawings, as specified herein or both, except as for items specifically indicated as "NIC ITEMS".

1.04 RELATED WORK

- A. Section 02300 - Earthwork.
- B. Section 02230 - Site Clearing
- C. All applicable Sections under Divisions 1, 2, 3, and 4.

1.05 QUALITY ASSURANCE

- A. CONTRACTOR Qualifications: Minimum of five years experience in demolition of comparable nature.
- B. Requirements of All Applicable Regulatory Agencies:
 - 1. All applicable Building Codes and other Public Agencies having jurisdiction upon the WORK.

1.06 SUBMITTALS

- A. Permits and notices authorizing building/structure demolition.
- B. Certificates of severance of utility services.

- C. Permit for transport and disposal of debris.
- D. Demolition procedures and operational sequence for review and acceptance by ENGINEER.

1.07 JOB CONDITIONS

A. Existing Conditions:

1. The demolition WORK shall be done as indicated on the construction plans.
2. Remove all demolition debris from the site the same day the WORK is performed. Leave no deposits of demolished material on site over night unless approved by the ENGINEER.
3. Structural demolition, excavation, backfill and compaction as indicated in Drawings.

B. Protection:

1. Erect barriers, fences, guardrails, enclosures, and shoring to protect personnel, structures, and utilities remaining intact.
2. Protect designated trees and plants from damages.
3. Use all means necessary to protect existing objects and vegetation designated to remain, and, in the event of damage, immediately make all repairs, replacements and dressings to damaged plants necessary, to the approval of the ENGINEER at no additional cost to the OWNER.

C. Maintaining Traffic:

1. Ensure minimum interference with roads, streets, driveways, sidewalks, and adjacent facilities.
2. Do not close or obstruct streets and sidewalks without written approval from the ENGINEER.
3. If required by governing authorities, provide alternate routes around closed or obstructed traffic ways.
4. The CONTRACTOR shall submit with bid package an approved traffic control plan which shall also comply with Section 01570, MOT.

D. Dust Control:

1. Use all means necessary for preventing dust from demolition operations from being a nuisance to adjacent property OWNERS. Methods used for dust control are subject to approval by the ENGINEER prior to use.

E. Burning:

1. On-site burning will not be permitted.

1.08 GENERAL ITEMS

- A. Scope of WORK shall comprise the following: Provide all labor, materials, necessary equipment and services to complete the demolition and clearing WORK, as indicated on the Contract plans, and as specified herein.
- B. The CONTRACTOR shall provide references to the OWNER to demonstrate a minimum of five years experience in demolition of a comparable nature. Current occupational licenses held by CONTRACTOR shall be submitted to OWNER.
- C. The CONTRACTOR shall be responsible for adherence to all applicable codes of all regulatory agencies having jurisdiction upon the WORKS.

1.09 REFERENCE STANDARDS

- A. Code of Federal Regulations
 1. 40 CRF 82
- B. National Fire Protection Association
 1. NFPA 241 - Standard for Safeguarding.

1.10 DEFINITIONS

- A. Remove: Detach items from existing construction and legally dispose of them off-site unless indicated to be removed and salvaged or recycled.
- B. Remove and Salvage: Detach items from existing construction and deliver them to the OWNER.
- C. Existing to Remain: Existing items of construction that are not to be removed and that are not otherwise indicated to be removed, removed and salvaged, or recycled.

1.11 MATERIALS OWNERSHIP

- A. Historic items, relics, and similar objects including, but not limited to, cornerstones and their contents, commemorative plaques and tablets, antiques, and other items of interest or value to the OWNER that may be encountered during demolition shall remain on OWNER's property. Carefully remove and salvage each item or object in a manner to prevent damage and deliver promptly to the OWNER.

1.12 SUBMITTALS (When required by OWNER or authorities having jurisdiction)

- A. Qualification Data for the following:
 1. Demolition Firm;
 2. Test Control Firm;

3. Refrigerant Recovery Technician; and,
4. Licensed Professional Providing Demolition Oversight.

B. Pollution Control Measures

1. The CONTRACTOR shall prepare and delivery approved pollution and dust control Drawings to the OWNER with the bid package prior to the commencement of demolition WORK. The Drawing shall outline proposed methods for dust control, noise control and maintaining the surrounding streets and buildings in a clean condition for both demolition operations and during debris removal. The Drawing shall be subject to the review and approval by the OWNER and the OWNER's ENGINEER.

C. Demolition Schedule/Plan

1. The CONTRACTOR shall submit for review and approval a detailed schedule for all proposed WORK to the OWNER with the bid package. This submission shall include a calendarized schedule of the proposed WORK and a step-by-step description of all aspects pertaining to demolition and protection of existing structures and adjacent community, labor forces, demolition rubble management and disposal and other items of WORK required under this Contract.

D. Utility Schedule

1. The CONTRACTOR shall submit to the OWNER and all affected utility/service companies, a proposed schedule of coordination for all necessary utility/service shut-offs, capping and continuation of utility services as required with the bid package. The CONTRACTOR shall provide the OWNER with written confirmation for all utility or service companies serving the site that service has been terminated prior to capping, abandoning or removal of any such utility and prior to commencement of building demolition.
2. The CONTRACTOR shall, during their WORK, accurately locate and mark on the Contract Drawing the location of all underground utility and services that have been capped and those that are to remain within the Contract limit area.

E. Permits

1. Prior to submission of bid package, the CONTRACTOR shall investigate all permit requirements and include any cost for these requirements in the bid. Prior to the commencement of WORK, the CONTRACTOR shall obtain all necessary permits and certificates associated with utility disconnections, storage tank removals and building demolition WORK from any and all Federal, State or regulatory authorities having jurisdiction over this project. The CONTRACTOR shall incur all fees and other requirements associated with obtaining the required permits and certificates. Copies of all permits

executed and certificates obtained shall be sent to the OWNER. Costs associated with permit and certificate procurements, including Drawing and permit preparation, revisions, filing fees, etc., shall be borne by the CONTRACTOR.

2. Including but not limited to, the following permits and certificates may be applicable and shall be obtained by the CONTRACTOR prior to applying for and obtaining general demolition permits.
 - a. Plumbing permit for water shut-off;
 - b. Plumbing permit for sewer seal;
 - c. Water shut-off certificate (original);
 - d. Building and/or Fire Department permit for underground storage tank removal;
 - e. Letters from Electric and Gas Utility companies and gas meter shut-offs;
 - f. Letters from Cable TV companies for cable disconnections and removals.
 - g. Certificate from Tax Office (taxes paid);
 - h. Letter to adjacent Owners of proposed demolition with proof of receipt;
 - i. Exterminator Certificate;
 - j. Board of Health approval;
 - k. Soil Erosion and Sediment Control Permit;
 - l. Asbestos Abatement Permit;
 - m. Asbestos Abatement Completion; and,
 - n. Demolition Contractor's License.

F. Statement of Refrigerant Recovery

1. Signed by refrigerant recovery technician responsible for recovering refrigerant, stating that all refrigerant that was present was recovered and that recovery was performed according to EPA regulations. Include name and address of technician and date refrigerant was recovered.

1.13 QUALITY ASSURANCE

A. Pre-Demolition Conference

1. The CONTRACTOR along with all designated subcontractors shall schedule a pre-demolition meeting to be attended by the OWNER and other necessary attendees prior to commencement of WORK.

B. Pre-Demolition Video

1. The CONTRACTOR shall conduct and provide to the OWNER a video of site conditions prior to initiation of demolition activities. The video shall provide documentation of the condition of on-site and adjacent building structures and on-site surface features including, but not limited to curbs, sidewalks, landscapes, pavements, utility structures at grade, light poles, telephone poles, fences, bollards, etc.

C. Progress Conference

1. Once the demolition WORK has begun, the CONTRACTOR shall schedule, administer and attend meetings with the OWNER as deemed necessary by the OWNER to maintain optimum degree of communications between interested parties. The CONTRACTOR shall include selected subcontractors at such times as their interests may be involved.

1.14 PROJECT CONDITIONS

- A. Buildings to be demolished will be vacated and their use discontinued before start of WORK; and,
- B. The CONTRACTOR shall maintain access to existing walkways, exits, and other adjacent occupied or used facilities. The CONTRACTOR shall not close or obstruct walkways, exits, or other occupied or used facilities without written permission from authorities having jurisdiction.
- C. OWNER assumes no responsibility for buildings and structures to be demolished.
 1. Conditions existing at time of inspection for bidding purpose will be maintained by OWNER as far as practical.
- D. Hazardous Materials: It is not expected that hazardous materials will be encountered in the WORK, unless otherwise identified in the Contract Documents.
 1. If materials suspected of containing hazardous materials are encountered, other than those identified in the Contract Documents, do not disturb; immediately notify OWNER.

1.15 COORDINATION

- A. Arrange demolition schedule so as not to interfere with OWNER's or other existing on-site operations.

PART 2 - PRODUCTS

2.01 The CONTRACTOR shall supply all materials as required.

PART 3 - EXECUTION

3.01 CLARIFICATION

- A. The Drawings do not purport to show all objects existing on the site.
- B. Before commencing the WORK of this Section, verify with the OWNER all objects to be removed and all objects to be preserved. If project is adjacent to private property, notify residents and businesses two weeks in advance of items to be removed from right of way and private property.

3.02 SCHEDULING

- A. Schedule all WORK in a careful manner with all necessary consideration for the public and the OWNER.
- B. Avoid interference with the use of, and passage to and from, adjacent facilities.

3.03 EXAMINATION

- A. Survey existing conditions and correlate with requirements indicated to determine extent of building demolition required.
- B. Review project record documents of existing construction. OWNER does not guarantee that existing conditions are same as those indicated in project record documents.
- C. Inventory and record the condition of items to be removed and salvaged.
- D. Verify that all hazardous materials and petroleum products have been removed before proceeding with building demolitions operations.
- E. Verify that all asbestos containing materials have been removed before proceeding with building demolition operations.
- F. Verify that structures to be demolished are discontinued in use and ready for removal.
- G. Do not commence WORK until all conditions and requirements of all applicable public agencies are complied with.

3.04 PROTECTION

- A. Existing Facilities: Protect adjacent walkways, loading docks, building entries, and other building facilities during demolition operations.
- B. Existing Items to Remain: Protect construction indicated to remain against damage

and soiling during demolition. When permitted by OWNER items may be removed to a suitable, protected storage location during demolition and reinstalled in their original locations after demolition operations are complete.

- C. Existing Utilities: Maintain utility services indicated to remain and protect them against damage during demolition operations.
 - 1. Do not interrupt existing utilities serving adjacent occupied or operating facilities unless authorized in writing by OWNER and authorities having jurisdiction; and,
 - 2. Provide temporary services during interruptions to existing utilities, as acceptable to OWNER and to authorities having jurisdiction.
 - a. Provide at least 72 hours notice to OWNER if shutdown of service is required during changeover.
- D. Temporary Protection: Erect temporary protection, such as walks, fences, railings, canopies, and covered passageways, where required by authorities having jurisdiction and as indicated. Comply with requirements in Division 1 Section 01570 Temporary Controls.
 - 1. Protect existing site improvements, appurtenances, and landscaping to remain;
 - 2. Provide temporary barricades and other protection required to prevent injury to people and damage to adjacent buildings and facilities to remain;
 - 3. Provide protection to ensure safe passage of people around building demolition area and to and from occupied portions of adjacent buildings and structures; and,
 - 4. Protect walls, windows, roofs, and other adjacent exterior construction that are to remain and that are exposed to building demolition operations.

3.05 DISCONNECTION OF UTILITIES

- A. Before starting site operations, disconnect or arrange for the disconnection of all effected utility service:
 - 1. Arrange and pay for disconnecting, removing, capping, and plugging utility services and meters. Disconnect and stub off. Notify affected utility company in advance and obtain approval before starting this WORK.
 - 2. Do not interrupt existing utilities serving occupied or used facilities, except when authorized in writing by authorities having jurisdiction.
 - 3. Place markers to indicate location of disconnected services.
 - 4. On-site drainage structures and drain fields shall be removed in their entirety

by methods approved by the OWNER's representative, and replaced as directed by the ENGINEER of Record if necessary.

3.06 PROTECTION OF EXISTING STRUCTURES AND UTILITIES

- A. Utility Services: Maintain existing utilities, keep in service, and protect against damage during demolition operations.
- B. Prevent movement or settlement of adjacent structures. Provide and place bracing or shoring and be responsible for safety and support of structures. Assume liability for such movement, settlement, damage, or injury.
- C. Cease operations and notify OWNER immediately if safety of adjacent structures appears to be endangered. Take precautions to properly support structures. Do not resume operations until safety is restored.
- D. Prevent movement, settlement, damage, or collapse of adjacent services, sidewalks, driveways and trees. Assume liability for such movement, settlement, or collapse. Promptly repair damage at no cost to the OWNER.
- E. Ensure safe passage of persons around areas of demolition.

3.07 MAINTAINING TRAFFIC

- A. Do not interfere with use of adjacent buildings and facilities. Maintain free and safe passage to and from. Conduct demolition operations and removal of debris to ensure minimum interference with roads, streets, walks, and other adjacent occupied or used facilities. Do not close or obstruct streets, walks, or other occupied or used facilities without permission from authorities having jurisdiction. Provide alternate routes around closed or obstructed travel ways if required by governing authorities.

3.08 POLLUTION CONTROLS

- A. Use water sprinkling, temporary enclosures, and other suitable methods to limit dust and dirt rising and scattering in air to lowest practical level. Comply with governing regulations pertaining to environmental protection.
- B. Clean structures and improvements of dust, dirt, and debris caused by demolition operations as directed by the OWNER or their representative or governing authorities. Return adjacent areas to condition existing prior to start of WORK.

3.09 INSPECTION AND PREPARATION

- A. Verify that structures to be demolished are discontinued in use and ready for removal.
- B. Do not commence WORK until all conditions and requirements of all applicable public agencies are complied with.

- C. Arrange for, and verify termination of utility services to include removing meters and capping lines.
- D. The Drawings do not purport to show all objects existing on the site; at the pre-demolition or preconstruction meeting before commencement of the WORK, verify with the OWNER all objects to be removed and all objects to be preserved.

3.10 DEMOLITION

- A. General: Demolish as indicated on Drawings as specifically identified on construction Drawings existing buildings, structures, and site improvements completely.
- B. Site Access and Temporary Controls: Conduct building demolition and debris-removal operations to ensure minimum interference with roads, streets, walks, walkways, and other adjacent occupied and used facilities.
 - 1. Do not close or obstruct streets, walks, walkways, or other adjacent occupied or used facilities without permission from OWNER and authorities having jurisdiction. Provide alternate routes around closed or obstructed traffic ways if required by authorities having jurisdiction; and,
 - 2. Use water mist and other suitable methods to limit spread of dust and dirt. Comply with governing environmental-protection regulations. Do not use water when it may damage adjacent construction or create hazardous or objectionable conditions, such as ice, flooding, and pollution.
- C. Pull out any existing utility lines designated for abandonment, irrigation, electrical lines, pull boxes and splice boxes, maintenance access structures and catch basins to be removed and all other objects designated to be removed or interfering with the WORK in advance of mobilization. Contact the utility company or agency involved for their requirements for performing this WORK in advance of construction. All removed equipment and materials shall be removed from the WORK area the same day as removed.
- D. Remove all debris from the site and leave the site in a neat, orderly condition to the full acceptance of the ENGINEER, or the OWNER. No debris shall be left on the site over night.
- E. Clear and Grub and dispose of all trees, shrubs and other organic matter not otherwise addressed on tree removal and relocation plans and specifications. There shall be no special measurement and payment for this WORK. It shall be included in Clearing.

3.11 MECHANICAL DEMOLITION

- A. Proceed with demolition of structural framing members systematically, from higher to lower level. Complete building demolition operations above each floor or tier before disturbing supporting members on next lower level.

- B. Remove debris from elevated portions by chute, hoist, or other device that will convey debris to grade level in a controlled descent. Remove structural framing members and lower to ground by method suitable to minimize ground impact or dust generation.
- C. Below-Grade Construction: Demolish foundation walls and other below-grade construction that is within 10 feet outside of building limits indicated for new construction to a minimum depth of 2 feet below subgrade or as indicated on Drawings or as required to eliminate conflict with new construction. Below-grade construction outside this area shall be abandoned or removed as indicated on the Drawings.
- D. Existing Utilities: Demolish existing utilities and below-grade utility structures that are within 10 feet outside of building limits indicated for new construction. Abandon utilities outside this area. Remove, abandon, or grout fill existing utilities and/or utility structures as identified on the Drawings or as directed by the OWNER.

3.12 EXPLOSIVE DEMOLITION

- A. Explosives: Use of explosives is prohibited.

3.13 SITE RESTORATION

- A. Below-Grade Areas: Rough grade below-grade areas ready for further excavation or new construction.
- B. Below-Grade Areas: Completely fill below-grade areas and voids resulting from building demolition operations with satisfactory soil materials according to backfill requirements in Division 2 Section 02300, Earthwork.
- C. Site Grading: Uniformly rough grade area of demolished construction to a smooth surface, free from irregular surface changes. Provide a smooth transition between adjacent existing grades and new grades.

3.14 REPAIRS

- A. General: Promptly repair damage to adjacent construction caused by building demolition operations.
- B. Where repairs to existing surfaces are required, patch to produce surfaces suitable for new materials.
- C. Restore exposed finishes of patched areas and extend restoration into adjoining construction in a manner that eliminates evidence of patching and refinishing.

3.15 DISPOSAL OF DEMOLISHED MATERIALS

- A. General
 - 1. The CONTRACTOR shall remove from the site all debris, rubbish and other

materials resulting from demolition and shall safely and legally dispose of all these items in accordance with applicable Federal, State and regulatory authority having jurisdiction codes and regulations. All recycling must be done in accordance with all currently applicable State waste flow regulations, and regulatory authority having jurisdiction requirements. Burning of any demolished materials on-site shall not be permitted. Any recycling of demolition debris shall be approved by the OWNER.

2. Material resulting from demolition and not scheduled for salvaging shall become the property of the CONTRACTOR and shall be removed from site and legally disposed of off-site. Disposal shall be timely, performed as promptly as possible and not left until the final cleanup. Material shall not be left on the job site for more than 60 days.
3. Remove from site contaminated, vermin infested, or dangerous materials encountered and disposed of by safe means so as not to endanger health of workers and public.
4. Burning of removed materials from demolished structures will not be permitted on-site.

B. Submittals

1. Written permission shall be obtained from the property OWNER on whose property the demolition material is to be disposed. Copies of the agreements shall be furnished to the OWNER prior to removing any materials from the demolition site; and,
2. Hazardous Materials: The CONTRACTOR shall provide manifests or disposal tickets for each truck that exits and enters the site with demolition and construction material to the OWNER's ENGINEER and the OWNER. These manifests shall indicate the following:
 - a. Date and time of departure from the demolition site;
 - b. Type of material carted off-site or type of material brought on-site;
 - c. Amount of material brought on-site;
 - d. Amount of material (in tons);
 - e. Truck ID number;
 - f. Final destination of the excess material;
 - g. Date and time of entry to the demolition material;
 - h. Date and time of entry to the demolition site;
 - i. Amount of material; and,

- j. Source of material brought on-site.

3.16 CLEANING

- A. Clean adjacent structures and improvements of dust, dirt, and debris caused by building demolition operations. Return adjacent areas to condition existing before building demolition operations began.

3.17 COMPLETION OF WORK

- A. Leave the site in a neat, orderly condition to the full acceptance of the OWNER.
- B. Dirt remaining after demolition shall be graded level and compacted, in preparation for filling operations to follow demolition. Trenches shall be filled in layers of 12" maximum thickness and compacted in accordance with the technical specifications applicable to backfilling of trenches.

3.18 MEASUREMENT AND PAYMENT

- A. There shall be no special measurement or payment for the WORK under this section; it shall be included in the price bid for items associated with the removal and disposal/demolition.

END OF SECTION 02221

SECTION 02225

TRENCH BACKFILL AND COMPACTION

PART 1 - GENERAL

1.1 SCOPE OF WORK:

- A. The extent of trenching, backfill and compacting is shown on the drawings and/or specified. This section includes furnishing equipment, labor and material, and performing all operations necessary and incidental to perform the required work.

1.2 APPLICABLE CODES, STANDARDS AND SPECIFICATIONS:

- A. American Association of State Highway and Transportation Officials (AASHTO).
- B. Florida Department of Transportation "Standard Specifications for Road and Bridge Construction," Sections 120 and 125, 1996 Edition.
- C. Florida Trench Safety Act (90-96), CS/HB 3183.
- D. Underground Facility Damage Prevention and Safety Act (FS556).

1.3 TRENCH SAFETY SYSTEM:

- A. The CONTRACTOR shall follow the provisions of the "Florida Trench Safety Act", which incorporates OSHA Standards 29CFR's 1926.650, Subpart P as the State's trench safety standards. Trench excavation exceeding 5 feet in depth shall have an adequate safety system consisting of sheeting and shoring, suitable trench box, or other suitable system meeting the requirements of the Act. Call "Sunshine" at 811.
- B. The CONTRACTOR shall be solely responsible for making all excavations in a safe manner. Provide appropriate measures to retain side slopes to ensure that persons working in or near the excavation are protected.

PART 2 – PRODUCTS (NOT USED)

PART 3 - EXECUTION

3.1 CLEARING OF THE SITE AND PREPARATION OF RIGHT-OF-WAYS:

- A. Conform to Section 02230 SITE CLEARING.

3.2 DISPOSAL OF CLEARED MATERIAL:

- A. Conform to Section 02230 SITE CLEARING.

3.3 OBSTRUCTIONS:

- A. This item refers to obstructions which may be removed and do not require replacement. Remove obstructions within the trench area or adjacent thereto without additional compensation. Obstructions of such include, but not limited to, muck, rock, tree roots, stumps, abandoned piling, buildings and concrete structures, logs, and debris of all types without additional compensation. The ENGINEER may, if requested, make changes in the trench alignment to avoid major obstructions, if such alignment changes can be made, within the easement or right-of-way without adversely affecting the intended function of the facility, at no additional cost to the Owner.
- B. Dispose of obstructions removed from the excavation in accordance with Section 02230 SITE CLEARING.

3.4 PROTECTION OF EXISTING UTILITIES AND STRUCTURES:

- A. Conform to Section 01561: PROTECTION OF EXISTING FACILITIES.

3.5 TRENCH EXCAVATION:

- A. The CONTRACTOR shall perform all aspects of excavation, of every description, and of whatever substance encountered to the dimensions and depths indicated on the drawings or as necessary. Excavation shall be unclassified regardless of material encountered. Unless otherwise indicated, excavation shall be by open cut. No separate payment for excavation as such shall be made. The cost thereof shall be included in the unit prices of pipe installation.

The CONTRACTOR shall make their own estimate of the kind and extent of the various materials which will be encountered in the excavation. Undercutting will not be permitted, except when ordered by the ENGINEER.

- B. Where it is necessary to trim branches for equipment clearance, all severed root ends or cuts to branches over ½" diameter shall be treated with an asphalt base pruning paint. Backfill over exposed roots as soon as possible.
- C. Except in rock-and-water-bearing earth, mechanical excavation shall be limited to four inches above the elevation of the pipe invert. All additional excavation shall be made manually. Excavation in rock shall be made by a method approved by the ENGINEER.

3.6 SHORING, SHEETING AND BRACING:

- A. The CONTRACTOR shall provide all trench and structural bracing, shoring, or sheeting necessary to construct and protect the excavation from damage to existing utilities of all types, roadways, structures, and private property, and as required for the safety of the public, and employees.

- B. Increase trench widths accordingly by the thickness of the sheeting. Maintain sheeting in place until the pipe has been placed and backfilled at the pipe zone.
- C. Sheeting shall be removed by the CONTRACTOR during backfilling operations in a manner that will not damage to the pipe or permit voids in the backfill.
- D. All sheeting, shoring and bracing of trenches shall conform to the safety requirements of the Trench Safety Act, and to Federal, State or local public agency having jurisdiction.

3.7 DEWATERING:

- A. The CONTRACTOR shall, at all times, provide and maintain ample means and devices to promptly remove and dispose of all water from entering the trench excavation during the time the trench is being prepared for the pipe laying, during the laying of the pipe and until the backfill at the pipe zone has been completed, including compaction. These provisions shall apply during the daylight hours as well as overnight.
- B. A wellpoint system or other ENGINEER approved dewatering method shall be utilized if necessary to maintain the excavation in a dry condition.
- C. Dewatering by trench pumping will not be permitted if migration of fine-grained material from bottom, side walls or bedding material will occur. In the event that satisfactory dewatering cannot be accomplished due to subsurface conditions or where dewatering could damage existing structures the CONTRACTOR shall obtain the ENGINEER's approval of wet trench construction procedures before commencing construction. Dewatering shall cease in a manner to allow the subsurface water to slowly return to normal levels.
- D. The dewatering or any excavation areas and the disposal of the water shall be in strict accordance with the latest revision of all local and State government rules and regulations.
- E. The CONTRACTOR shall obtain all necessary dewatering permits from applicable Water Management District, pay for all associated fees, and comply with all provisions therein, along with complying with OWNER's Noise Ordinances.

3.8 DISPOSAL OF REMOVED WATER:

- A. Water pumped from the trench or other excavation shall be disposed of in storm sewers having adequate capacity, canals or suitable disposal pits as approved by the ENGINEER. CONTRACTOR is responsible for acquiring all permits required to discharge the water and shall protect waterways from turbidity during the dewatering operation. In areas where adequate disposal sites are not available, partially backfilled trenches may be used for water disposal only when the CONTRACTOR's plan for trench disposal is approved in writing by the

ENGINEER. The CONTRACTOR's plan shall include temporary culverts, barricades and other protective measures to prevent damage to property or injury to any person or person.

- B. Dispose of the water in a manner to prevent flooding of streets and damage to adjacent property. Drainage of trench water through the pipeline under construction is prohibited.
- C. Engines driving dewatering pumps shall be equipped with residential type mufflers.

3.9 TRENCH WIDTH:

- A. The minimum width of the trench shall be equal to the outside diameter of the pipe at the joint plus 12 in. each side of pipe for sheeted trench, with the maximum width of trench, measured at the top of the pipe, not to exceed the outside pipe diameter, plus the appropriate sloped trench wall to meet OSHA requirements, unless otherwise shown on the drawings.
- B. Confine trench widths to dedicated rights-of-way, unless construction easements have been obtained from the affected property Owners.
- C. Trench walls shall be maintained vertical from the bottom of the trench to a line measured at the top of the pipe. From the top of the pipe to the surface the trench walls shall be as vertical as possible under soil condition.

3.10 OPEN TRENCH:

- A. The extent of open trench shall be limited so that no more than 100 feet of open trench in advance of the pipe laying operation.
- B. Pipe trenches across roadways and driveways shall be backfilled as soon as pipe is installed. Where, in the opinion of the ENGINEER, adequate detour facilities are not available, no trench shall be left open across a roadway or commercial property driveway where adequate detour routes are not available for a period in excess of 30 minutes, or as directed by the governing authority.
- C. All open trench shall be protected by the CONTRACTOR with barriers, warning devices and traffic control devices, which shall be kept in the correct position, properly directed and clearly visible at all times.
- D. All open trench shall be backfilled at the end of the day and protected with appropriate signage, reflective tapes and devices. The barrier, warning and traffic control devices, as conformed to F.D.O.T. rules and regulations, shall be suitably lighted at all times.

3.11 LOCATION OF EXCAVATED MATERIALS:

- A. Excavated materials suitable for backfill shall be piled in an orderly manner at a sufficient distance from the trench to avoid overloading and to prevent slides or cave-ins.
- B. Place the excavated material only within the construction easement, right-of-way or approved working area. Do not obstruct any private driveways or public traveled roadways, streets, sidewalks, or driveways. Conform to all Federal, State and local codes governing the safe loading of all trenches with excavated material.

3.12 BOULDER REMOVAL:

- A. Where encountered in the trench bed, all rocks, stones, boulders or concrete, having any dimension larger than permitted to be used for backfill in the paragraph entitled "Backfilling" of these specifications, shall be excavated to a depth of 8" below the bottom of the pipe and shall be removed from the site and disposed of by the CONTRACTOR. All undercut trench excavation shall be backfilled and tamped with materials as specified in the following paragraphs under UNSTABLE SUBGRADE.
- B. Where bell-and spigot pipe is used, the 8-inch cushion shall be maintained under the bell as well as under the straight portion of the pipe.

3.13 UNSTABLE SUBGRADE:

- A. All pipe and other structures shall be provided with a stable foundation; any material which, by reason of kind or condition, is not or cannot be made stable by drainage or compaction shall be removed or replaced.
- B. In the event that unstable materials is encountered at or below the excavation depth specified and/or shown on the drawings, the ENGINEER shall be notified. Such material shall be removed and replaced with suitable material.
- C. For the purpose of this specification, muck, peat, and other highly organic soils shall be considered to be unstable material and shall be removed at CONTRACTOR's expense. In addition, any soil which is or might become wet to such a degree that its moisture content is equal to or greater than 90% of its liquid limit will have to be specifically approved by the ENGINEER with regard to stability or shall be considered to be unstable material requiring removal and replacement.
- D. If muck is encountered, it shall be completely removed in accordance with F.D.O.T. Roadway and Traffic Design Standard Index 500.

3.14 OVERDEPTH EXCAVATION:

- A. Where unauthorized excavation occurs, the bottom of the excavation shall be brought up to the proper excavation elevation utilizing suitable and properly compacted backfill material at no additional expense to the Owner.

3.15 DISPOSAL OF EXCESS EXCAVATED MATERIAL AND DEBRIS:

- A. The CONTRACTOR, at his own expense, shall dispose of all excavated materials not suitable for backfill at an appropriate legal site.

3.16 OTHER STRUCTURES:

- A. Excavation shall be carried to the depths indicated and shall conform to the shape of the structure with sufficient allowance for setting forms, inspection, and proper performance of the work.

3.17 TRENCH BACKFILL:

A. MATERIAL:

Backfill material shall be excavated material, predominately sandy material and essentially free of rock, stones , organic material, asphaltic concrete, clay, concrete, boulders and other deleterious material.

1. Pipe Embedment:

The backfill material required for placement around the pipe and to a depth of 1 foot above the top of the pipe shall consist of clean, fine to medium sand or a mixture of sand, shell or crushed rock with a maximum size of 3/4" and not more than 10 percent passing the U.S. Standard Number 200 sieve, properly graded and mixed so that fine grain material from the side walls of the trench or backfill above the embedment will not migrate into the backfill material.

2. Above Pipe Embedment:

The backfill material used to bring the trench to final subgrade from a depth of 1 foot above the top of the pipe shall consist of sand or a mixture of clean mineral soils with no particle size larger than 3-1/2".

3. Additional Fill:

If sufficient suitable backfill material is not available from the excavation, additional fill meeting the above requirements shall be provided and paid for by the CONTRACTOR.

B. BACKFILL OPERATION:

1. Trench:

Pipe trench shall be backfilled immediately after the pipe is laid unless other protection for the pipe line is provided. Backfill materials shall be selected, deposited and compacted so as to eliminate the possibility of lateral displacement of the pipe.

2. Under Pipe:

The bedding surface for the pipe shall provide a firm foundation of uniform density throughout the entire length of the pipe. The pipe shall be carefully bedded in soil foundation that has been accurately shaped and rounded to conform to the lowest $\frac{1}{4}$ of the outside circular portion of the pipe for its entire length, and when necessary, shall be tamped to secure uniform, firm support. Where bell and spigot pipe is used, the bell holes shall be deep enough to ensure that the bell does not bear on the bottom of the excavation, and shall not be excessively wide in the longitudinal direction of the pipe.

3. Over Pipe:

From the centerline of the pipe, fittings and appurtenances, to an elevation two feet above the top of the pipe, the trench shall be backfilled by hand or by approved mechanical methods.

Backfilling material shall be deposited in the trench for its full width on each side of the pipe and appurtenances. Backfilling shall be carried out simultaneously on both sides of the pipe.

Do not push backfill into the trench in such a way as to permit free fall of the material until at least 2 feet of cover is provided over the top of the pipe. Under no circumstances allow sharp, heavy pieces of material to drop directly onto the pipe or the tamped material around the pipe.

C. COMPACTION EQUIPMENT:

1. Compaction equipment shall be of suitable type and adequate to obtain the amount of compaction specified. Compaction equipment shall be operated in strict accordance with the manufacturer's instructions and recommendations and shall be maintained in such condition that it will deliver the manufacturer's rated compactive effort.
2. Hydro-compaction (puddling) of the backfill material will not be permitted.

D. PLACING AND COMPACTION:

1. The backfill material placed around the pipe to final subgrade, shall be compacted to a density of not less than 98% the maximum dry density as determined by of AASHTO Method T-180.

2. The fill lift thickness shall be uniformly compacted and restricted to 8 inches maximum. Particular care shall be taken to insure that the backfill at the haunch is free from voids and is properly compacted.

E. COMPACTION TESTS:

1. The ENGINEER may at any time instruct the CONTRACTOR to partially excavate a previously backfilled trench or temporarily backfilling of a short section of the trench for the purpose of obtaining measurements of the density of the backfill.
2. The cost of the partial excavation and restoration of the backfill will be paid for by the CONTRACTOR.
3. The OWNER will pay for the proctors and density tests. Any test failures will be paid by the CONTRACTOR.
4. Proctor and density tests (two tests – one at pipe and one at base course) shall be taken along the pipe, and at locations of manholes, inlets, and valves. The location, depth, and number of the tests shall be as selected by the ENGINEER. Maximum intervals between tests shall be 100 feet.

F. STRUCTURAL ELEMENTS:

1. Backfill adjacent to structural elements shall be placed, as far as practical, as the adjacent structural elements have been completed and accepted. Backfilling against concrete shall be done only when approved.
2. Compaction adjacent to structural elements shall be performed by the means of a self-propelled, hand-led vibratory compactor. The compactor shall impart a dynamic force of not less than 7000 pounds.

G. MISCELLANEOUS:

1. Backfilling and compacting around meter boxes, valve boxes, manholes, storm inlets, and other structures shall be accomplished in the same manner as the connected pipe. Extreme care shall be used in backfilling wellpoint holes to prevent voids and settlement. If necessary, the holes should be plugged with a concrete slurry, such plugging to be at the expense of the CONTRACTOR.

3.18 MAINTENANCE OF AREA UNDER CONSTRUCTION:

- A. As specified in this section, the CONTRACTOR shall keep the pipe laying operation as close to the excavation operation as possible during the execution of the work. Construction activity within this work area shall include all phases of the pipe laying operations including dewatering equipment, excavation, pipe laying, backfilling of

trenches and the completion of the restored base construction as specified. No open trench will be left unprotected overnight or on weekends.

- B. This maintenance shall include, but not be limited to, the addition of crushed rock backfill material or temporary asphalt pavement in paved areas to keep the surface of backfilled trenches reasonably smooth, free from ruts and potholes and suitable for normal traffic flow.
- C. No additional payment will be made for the maintenance of the trench backfill prior to completion of the work outlined above.

3.19 RESTORATION OF SURFACE IMPROVEMENTS:

A. GENERAL:

- 1. All surface improvements on public or private property which have been damaged or removed during excavation or any of the other CONTRACTOR's operation or other various construction activities shall be restored to conditions equal to or better than conditions existing prior to beginning work.
- 2. These surface improvements include but are not limited to grass plots, sod, shrubbery, ornamental trees, signs, fences, mailboxes and other improvements on public or private property.
- 3. Road shoulders, alleys and driveways of shell, limerock, stabilized soil or gravel where disturbed shall be restored with like materials as removed. There shall be no mixing of unlike materials. The disturbed area shall be replaced with the appropriate materials to a minimum depth to restore it to a condition equal to or better than conditions existing prior to beginning work.
- 4. Roadways other than paved streets where disturbed shall be replaced with like materials to a minimum compacted thickness of twelve (12) inches. There shall be no mixing of unlike materials. These roadways shall be compacted to a minimum of 98% of the maximum dry density as determined by AASHTO Method T-180.
- 5. No additional cost for replacement of roadways other than paved streets will be allowed by the Owner.

B. PAVEMENT, CURB AND SIDEWALK REMOVAL:

- 1. Cut all bituminous and concrete pavements, regardless of the thickness, and all curbs and sidewalks, prior to excavation of the trenches with an approved pavement saw, hydro hammer, or approved pavement cutter. Unless otherwise indicated on the Plans, width of the pavement cut shall be at least equal to the required width of the trench at ground surface.

2. Replacement concrete sidewalks shall be restored with a new modular panel, and the old panels shall be completely removed. No partial panels will be accepted.
3. Pavement and concrete materials removed shall be hauled from the site and not used for trench backfill.
4. The CONTRACTOR shall remove pavements as part of the trench excavation. The material from permanent pavement removal shall be carefully separated from trench excavation material and disposed of by the CONTRACTOR.

3.20 WARRANTY:

- A. In conformance with GENERAL CONTRACT REQUIREMENTS.

END OF SECTION

SECTION 02230

SITE CLEARING

PART 1 - GENERAL

1.01 RELATED DOCUMENTS

- A. All applicable provisions of the Bidding and Contract Requirements, and Division 1 - General Requirements shall govern the work under this Section.

1.02 WORK INCLUDED

- A. Provide all labor, materials, necessary equipment and services to complete the clearing work, as indicated on the drawings, as specified herein or both.
- B. Under this section, the CONTRACTOR shall do all clearing, grubbing, root-raking, and necessary clean-up operations in connection with the construction of the work and its related sitework.
- C. The work shall consist of the removal and disposal of trees, stumps, roots, limbs, brush, fences (chain link, wood, etc.), decorative or masonry walls, etc. from all project areas as designated on the drawings as specified herein, and as directed by the ENGINEER on the site. Fencing and walls removed shall be neatly placed on adjacent property if requested by OWNER or property owner. Trees or shrubs shall be placed on adjacent property if requested by OWNER or property owner. Otherwise, the CONTRACTOR shall dispose of them offsite at the CONTRACTOR's expense.
- D. The CONTRACTOR shall remove all refuse, asphalt pavement, concrete pavement, glass, metal, stone, plaster, lumber, paper materials, and any and all trash found in clearing and adjacent areas as directed by the ENGINEER.
- E. The CONTRACTOR shall furnish all services, labor, transportation, materials, and equipment necessary for the performance of these operations. All clearing and cleanup operations shall be accomplished to the complete satisfaction of the ENGINEER.
- F. The CONTRACTOR shall strip all existing topsoil and stockpile it on-site in locations approved by the OWNER. All topsoil material shall be stockpiled within a haul distance of 3,000 feet.

1.03 RELATED WORK

- A. Section 02210 - Subsurface Investigation
- B. Section 02300 - Earthwork
- C. Section 02370 - Erosion Control and Slope Protection

1.04 MATERIALS OWNERSHIP

- A. Except for materials indicated to be stockpiled or to remain on owner's property, cleared materials shall become the CONTRACTOR's property and shall be removed from the site.

1.05 PROJECT CONDITIONS

- A. Traffic: Minimize interference with adjoining roads, streets, walks, and other adjacent occupied or used facilities during site-clearing operations.
- B. Salvageable Improvements: Carefully remove items indicated to be salvaged and store on OWNER's premises where indicated.
- C. Notify utility locator service for area where Project is located prior to site clearing as per requirements.
- D. CONTRACTOR shall verify existing grades prior to performing work under this section. If existing grades are at variance with the drawings, notify the OWNER and receive instructions prior to proceeding. No additional compensation will be considered resulting from grade variances once site clearing has commenced.
- E. All benchmarks and monuments shall be protected during construction. If disturbed or destroyed, they shall be replaced in original position by a licensed surveyor at the CONTRACTOR's expense.
- F. Protect areas outside limits of disturbance from encroachment by construction personnel or equipment, regardless of property ownership. Access shall be by specific, written permission or easement only.

PART 2 - PRODUCTS

- 2.01 CONTRACTOR shall provide and use all necessary equipment and materials to perform work satisfactorily.

PART 3 - EXECUTION

3.01 PREPARATION

- A. Locate and clearly flag trees and vegetation to remain or to be relocated. All trees and vegetation to remain shall be barricaded and protected during the construction process per Article 3.02 of this section.
- B. Limit of clearing is to be staked in accordance with CONTRACTOR's calculated ROW limits, and verified by OWNER prior to removal of any trees or other improvements.
- C. All trees and shrubs not designated to remain within the area to be graded, whether shown or not on the drawings, shall be cut and the removal of stumps

shall comply with Article 3.03 of this section. Burning on site is not permitted, unless otherwise approved by the OWNER and authorities having jurisdiction.

- D. Protect existing site improvements to remain, from damage during construction. Restore damaged improvements to their original condition, as acceptable to the OWNER.

3.02 TREE PROTECTION

- A. Erect and maintain a temporary fence around drip line of individual trees or around perimeter drip line of groups of trees to remain. Remove fence when construction is complete.
- B. Do not excavate within drip line of trees, unless otherwise indicated.
- C. Where excavation for new construction is required within drip line of trees, hand clear and excavate to minimize damage to root systems. Use narrow-tine spading forks, comb soil to expose roots, and cleanly cut roots as close to excavation as possible.
- D. Repair or replace trees and vegetation indicated to remain that are damaged by construction operations, in a manner approved by the OWNER.

3.03 TREE REMOVAL AND TREE PRESERVATION

- A. No trees shall be removed if located outside of the right-of-way.
- B. Within the rights-of-way, clearing and grubbing includes removal of trees less than 3.5" in diameter (measured at 4.5' above highest adjacent grade) conflicting with proposed water and sewer main improvements. Although within the rights-of-way, no trees with a trunk diameter of 3.5" or greater (measured at 4.5' above highest adjacent grade) shall be removed without coordination and approval from the OWNER and ENGINEER with the exception of Australian Pines, Melaleuca or Florida Holly. Trees shall be evaluated on an individual basis in accordance with following:
 - 1. Type and size of tree.
 - 2. Proximity to proposed and/or existing utility lines and/or exfiltration trench.
 - 3. Change in adjacent grades for swale excavation.
 - 4. Proximity to proposed sidewalk.
 - 5. Proximity to proposed edge of roadway.
 - 6. Living condition of the tree.

- C. At the request of the adjacent home owner, some trees including Palm Trees and other trees may be relocated to private property by the CONTRACTOR. Homeowners shall be responsible for preparation of an area to place the tree and for subsequent watering of the relocated trees.
- D. If requested by the OWNER or municipality, trees to be removed may be relocated by CONTRACTOR to a location within 5 miles of the project limits.

3.04 CLEARING AND GRUBBING

- A. Remove obstructions, trees, shrubs, grass, and other vegetation within the limit of disturbance to permit installation of new construction. Removal includes digging out stumps and obstructions and grubbing roots, unless otherwise specified. In areas outside the building limits where the depth of fill exceeds 8 feet in height, unless otherwise directed by the OWNER, sound trees shall be cut at a height of not more than 6 inches above natural ground.
- B. Fill depressions caused by clearing and grubbing operations with satisfactory soil material, unless further excavation or earthwork is indicated.
 - 1. Place fill material in horizontal layers and compact each layer to a density equal to adjacent original ground as in accordance with Section 02300, Earthwork.

3.05 TOPSOIL STRIPPING

- A. Strip topsoil to full depth encountered in areas indicated to be graded in a manner to prevent intermingling with underlying subsoil or waste materials.
- B. Stockpile sufficient topsoil material to facilitate sodding and landscaping. Stockpile away from edge of excavations without intermixing with subsoil. Grade and shape stockpiles to drain surface water.
- C. Protect soil stockpiles as per Section 02370, Erosion Control and Slope Protection.

3.06 DISPOSAL

- A. Disposal: Remove surplus soil material, unsuitable or excess topsoil, obstructions, demolished materials, and waste materials, including trash and debris, and legally dispose of them off OWNER's property.

3.07 MEASUREMENT AND PAYMENT

- A. There shall be no separate measurement and payment for the work under this section. It shall be included in the appropriate unit price bid.

END OF SECTION 02230

SECTION 02240

DEWATERING

PART 1 - GENERAL

1.01 RELATED DOCUMENTS

- A. All applicable provisions of the Bidding and Contract Requirements, and Division 1 - General Requirements shall govern the work under this Section.

1.02 WORK INCLUDED

- A. Obtain any permits required and provide all labor, materials, necessary equipment and services to complete any dewatering required for the satisfactory completion of the WORK.

1.03 RELATED WORK

- A. Section 02300 - Earthwork.
- B. Section 02305 - Excavation and Backfilling for Utilities.
- C. Section 02502 - Valves, General.
- D. Section 02510 - Water Distribution System.
- E. Section 02530 – Sanitary Sewerage System.
- F. Section 02535 – Structures and Maintenance Access Structures.
- G. Section 02630 – Storm Drainage Facilities.

PART 2 - PRODUCTS

2.01 EQUIPMENT

- A. Dewatering, where required, may include the use of temporary reservoirs and diking, well points, sump pumps, temporary pipelines for water disposal; discharge testing for petroleum products, metals, pH, turbidity, etc.; rock or gravel placement; and other means. Standby pumping equipment must be maintained on the jobsite and operate within any local noise ordinance limits. "Silent Knight" pump equipment is preferred. All safety requirements, fencing, etc. shall be installed and maintained by the CONTRACTOR.

PART 3 - EXECUTION

3.01 GENERAL REQUIREMENTS

- A. The CONTRACTOR shall provide all equipment necessary for dewatering. It shall have on hand, at all times, sufficient pumping equipment and machinery in good working condition and shall have available, at all times, competent workmen for the operation of the pumping equipment. Adequate standby equipment shall be kept available at all times to insure efficient dewatering and maintenance of dewatering operation during power failure.
- B. Dewatering for structures and pipelines shall commence when groundwater is first encountered, and shall be continuous until such times as water can be allowed to rise in accordance with the provisions of this Section or other requirements.
- C. At all times, site grading shall promote drainage. Surface runoff shall be diverted from excavations. Water entering the excavation from surface runoff shall be collected in shallow ditches around the perimeter of the excavation, drained to sumps, and be pumped or drained by gravity from the excavation to maintain a bottom free from standing water.
- D. Dewatering shall at all times be conducted in such a manner as to preserve the undisturbed bearing capacity of the subgrade soils at proposed bottom of excavation.
- E. If foundation soils are disturbed or loosened by the upward seepage of water or an uncontrolled flow of water, the affected areas shall be excavated and replaced with pea rock at no additional cost to the COUNTY.
- F. The CONTRACTOR shall maintain the water level below the bottom of excavation in all work areas where groundwater occurs during excavation construction, and backfilling, up to natural groundwater level.
- G. Flotation shall be prevented by the CONTRACTOR by maintaining a positive and continuous removal of water. The CONTRACTOR shall be fully responsible and liable for all damages which may result from failure to adequately keep excavations dewatered.
- H. If well points or wells are used, they shall be adequately spaced to provide the necessary dewatering and shall be sand-packed and/or other means used to prevent pumping of fine sands or silts from the subsurface. A continual check by the CONTRACTOR shall be maintained to ensure that the subsurface soil is not being removed by the dewatering operation.
- I. The CONTRACTOR shall dispose of water from the WORK in a suitable manner without damage to adjacent property. CONTRACTOR shall be responsible for

obtaining any permits that may be necessary to dispose of water including water sampling and testing per all regulatory requirements. No water shall be drained into work built or under construction without prior consent of the ENGINEER. Water shall be filtered using a silt box or another approved method to remove sand and fine-sized soil particles before disposal into any drainage system. Dewatering disposal points shall be approved by the ENGINEER prior to being used. Storm drains used by the CONTRACTOR for dewatering shall be cleaned by a jet vac or other method approved by the ENGINEER after dewatering is complete.

- J. The release of groundwater to its static level shall be performed in such a manner as to maintain the undisturbed state of the natural foundation soils, prevent disturbance of compacted backfill and prevent flotation or movement of structures, pipelines, and sewers.
- K. Dewatering of trenches, testing, and other excavations shall be considered as incidental to the construction of the WORK and all costs thereof shall be included in the various contract prices in the Bid Forms, unless a separate bid item has been established for dewatering. If the CONTRACTOR chooses to construct a dewatering pit a copy of the land lease shall be submitted to the COUNTY. Perimeter berms and chain link fence shall be constructed as necessary for safety.
- L. The CONTRACTOR shall submit a dewatering plan to the CONSULTANT for review. The CONTRACTOR is advised that the South Florida Water Management District (SFWMD) will require that a dewatering plan, prepared by a State of Florida licensed Professional Engineer or Registered Professional Geologist, be submitted and approved prior to issuance of a dewatering permit. The CONTRACTOR will retain a State of Florida Licensed Professional Engineer or Registered Professional Geologist to prepare and submit dewatering report application to the regulatory agencies for permitting.
- M. The CONTRACTOR may be required to provide testing and monitoring of the dewatering operations, and to institute dewatering methods and controls, as required by SFWMD. The CONTRACTOR will be responsible for all costs associated with means and methods of dewatering which will be set forth by dewatering permits.

3.02 QUALITY CONTROL

- A. It shall be the sole responsibility of the CONTRACTOR to control the rate and effect of the dewatering in such a manner as to avoid all objectionable settlement and subsidence.
- B. All dewatering operations shall be adequate to assure the integrity of the finished project and shall be the responsibility of the CONTRACTOR.

- C. Where critical structures or facilities exist immediately adjacent to areas of proposed dewatering, reference points shall be established and observed at frequent intervals to detect any settlement which may develop. The responsibility for conducting the dewatering operation in a manner which will protect adjacent structures and facilities rests solely with the CONTRACTOR. The cost of repairing any damage to adjacent structures and restoration of facilities shall be the responsibility of the CONTRACTOR.

3.03 CONTRACTOR SUBMITTALS

- A. Prior to commencement of excavation, the CONTRACTOR shall submit a detailed plan and operation schedule for dewatering of excavations. The CONTRACTOR may be required to demonstrate the system proposed and to verify that adequate equipment, personnel, and materials are provided to dewater the excavations at all locations and times. The CONTRACTOR's dewatering plan is subject to review by the ENGINEER and regulatory agencies.

3.04 MEASUREMENT AND PAYMENT

- A. There shall be no special measurement or payment for the work under this section; it shall be included in the appropriate unit price bid.

END OF SECTION 02240

SECTION 02300

EARTHWORK

PART 1 - GENERAL

1.01 RELATED DOCUMENTS

- A. All applicable provisions of the Bidding and Contract Requirements, and Division 1 - General Requirements shall govern the work under this Section.

1.02 WORK INCLUDED

- A. Provide all labor, materials, necessary equipment and services to complete the Earthwork, as required to install the pipe as indicated on the drawings, as specified herein or both.
- B. Including but not necessarily limited to the following:
 - 1. Excavation, including demucking.
 - 2. Backfilling.
 - 3. Filling.
 - 4. Grading, general site and building pads.
 - 5. Compaction.
 - 6. Coordination with ENGINEER for offsite disposal of all excess materials and stock piling of suitable materials to be used as fill or backfill.
- C. Cutting, proofrolling, filling and grading to required lines, dimensions, contours and elevations for proposed improvements as shown and implied on the drawings and required by these specifications.
- D. Scarifying, compaction, moisture content conditioning and control, and removal of unsuitable material to ensure proper preparation of areas for the proposed improvements.
- E. Undertake any special construction procedures for the site recommended in the geotechnical report for preparation of building and pavement areas.
- F. There shall be no classification of excavation for measurement of payment regardless of materials encountered.
- G. The work of this Section includes all earthwork required for construction of the WORK. Such earthwork shall include, but not be limited to, the loosening,

removing, loading, transporting, depositing, and compacting in its final location of all materials wet and dry, as required for the purposes of completing the work specified in the Contract Documents, which shall include, but not be limited to, the furnishing, placing, and removing of sheeting and bracing necessary to safely support the sides of all excavation; all pumping, ditching, draining, and other required measures for the removal or exclusion of water from the excavation; the supporting of structures above and below the ground; all backfilling around structures and all backfilling of trenches and pits; the disposal of excess excavated materials; borrow of materials to makeup deficiencies for fills; and all other incidental earthwork, all in accordance with the requirement of the Contract Documents.

1.03 RELATED WORK

- A. All applicable sections of Division 1, 2, and 3.

1.04 REFERENCE SPECIFICATIONS, CODES, AND STANDARDS

- A. **Codes:** All codes, as referenced herein, are specified in Section 01420, "Reference Standards".
- B. **American Society for Testing and Materials (ASTM) - latest edition**

ASTM D 422 Method for Particle-Size Analysis of Soils.

ASTM D 698 Test Methods for Moisture-Density Relations of Soils and Soil-Aggregate Mixtures, Using 5.5-lb (2.49-kg) Rammer and 12-in (304.8-mm) Drop.

ASTM D 1556 Test Method for Density of Soil in Place by the Sand Cone Method.

ASTM D 1557 Test Methods for Moisture-Density Relations of Soils and Soil-Aggregate Mixtures Using 10-lb (4.54-kg) Rammer and 18-in (457-mm) Drop.

ASTM D 1633 Test Method for Compressive Strength of Molded Soil-Cement Cylinders.

ASTM D 2216 Laboratory Determination of Moisture content of Soil.

ASTM D 2419 Test Method for Sand Equivalent Value of Soils and Fine Aggregate.

ASTM D 2487 Classification of Soils for Engineering Purposes.

ASTM D 2901 Test Method for Cement Content of Freshly-Mixed Soil-Cement.

- ASTM D 2922 Test Methods for Density of Soil and Soil-Aggregate in Place by Nuclear Methods (Shallow Depth).
- ASTM D 3017 Test for Water Content of Soil and Soil-Aggregate in Place by Nuclear Methods (Shallow Depth)
- ASTM D 4253 Test Methods for Maximum Index Density of Soils Using a Vibratory Table.
- ASTM D 4254 Test Methods for Minimum Index Density of Soils and Calculation of Relative Density.
- ASTM D 4318 Test for Plastic Limit, Liquid Limit, and Plasticity Index of Soils
- ASTM D 4429 Standard Test Method for CBR (California Bearing Ratio) of Soils in Place

C. American Association of State Highway and Transportation Officials (AASHTO) - latest edition

- 1. T 88 Particle Size Analysis of Soils

1.05 SUBSOIL INFORMATION

- A. Refer to Section 02210 - Subsurface Investigation.

1.06 SITE INSPECTION

- A. The CONTRACTOR shall visit the site and acquaint themselves with all existing conditions. Make their own subsurface investigation to satisfy themselves as to site and subsurface conditions, but such subsurface investigations shall be performed only under time schedules and arrangements approved in advance by the OWNER and ENGINEER.

1.07 TOPOGRAPHIC INFORMATION

- A. The existing grades shown on the drawings are approximate only and no representation is made as to their accuracy or consistency. The CONTRACTOR shall verify all existing grades to the extent necessary to insure completion of the job to the proposed grades indicated on the drawings.

1.08 DISPOSAL OF SURPLUS OR UNSUITABLE MATERIAL

- A. Unsuitable material encountered during the course of construction shall be removed from the construction site at the expense of the CONTRACTOR. Unsuitable material shall not be stockpiled on-site. All suitable material shall be stockpiled at areas approved by the ENGINEER.

1.09 BENCHMARKS AND MONUMENTS

- A. CONTRACTOR shall employ a registered Professional Surveyor and Mapper to lay out lines and grades as indicated. Benchmarks shall be established by a Professional Surveyor and Mapper registered in the State of Florida. Benchmarks shall be permanent and easily accessible and maintained and replaced if disturbed or destroyed. All benchmarks shall be North American Vertical Datum of 1988 (NAVD).

1.10 UTILITIES

- A. Before starting site operations, arrange for the disconnection of all utility services designated to be removed, or are required to be disconnected for the satisfactory completion of the WORK.
- B. Locate all existing active utility lines traversing the site and determine the requirements for their protection. Preserve in operating condition all active utilities adjacent to or traversing the site and/or designated to remain.
- C. Observe rules and regulations governing respective utilities in working under requirements of this section. Adequately protect utilities from damage, remove or replace as indicated, specified or required. Remove, plug or cap inactive or abandoned utilities encountered in excavation. Record location of all utilities.

1.11 QUALITY ASSURANCE

- A. A geotechnical engineer may be retained by the OWNER to observe performance of work in connection with excavating, filling, grading, and compaction. This inspection will not relieve the CONTRACTOR from their responsibility to complete the work in accordance with the drawings and specifications. The CONTRACTOR shall re-adjust all work performed that does not meet technical or design requirements but make no deviations from the Contract documents without specific and written acceptance of the ENGINEER.
- B. Visual field confirmation and density testing of subgrade preparation and fill placement procedures shall be performed by the field geotechnical engineer as part of the construction testing requirements. The CONTRACTOR shall be informed as soon as possible of the test results.
- C. The ENGINEER shall prepare field reports that indicate compaction test location, elevation data, testing results and acceptability. The OWNER and CONTRACTOR shall be provided with written copies of the results within 24 hours of time test was performed.
- D. All costs related to reinspection, due to failures, shall be paid for by the CONTRACTOR at no additional expense to OWNER. The OWNER reserves the

right to direct any inspection that is deemed necessary. CONTRACTOR shall provide free access to site for inspection activities.

- E. Where soil material is required to be compacted to a percentage of maximum density, the maximum density at optimum moisture content will be determined in accordance with ASTM D 1557. Where cohesionless, free draining soil material is required to be compacted to a percentage of relative density, the calculation of relative density will be determined in accordance with ASTM D 4253 and D 4254. Field density in-place tests will be performed in accordance with ASTM D 1556, ASTM D 2922, or by such other means acceptable to the ENGINEER.
- F. In case the tests of the fill or backfill show non-compliance with the required density, the CONTRACTOR shall accomplish such remedy as may be required to insure compliance. Subsequent testing to show compliance shall be by a testing laboratory selected by the OWNER and shall be at the CONTRACTOR's expense.
- G. Particle size analysis of soils and aggregates will be performed using ASTM D 422.
- H. Determination of sand equivalent value will be performed using ASTM D 2419.
- I. **Unified Soil Classification System:** References in these specifications are to soil classification types and standards set forth in ASTM D 2487. The CONTRACTOR shall be bound by all applicable provisions of said ASTM D 2487 in the interpretation of soil classifications.
- J. Comply with requirements of all applicable building codes and other public agencies having jurisdiction upon the work.

1.12 SUBMITTALS

- A. Within 10 days after award of the contract, the CONTRACTOR shall submit to the OWNER, with their bid package, a schedule detailing the sequence, and time of completion of all phases of work under this section.
- B. At least 2 weeks in advance of imported fill use, the CONTRACTOR shall submit the following laboratory test data to the ENGINEER for each type of imported soil/gravel material to be used as compacted fill.
 - 1. Moisture and Density Relationship: ASTM D1557 or D698 as required by project geotechnical engineering study;
 - 2. Mechanical Analysis: AASHTO T-88; and,
 - 3. Plasticity Index: ASTM D 4318.

- C. Together with the above test data, the CONTRACTOR shall submit a 5-pound sample of each type of off-site fill material in an air tight container for the approval of the ENGINEER and OWNER.
- D. Submit the name of each material supplier and specific type and source of each material. Any change in source or soil type throughout the job requires approval of the OWNER and the ENGINEER.

PART 2 - PRODUCTS

2.01 SUITABLE FILL AND BACKFILL MATERIAL REQUIREMENTS

- A. **General:** Fill, backfill, and embankment materials shall be suitable selected or processed clean, fine earth, rock, or sand, free from grass, roots, brush, or other vegetation.
- B. Fill and backfill materials to be placed within 6 inches of any structure or pipe shall be free of rocks or unbroken masses of earth materials having a maximum dimension larger than 3 inches.
- C. **Suitable Materials:** Soils not classified as unsuitable as defined in Paragraph entitled, "Unsuitable Material" herein, are defined as suitable materials and may be used in fills, backfilling, and embankment construction subject to the specified limitations. In addition, when acceptable to the ENGINEER, some of the material listed as unsuitable may be used when thoroughly mixed with suitable material to form a stable composite.
- D. Suitable materials may be obtained from on-site excavations, may be processed on-site materials, or may be imported. If imported materials are required to meet the requirements of this Section or to meet the quantity requirements of the project the CONTRACTOR shall provide the imported materials at no additional expense to the OWNER, unless a unit price item is included for imported materials in the bidding schedule.
- E. On-site fill
 - 1. On-site materials for use as fill shall consist of excavated soil from other portions of the site;
 - 2. The CONTRACTOR shall use the on-site soil judiciously to facilitate the construction schedule including the use of the most readily compactable soil for fill in building areas and as fill within 2 feet of pavement subgrade;
 - 3. Topsoil shall not be utilized as engineered fill;

4. Excavated material containing rock, stone or masonry debris smaller than 2 feet in its largest dimension, may be mixed with suitable material and utilized up to 3 feet below proposed subgrade;
5. Excavated material containing rock, stone or masonry debris smaller than 6 inches in its largest dimension may be mixed with suitable material and utilized up to 18 inches below proposed subgrade;
6. No material greater than 2 inches in its largest dimension may be utilized within 18 inches of proposed subgrade;
7. No material greater than 2 inches in its largest dimension may be utilized as backfill for storm drainage or utility trenches.
8. Prior to placement, on-site material to be used as fill shall not contain:
 - a. Debris other than crushed concrete and brick meeting the above requirements.
 - b. Timber or railroad ties.
 - c. Other deleterious materials such as steel rails, rebar, trash, etc.
 - d. Hazardous material - Unsuitable and deleterious materials and debris shall be disposed of off-site in accordance with all applicable regulations.

F. Off-site imported fill

1. If necessary, off-site fill shall be obtained and provided by the CONTRACTOR;
2. Fill shall be clean, well graded granular soil which is non-expansive and non-collapsible and shall have less than 20% by weight passing the #200 sieve. The portion passing the #200 shall be non-plastic. Fill with less fines (less than #200) may be required on project specific basis and as required by ENGINEER. Likewise, fill with more than 20% fines may be acceptable on a project specific basis or as identified in a geotechnical engineering study;
3. Imported fill shall be free of all hazardous substances. Certification of compliance and, if requested, test results substantiating compliance shall be furnished to the OWNER and ENGINEER by the CONTRACTOR not less than one week prior to its intended use;
4. The OWNER reserves the right to test off-site fill material for conformance with these specifications; and,
5. The CONTRACTOR shall be responsible for all permits and regulatory requirements associated with offsite borrow sources.

G. The following types of suitable materials are designated and defined as follows:

1. Type 1 (one inch minus granular backfill): Crushed rock, gravel, or sand with 100 percent passing a 1-inch sieve and a sand equivalent value not less than 50.
2. Type 2 (one half inch minus granular backfill): Crushed rock, gravel, or sand with 100 percent passing a 1/2-inch sieve and a sand equivalent value not less than 50.
3. Type 3 (sand backfill): Sand with 100 percent passing a 3/8-inch sieve, at least 90 percent passing a number 4 sieve, and a sand equivalent value not less than 30.
4. Type 4 (coarse rock backfill): Crushed rock or gravel with 100 percent passing a 1-inch sieve and not more than 10 percent passing a Number 4 sieve.
5. Type 5 (pea gravel backfill - ASTM #89): Crushed rock or gravel with 100 percent passing a 1/2-inch sieve, 90 percent passing a Number 8 sieve and not more than 10 percent passing a Number 4 sieve.
6. Type 6 (coarse drainrock - ASTM #4): Crushed rock or gravel meeting the following gradation requirements:

<u>Sieve Size</u>	<u>Percentage Passing</u>
2-inch	100
1-1/2-inch	90-100
1-inch	20-55
3/4-inch	0-15
No. 200	0-3

7. Type 7 (graded drainrock): Crushed rock or gravel, durable and free from slaking or decomposition under the action of alternate wetting or drying. The material shall be uniformly graded and shall meet the following gradation requirements.

<u>Sieve Size</u>	<u>Percentage Passing</u>
1-inch	100
3/4-inch	90-100
3/8-inch	40-100
No. 4	25-40
No. 8	18-33
No. 30	5-15
No. 50	0-7
No. 200	0-3

The drainrock shall have a sand equivalent value not less than 75. The finish graded surface of the drainrock immediately beneath hydraulic structures shall be stabilized to provide a firm, smooth surface upon which to construct reinforced concrete floor slabs.

8. Type 8 (Ballast Rock / $\frac{3}{4}$ " Rock): Crushed rock or gravel, durable and free from slaking or decomposition under the action of alternate wetting or drying. The material shall be uniformly graded and shall meet the following gradation requirements.

<u>Sieve Size</u>	<u>Percentage Passing</u>
1-inch	100
3/4-inch	40-60
No. 4	0-3
No. 8	0-3

9. Type 9: (Bedding rock -ASTM #67): Well graded crushed rock or gravel meeting the following gradation:

<u>Sieve Size</u>	<u>Percentage Passing</u>
1-inch	100
3/4-inch	98-100
1/2-inch	55-70
3/8-inch	30-40
No. 4	0-6

10. Type 10 (Class I crushed stone - ASTM #57): Manufactured angular, granular crushed stone, rock, or slag, with 100 percent passing a 1-inch sieve and less than 5 percent passing a Number 4 sieve.

11. Type 11 (aggregate base): Crushed rock aggregate base material of such nature that it can be compacted readily by watering and rolling to form a firm, stable base for pavements. At the option of the CONTRACTOR, the grading for either the 1-1/2-inch maximum size or 3/4-inch maximum size shall be used. The sand equivalent value shall be not less than 22, and the material shall meet the following gradation requirements.

<u>Sieve Size</u>	<u>Percentage Passing</u>	
	<u>1-1/2-inch Max.</u>	<u>3/4-inch Max.</u>
2-inch	100	-
1-1/2 inch	90-100	-
1-inch	-	100
3/4-inch	50-85	90-100
No. 4	25-45	35-55
No. 30	10-25	10-30
No. 200	2-9	2-9

12. Type 12 (aggregate subbase): Crushed rock aggregate subbase material that can be compacted readily by watering and rolling to form a firm stable base. The sand equivalent value shall be not less than 18 and shall meet the following gradation requirements.

<u>Sieve Size</u>	<u>Percentage Passing</u>
3-inch	100
2-1/2 inch	87-100
No. 4	35-95
No. 200	0-29

13. Type 13 (cement-treated backfill): Material which consists of Type 7 material, or any mixture of Types 3, 7, 10 and 11 materials which has been cement-treated so that the cement content of the material is not less than 5 percent by weight when tested in accordance with ASTM D 2901. The ultimate compressive strength at 28 days shall be not less than 400 psi when tested in accordance with ASTM D 1633.
14. Type 14 (topsoil): Stockpiled topsoil material which has been obtained at the site by removing soil to a depth not exceeding 2 feet. Removal of the topsoil shall be done after the area has been stripped of vegetation and debris as specified.
15. Type 15 (trench plug): Low permeable fill material, a nondispersible clay material having a minimum plasticity index of 10.

- H. If approved by the ENGINEER, any bituminous concrete on the site shall be milled/removed prior to placing any fill and shall be reused only onsite immediately below the pavement stone base course.

2.02 UNSUITABLE MATERIAL

- A. Unsuitable soils for fill material shall include soils which, when classified under ASTM D 2487, fall in the classifications of Pt, OH, CH, MH or OL.
- B. In addition, any soil which cannot be compacted sufficiently to achieve the percentage of maximum density specified for the intended use shall be classed as unsuitable material.

2.03 USE OF FILL, BACKFILL, AND EMBANKMENT MATERIAL TYPES

- A. The CONTRACTOR shall use the types of materials as designated herein for all required fill, backfill, and embankment construction hereunder.
- B. Where these Specifications conflict with the requirements of any local agency having jurisdiction, or with the requirements of a material manufacturer, the

ENGINEER shall be immediately notified. In case of conflict therewith, the CONTRACTOR shall use the most stringent requirement, as determined by the ENGINEER.

C. Fill and backfill types shall be used in accordance with the following provisions:

1. Embankment fills shall be constructed of any mixture of Type 1 through Type 11 materials.
2. Pipe zone backfill, as defined under Paragraph 3.15 "Pipe and Utility Trench Backfill" herein, shall consist of the following materials for each pipe material listed below. Where pipelines are installed on grades exceeding 4 percent, and where backfill materials are graded such that there is less than 10 percent passing a Number 4 sieve, trench plugs of Type 13 or 14 materials shall be provided at maximum intervals of 200 feet or as shown on the Drawings.
 - a. Mortar coated pipe, concrete pipe, and uncoated ductile iron pipe shall be provided Type 1, 2, 3, 4, 5, 9 or 10 pipe zone backfill materials.
 - b. Coal tar enamel coated pipe, polyethylene encased pipe, tape wrapped pipe, and other non-mortar coated pipe shall be backfilled with Type 3 pipe zone backfill material.
 - c. Plastic pipe and vitrified clay pipe shall be backfilled with Type 9 or 10 pipe zone backfill material.
3. Trench zone backfill for pipelines as defined under Paragraph 3.15 "Pipe and Utility Trench Backfill" shall be or any of Types 1 through 11 backfill materials or any mixture thereof, except that Type 14 material may be used for trench zone backfill in agricultural areas unless otherwise shown or specified.
4. Final backfill material for pipelines under paved area, as defined under Paragraph 3.15 "Pipe and Utility Trench Backfill" shall be Type 11 backfill material. Final backfill under areas not paved shall be the same material as that used for trench backfill, except that Type 14 material shall be used for final backfill in agricultural areas unless otherwise shown or specified.
5. Trench backfill and final backfill for pipelines under structures shall be the same material as used in the pipe zone, except where concrete encasement is required by the Contract Documents.
6. Aggregate base materials under pavements shall be Type 11 material constructed to the thicknesses shown or specified. Where specified or shown, aggregate subbase shall be Type 12 Material.

7. Backfill around structures shall be or Types 1 through Type 11 materials, or any mixture thereof.
8. Backfill materials beneath structures shall be as follows:
 - a. Drainrock materials under hydraulic structures or other water retaining structure with underdrain systems shall be Type 7 or Type 8 material.
 - b. Under concrete hydraulic structures or other water retaining structures without underdrain systems, Types 7, 8 or 11 materials shall be used.
 - c. Under structures where groundwater must be removed to allow placement of concrete, Type 6 material shall be used.
 - d. Under all other structures, Type 4, 5, 6, 7, 8, 9 or 11 material shall be used.
9. Backfill used to replace pipeline trench over-excavation shall be a layer of Type 6, 7, 8, 9 or 10 materials. This backfill material shall be wrapped with filter fabric to prevent migration of fines for wet trench conditions. The same material as used for the pipe zone backfill may be used if the trench conditions are not wet. Filter fabric shall be **Mirafi 140 N, Mirafi 700 X, or equal.**
10. The top 6 inches of fill on reservoir roofs, embankment fills around hydraulic structures, and all other embankment fills shall consist of Type 14 material, topsoil.

2.04 EMBANKMENT

- A. The maximum sizes of rock which will be permitted in the completed fill areas are as follows:

<u>Depth Below Finish Grade</u>	<u>Maximum Allowable Diameter</u>
Top 4 inches	1 inch
4 inches to 12 inches	3-1/2 inches
12 inches to 2 feet	6 inches
2 feet to 4 feet	12 inches
4 feet to 8 feet	24 inches
Below 8 feet	36 inches

- B. Embankments shall be constructed of material containing no muck, stumps, roots, brush, vegetable matter, rubbish or other material that will not compact into a suitable and enduring roadbed, and material designated as undesirable shall

be removed from the site. Where embankments are constructed adjacent to bridge end bents or abutments, rock larger than 3-1/2 inches in diameter shall not be placed within three feet of the location of any abutment.

- C. Fill material containing debris, sod, biodegradable materials shall not be used as fill in construction areas.
- D. Fill material required for the building pads and for pavement subgrade shall be granular fill, free of organic material.
- E. Fill material required for pervious and sodded areas shall have a maximum organic component of 10%. CONTRACTOR shall provide, at their cost, organic content test results for approval by the ENGINEER.

2.05 EQUIPMENT

- A. Compactor for mass earthwork shall be minimum 3-ton static drum weight vibratory roller or 5-ton static drum weight sheeps footed compactor as appropriate for the type of soil material at the site or other compactor approved by the ENGINEER.
- B. Compactor for trenches and where access or maneuverability is limited use, a double drum walk behind roller or vibratory plate compactor or "jumping jack" tampers.

PART 3 - EXECUTION

3.01 GENERAL

- A. Prior to bidding of all work within this section, the CONTRACTOR shall become thoroughly familiar with the geotechnical engineering study, if available, as well as the site, site conditions, and all portions of the Work falling within this section.
- B. The CONTRACTOR shall prepare erosion control drawings for staging of earthwork operations and for erosion control measures to be implemented prior to commencement of earthwork.
- C. Locate and identify existing utilities that are to remain and protect them from damage.
- D. Notify utility companies to allow removal and/or relocation of any utilities that are in conflict with the proposed improvements.
- E. Protect fences, structures, sidewalks, paving, curbs, etc. that are to remain from equipment and vehicular traffic.
- F. Protect benchmarks, property corners and all other survey monuments from damage or displacement. If a marker needs to be removed/relocated it shall be

referenced by a licensed land surveyor and replaced, as necessary, by the same at no additional cost to the OWNER.

- G. Remove from the site, material encountered in grading operations that, in opinion of OWNER or ENGINEER, is unsuitable or undesirable for backfilling in pavement or building areas as per Paragraph 2.01.
- H. Identify required lines, levels, contours and datum to bring site grades to the proposed subgrade conditions inferred from the drawings.
- I. Do not perform any work associated with this section prior to completion of all required inspections, tests and approvals.
- J. When performing grading operations during periods of prolonged wet or dry weather, provide adequate measures for surface drainage and ground water control, and moisture control of soils (i.e., wetting or drying, scarify and discing) so as to place and compact the soil within the moisture content range a few percentage points of its optimum water content. Any disturbed areas should be proofrolled at the end of each day.
- K. Sloping, shoring, bracing, and fencing shall be installed in accordance with Federal OSHA requirements as well as the requirements of all regulatory authorities having jurisdiction.
- L. Allow no debris to accumulate on-site. Haul debris away from the site and dispose of at no cost to the OWNER.
- M. The CONTRACTOR shall remove and dispose of all excess excavated material at a site selected by the CONTRACTOR and reviewed by the ENGINEER.

3.02 JOB CONDITIONS

- A. Protection: Use all means necessary to protect existing objects and vegetation. In the event of damage, immediately make all repairs, and replacements necessary to the acceptance of the ENGINEER at no cost to the OWNER.

3.03 BACKFILL, FILLING & GRADING

A. Grades:

- 1. Cut, backfill, fill and grade to proper grade levels indicated. The proposed grades shown on the drawings are for establishing a finished grade over the site.

B. Filling:

- 1. Fill material shall be placed in horizontal layers and spread to obtain a uniform thickness.

2. After compaction, layers of fill are not to exceed twelve (12) inches for cohesive soils or eight (8) inches for noncohesive soils.

3.04 STRUCTURE, ROADWAY, AND EMBANKMENT EXCAVATION

- A. **General:** Except when specifically provided to the contrary, excavation shall include the removal of all materials of whatever nature encountered, including all obstructions of any nature that would interfere with the proper execution and completion of the work. The removal of said materials shall conform to the lines and grades shown or ordered. Unless otherwise provided, the entire construction site shall be stripped of all vegetation and debris, and such material shall be removed from the site prior to performing any excavation or placing any fill. The CONTRACTOR shall furnish, place, and maintain all supports and shoring that may be required for the sides of the excavations, and all pumping, ditching, or other measure for the removal or exclusion of water, including taking care of storm water, groundwater, and wastewater reaching the site of the work from any source so as to prevent damage to the work or adjoining property. Excavations shall be sloped or otherwise supported in a safe manner in accordance with applicable State safety requirements and the requirements of OSHA Safety and Health Standards for Construction (29CFR1926).
- B. **Excavation Beneath Structures and Embankments:** Except where otherwise specified for a particular structure or ordered by the ENGINEER, excavation shall be carried to the grade of the bottom of the footing or slab. Where shown or ordered, areas beneath structures or fills shall be over-excavated. The subgrade areas beneath embankments shall be excavated to remove not less than the top 6 inches of native material and where such subgrade is sloped, the native material shall be benched. When such over excavation is shown, both over-excavation and subsequent backfill to the required grade shall be performed by the CONTRACTOR. When such over-excavation is not shown but is ordered by the ENGINEER, such over-excavation and any resulting backfill will be paid for under a separate unit price bid item if such bid item has been established; otherwise, payment will be made in accordance with a negotiated price. After the required excavation or over-excavation has been completed, the exposed surface shall be scarified to a depth of 6 inches, brought to optimum moisture content, and rolled with heavy compaction equipment to obtain 98 percent of maximum density.
- C. **Excavation Beneath Paved Areas:** Excavation under areas to be paved shall extend to the bottom of the aggregate base or subbase, if such base is called for; otherwise, it shall extend to the paving thickness. After the required excavation has been completed, the top 12 inches of exposed surface shall be scarified, brought to optimum moisture content, and rolled with heavy compaction equipment to obtain 98 percent of maximum density. The finished subgrade shall be even, self-draining, and in conformance with the slope of the finished

pavement. Areas that could accumulate standing water shall be regraded to provide a self-draining subgrade.

- D. **Notification of ENGINEER:** The CONTRACTOR shall notify the ENGINEER at least 3 days in advance of completion of any structure excavation and shall allow the ENGINEER a review period of at least one day before the exposed foundation is scarified and compacted or is covered with backfill or with any construction materials.

3.05 PIPELINE AND UTILITY TRENCH EXCAVATION

- A. **General:** Unless otherwise shown or ordered, excavation for pipelines and utilities shall be open-cut trenches. Trench widths shall be kept as narrow as is practical for the method of pipe zone densification selected by the CONTRACTOR, but shall have a minimum width at the bottom of the trench equal to the outside diameter of the pipe plus 24 inches for mechanical compaction methods and 18 inches for water consolidation methods. The maximum width at the top of the trench shall be equal to the outside diameter of the pipe plus 36 inches for pipe diameters 18 inches and larger and to the outside diameter of the pipe plus 24 inches for pipe diameters less than 18 inches, or as shown on the Drawings.
- B. **Trench Bottom:** Except when pipe bedding is required, the bottom of the trench shall be excavated uniformly to the grade of the bottom of the pipe. The trench bottom shall be given a final trim, using a string line for establishing grade, such that each pipe section when first laid will be continually in contact with the ground along the extreme bottom of the pipe. Rounding out the trench to form a cradle for the pipe will not be required. Excavations for pipe bells and welding shall be made as required.
- C. **Open Trench:** The maximum amount of open trench permitted in any one location shall be 300 feet, or the length necessary to accommodate the amount of pipe installed in a single day, whichever is greater. All trenches shall be fully backfilled at the end of each day or, in lieu thereof, shall be covered by heavy steel plates adequately braced and capable of supporting vehicular traffic in those locations where it is impractical to backfill at the end of each day. The above requirements for backfilling or use of steel plate will be waived in cases where the trench is located further than 100 feet from any traveled roadway or occupied structure. In such cases, however, barricades and warning lights meeting OSHA requirements shall be provided and maintained.
- D. **Trench Over-Excavation:** Where the Drawings indicate that trenches shall be over-excavated, they shall be excavated to the depth shown, and then backfilled to the grade of the bottom of the pipe.
- E. **Over-Excavation:** When ordered by the ENGINEER, whether indicated on the Drawings or not, trenches shall be over-excavated beyond the depth shown.

Such over-excavation shall be to the depth ordered. The trench shall then be backfilled to the grade of the bottom of the pipe. All work specified in this Section shall be performed by the CONTRACTOR when the over-excavation ordered by the ENGINEER is less than 6 inches below the limits shown. When the over-excavation ordered by the ENGINEER is 6 inches or greater below the limits shown, additional payment will be made to the CONTRACTOR for that portion of the work which is located below said 6-inch distance. Said additional payment will be made under separate unit price bid items for over-excavation and bedding if such bid items have been established; otherwise, payment will be made in accordance with a negotiated price.

- F. Where pipelines are to be installed in embankment or structure fills, the fill shall be constructed to a level at least one foot above the top of the pipe before the trench is excavated.

3.06 OVER-EXCAVATION NOT ORDERED, SPECIFIED, OR SHOWN

- A. Any over-excavation carried below the grade ordered, specified, or shown, shall be backfilled to the required grade with the specified material and compaction. Such work shall be performed by the CONTRACTOR at its own expense.

3.07 EXCAVATION IN LAWN AREAS

- A. Where excavation occurs in lawn areas, the sod shall be carefully removed, kept damp, and stockpiled to preserve it for replacement. Excavated material may be placed on the lawn; provided that a drop cloth or other suitable method is employed to protect the lawn from damage. The lawn shall not remain covered for more than 72 hours. Immediately after completion of backfilling and testing of the pipeline, the sod shall be replaced and lightly rolled in a manner so as to restore the lawn as near as possible to its original condition. CONTRACTOR shall provide new sod if stockpiled sod has not been replaced within 72 hours.

3.08 EXCAVATION IN VICINITY OF TREES

- A. Except where trees are shown to be removed, trees shall be protected from injury during construction operations. No tree roots over 2 inches in diameter shall be cut without express permission of the ENGINEER. Trees shall be supported during excavation by any means previously reviewed and approved by the ENGINEER.

3.09 ROCK EXCAVATION

- A. Rock is defined as follows:

1. Rock shall be classified as material having a blow count in excess of 30 blows per foot from a Standard Penetration Test (ASTM D-1586) and

exceeding 1000 psi from an Unconfined Compression Strength Test (ASTM D-2938); and,

2. General Excavation - Any material that cannot be excavated with a single-toothed ripper drawn by a crawler tractor having a minimum draw bar pull rated at not less than 71,000 lbs. (Caterpillar D9N or equivalent), and occupying an original volume of at least 2 cubic yards or more; and,
 3. Trench Excavation - Any material that cannot be excavated with a backhoe having a break out force rated at not less than 44,000 lbs. (Caterpillar 235D or equivalent), and occupying an original volume of at least 2 cubic yards.
- B. Rock excavation shall include removal and disposal of the following: (1) all boulders measuring 1/3 of a cubic yard or more in volume; (2) all rock material in ledges, bedding deposits, and unstratified masses which cannot be removed without systematic drilling and blasting; (3) concrete or masonry structures which have been abandoned; and (4) conglomerate deposits which are so firmly cemented that they possess the characteristics of rock as described in Paragraph 3.09(A).
- C. Said rock excavation shall be performed by the CONTRACTOR; provided, that should the quantity of rock excavation be affected by any change in the scope of the work, an appropriate adjustment of the contract price will be made under a separate bid item if such bid item has been established; otherwise, payment will be made in accordance with a negotiated price.
- D. Explosives and Blasting: Blasting will not be permitted, except by express permission of the ENGINEER on a case-by-case basis. The use of explosives will be subject to the approval and regulations of all agencies having jurisdiction. If blasting is utilized at the site of the WORK, the CONTRACTOR shall take all precautions and provide all protective measures necessary to prevent damage to property and structures or injury to person. Prior to blasting, the CONTRACTOR shall secure all permits required by law for blasting operations and shall provide any additional hazard insurance required by the OWNER. The CONTRACTOR shall have a fully qualified and experienced blasting foreman in charge of all blasting operations.
- E. The CONTRACTOR will be held responsible for all and shall make good any damage caused by blasting or resulting from its possession or use of explosives on the WORK.
- F. All operations involving the handling, storage, and use of explosives shall be conducted in accordance with the requirements of the OSHA Standards for Construction, and in accordance with all local laws and regulations.

3.10 DISPOSAL OF UNSUITABLE EXCAVATED MATERIAL

- A. The CONTRACTOR shall remove and dispose of all unsuitable excavated material. This shall include muck, tree roots, rocks, garbage, debris, or any other material designated as unsuitable by Paragraph 2 of this Section. Disposal shall be at a site selected by the CONTRACTOR that is designated as an approved disposal site for the unsuitable material.

3.11 BACKFILL - GENERAL

- A. Backfill shall not be dropped directly upon any structure or pipe. Backfill shall not be placed around or upon any structure until the concrete has attained sufficient strength to withstand the loads imposed. Backfill around water retaining structures shall not be placed until the structures have been tested, and the structures shall be full of water while backfill is being placed.
- B. Except for drainrock materials being placed in over-excavated areas or trenches, backfill shall be placed after all water is removed from the excavation.

3.12 PLACING AND SPREADING OF BACKFILL MATERIALS

- A. Backfill materials shall be placed and spread evenly in layers. When compaction is achieved using mechanical equipment the layers shall be evenly spread so that when compacted each layer shall not exceed 6 inches in thickness.
- B. During spreading each layer shall be thoroughly mixed as necessary to promote uniformity of material in each layer. Pipe zone backfill materials shall be manually spread, tamped, and haunched around the pipe so that when compacted the pipe zone backfill will provide uniform bearing and side support.
- C. Where the backfill material moisture content is below the optimum moisture content water shall be added before or during spreading until the proper moisture content is achieved.
- D. Where the backfill material moisture content is too high to permit the specified degree of compaction the material shall be dried until the moisture content is satisfactory.

3.13 COMPACTION - GENERAL

- A. Compact each layer of fill in designated areas with approved equipment to achieve a maximum density at optimum moisture, AASHTO T 180 - latest edition.
 - 1. Building Pads: compaction shall be to 98% of maximum density, unless otherwise shown on the drawings or specifications. Building pads shall be within plus or minus one-tenth (0.1) of a foot of the elevations shown on the plans.

2. Refer to Sections 02741 Asphaltic Concrete Paving and 02751 Portland Cement Concrete Paving for compaction requirements in the affected areas.
 3. Under landscaped area, compaction shall be to 85% of maximum density, unless otherwise shown on the drawings.
- B. No backfill shall be placed against any masonry or other exposed building surface until permission has been given by the ENGINEER and in no case until the masonry has been in place seven days.
 - C. Heavy construction equipment will not be permitted within ten (10) feet of any masonry or other exposed building surface.
 - D. Compaction in limited areas shall be obtained by the use of mechanical tampers or approved hand tampers. When hand tampers are used, the materials shall be deposited in layers not more than four inches thick. The hand tampers used shall be suitable for this purpose and shall have a face area of not more than 100 square inches. Special precautions shall be taken to prevent any wedging action against masonry, or other exposed building surfaces.
- 3.14 COMPACTION OF FILL, BACKFILL, AND EMBANKMENT MATERIALS

- A. Each layer of Types 1, 2, 3, 7, 8, and 14 backfill materials as defined herein, where the material is graded such that at least 10% passes a No. 4 sieve, shall be mechanically compacted to the specified percentage of maximum density. Equipment that is consistently capable of achieving the required degree of compaction shall be used and each layer shall be compacted over its entire area while the material is at the required moisture content.
- B. Each layer of Type 4, 5, 6, and 13 backfill materials shall be compacted by means of at least 2 passes from a flat plate vibratory compactor. When such materials are used for pipe zone backfill, vibratory compaction shall be used at the top of the pipe zone or at vertical intervals of 24 inches, whichever is the least distance from the subgrade.
- C. Type 9 and 10 material requires mechanical spreading and placement to fill voids but does not require mechanical compaction or vibration. Tamping shall be used in pipe zone areas.
- D. Fill on structure roof slabs shall be deposited at least 30 days after the concrete roof slab has been placed. Equipment weighing more than 10,000 pounds when loaded shall not be used on a roof. A roller weighing not more than 8,000 pounds shall be used to compact fill on a roof.

- E. Flooding, ponding, or jetting shall not be used for fill on roofs, backfill around structures, backfill around reservoir walls, for final backfill materials, or aggregate base materials.
- F. Pipe zone backfill materials that are granular may be compacted by a combination of flooding and vibration using concrete vibrators or by jetting, when acceptable to the ENGINEER. Tamping shall be used to ensure adequate bedding in the pipe zone.
- G. Pipeline trench zone backfill materials, containing 5% or less of material passing a No. 200 sieve, may be compacted using flooding and jetting or vibration if the CONTRACTOR uses effective procedures that yield the specified compaction test results. Flooding and jetting shall not be done in such a manner that the pipe or nearby utilities are damaged, in areas of poorly draining or expansive soils, or where the use of the procedure is prohibited by any agency having jurisdiction over the street or right-of-way. Approved jet pipes or immersible vibrators shall be used so that each backfill layer is saturated and consolidated to its full depth before the next layer is placed. Jet pipes shall be kept at least 6 inches away from the pipe where the backfills being consolidated and 2 feet away from other pipes or utilities.
- H. Equipment weighing more than 10,000 pounds shall not be used closer to walls than a horizontal distance equal to the fill at that time. Hand operated power compaction equipment shall be used where use of heavier equipment is impractical or restricted due to weight limitations.
- I. Compaction Requirements: The following compaction test requirements shall be in accordance with AASHTO T-180, T-99-C or ASTM D 2487 as applicable. Where agency or utility company requirements govern, the highest compaction standards shall apply.

<u>Location or Use of Fill</u>	<u>Percentage of Maximum Density AASHTO T-180</u>	<u>Testing Frequency 1 per lift per</u>
Pipe zone backfill portion above bedding for flexible pipe.	100	150 lf
Pipe zone backfill bedding and over-excavated zones under bedding/pipe for flexible pipe, including trench plugs.	100	150 lf

<u>Location or Use of Fill</u>	<u>Percentage of Maximum Density AASHTO T-180</u>	<u>Testing Frequency 1 per lift per</u>
Pipe zone backfill portion above bedding for rigid pipe.	100	150 lf
Pipe zone backfill bedding and over-excavated zones under bedding/pipe for rigid pipe.	100	150 lf
Final backfill, beneath paved areas or structures.	100	10,000 sf
Final backfill, not beneath paved areas or structures.	95	20,000 sf
Trench zone backfill, not beneath paved areas or structures, including trench plugs.	95	150 lf
Embankments.	98	20,000 sf
Embankments, beneath paved areas or structures.	100	10,000 sf
Backfill beneath structures, hydraulic structures.	100	100 sf
Backfill around structures.	98	100 sf
Topsoil (type 14 material)	85	20,000 sf
Aggregate base or subbase (type 11 or 12 material)	100	10,000 sf

- J. Trench Backfill Requirements: the pipe has been structurally designed based upon the trench configuration specified herein.
- K. The CONTRACTOR shall maintain the indicated trench cross section up to a horizontal plane lying 6 inches above the top of the pipe.

- L. If, at any location under said horizontal plane, the CONTRACTOR slopes the trench walls or exceeds the maximum trench widths indicated in the Contract Documents, the pipe zone backfill shall be "improved" or the pipe class increased as specified herein, at no additional cost to the OWNER. "Improved" backfill shall mean sand-cement backfill or other equivalent materials acceptable to the ENGINEER.
- M. If the allowable deflection specified for the pipe is exceeded, the CONTRACTOR shall expose and reround or replace the pipe, repair all damaged lining and coating, and reinstall the pipe zone material and trench backfill as specified at no additional expense to the OWNER.

3.15 PIPE AND UTILITY TRENCH BACKFILL

- A. Pipe zone Backfill: The pipe zone is defined as that portion of the vertical trench cross-section lying between a plane 6 inches below the bottom surface of the pipe, i.e., the trench subgrade, and a plane at a point 6 inches above the top surface of the pipe. The bedding for flexible pipe is defined as that portion of pipe zone backfill material between the trench subgrade and the bottom of the pipe. The bedding for rigid pipe is defined as that portion of the pipe zone backfill material between the trench subgrade and a level line which varies from the bottom of the pipe to the springline as shown.
- B. Bedding shall be provided for all sewers, drainage pipelines, and other gravity flow pipelines. Unless otherwise specified or shown, for other pipelines the bedding may be omitted if all the following conditions exist.
 - 1. The pipe bears on firm, undisturbed native soil which contains only particles that will pass a one-inch sieve.
 - 2. The excavation is not through rock or stones.
 - 3. The trench subgrade soils are classified as suitable fill and backfill materials per Paragraph 2.01.
 - 4. The trench subgrade soils have, as a maximum, a moisture content that allows compaction.
- C. Where bedding is required, after compacting the bedding the CONTRACTOR shall perform a final trim using a stringline for establishing grade, such that each pipe section when first laid will be continually in contact with the bedding along the extreme bottom of the pipe. Excavation for pipe bells and welding shall be made as required.
- D. The pipe zone shall be backfilled with the specified backfill material. The pipe zone shall be well tamped per manufacturer's recommendation to prevent sags or settlement of the pipe. The CONTRACTOR shall exercise care to prevent

damage to the pipeline coating, cathodic bonds, or the pipe itself during the installation and backfill operations.

- E. Trench Zone Backfill: After the pipe zone backfill has been placed as specified above, and after all excess water has completely drained from the trench, backfilling of the trench zone may proceed. The trench zone is defined as that portion of the vertical trench cross-section lying between a plane 6 inches above the top surface of the pipe and a plane at a point 18 inches below the finished surface grade, or if the trench is under pavement, 18 inches below the roadway subgrade. If flooding, ponding, or jetting is used the pipe shall be filled with water to prevent flotation.
- F. Final Backfill: Final backfill is all backfill in the trench cross-sectional area within 18 inches of finished grade, or if the trench is under pavement, all backfill within 18 inches of the roadway subgrade.

3.16 EMBANKMENT CONSTRUCTION

- A. The area where an embankment is to be constructed shall be cleared of all vegetation, roots and foreign material. Following this, the surface shall be moistened, scarified to a depth of 6 inches, and rolled or otherwise mechanically compacted. Embankment fill material shall be placed and spread evenly in approximately horizontal layers. Each layer shall be moistened or aerated, as necessary. Unless otherwise approved by the ENGINEER, each layer shall not exceed 6 inches of compacted thickness. The embankment fill and the scarified layer of underlying ground shall be compacted to 95% of maximum density under structures and paved areas, and 90% of maximum density elsewhere.
- B. When an embankment fill is to be made and compacted against hillsides or fill slopes steeper than 4:1, the slopes of hillsides or fills shall be horizontally benched to key the embankment fill to the underlying ground. A minimum of 12 inches normal to the slope of the hillside or fill shall be removed and recompacted as the embankment fill is brought up in layers. Material thus cut shall be recompacted along with the new fill material at the CONTRACTOR's expense. Hillside of fill slopes 4:1 or flatter shall be prepared in accordance with Paragraph A, above.
- C. Where embankment or structure fills are constructed over pipelines, the first 4 feet of fill over the pipe shall be constructed using light placement and compaction equipment that does not damage the pipe. Heavy construction equipment shall maintain a minimum distance from the edge of the trench equal to the depth of the trench until at least 4 feet of fill over the pipe has been completed.

3.17 COMPACTION OF SUBGRADE SURFACES

- A. Any soft areas exhibiting excessive weaving or unsatisfactory material identified

during excavation, fill placement, compaction and proof testing shall be removed, replaced with suitable fill, and compacted as specified.

- B. Prior to preparing the subgrade in low lying areas, perform the following procedures:
1. Drain standing water by gravity or with a pump. Water should not be discharged directly to a storm drain system;
 2. After drainage of low area is complete, remove mulch, mud, debris, and other unsuitable material using equipment and methods that will minimize disturbance to the underlying soils;
 3. Thoroughly compact subgrade as specified.
 4. If proposed for fill, all muck, mud and other materials removed from above low areas shall be dried on-site by spreading in thin layers for observation by OWNER or OWNER's representative. If, after observation by OWNER material is found to be unsuitable, it shall be removed from the site.

3.18 UNDERCUT EXCAVATION

- A. When approved by OWNER and recommended by the ENGINEER, the CONTRACTOR may be required to remove natural soil materials in areas where fills are to be placed when determined to be undesirable in their location or condition. The CONTRACTOR shall be required to remove the undesirable material and backfill with approved material properly compacted.
- B. At locations where unstable soil is shown on the drawings or identified within the geotechnical engineering study, the removal and replacement of such soil shall be as directed on the drawings or as directed by the ENGINEER and the OWNER.
- C. At locations where soil is wet of optimum moisture, the CONTRACTOR shall provide a "good faith" effort in drying and discing these areas prior to completing undercut excavation as approved by the ENGINEER and OWNER.
- D. Where undercutting is required adjacent or beneath the location of the proposed drainage structure, undercut and backfill shall be done over a sufficient distance adjacent to the installation to prevent future operations from disturbing the completed drainage structure.
- E. All material removed in the work of undercut excavation will be classified by the geotechnical engineer and OWNER as either suitable for other use without excessive manipulation and utilized by the CONTRACTOR elsewhere in the work, or unsuitable for future use and disposed of by the CONTRACTOR as directed by the ENGINEER.

- F. The CONTRACTOR shall conduct undercut operations in such a way that the necessary measurements can be taken before any backfill is placed.
- G. Backfill in undercut areas shall be placed as a continuous operation along with the undercutting operation. No backfill material shall be placed in water unless otherwise permitted by the ENGINEER.

3.19 EXCAVATION, FILL, AND SUBGRADE PREPARATION

A. General

1. The building limits shall be as identified on the construction drawings. The building subgrade shall be constructed to include a minimum of 10 feet beyond the building limits, or as directed by the OWNER;
2. Structures include buildings, footings, foundations, retaining walls, embankment berms for storm water detention basins, slabs, tanks, curbs, mechanical and electrical appurtenances or other man-made stationary features constructed above or below the ground surface;
3. The building pad subgrade shall be prepared in strict accordance with the geotechnical engineering study and these specifications, whichever is more stringent; and,
4. The CONTRACTOR shall cut or fill to the proposed subgrade elevations based on finished grades and the pavement thicknesses as shown on the drawings. Subgrade elevations shall be constructed to within 0 to minus ½ inch of the proposed grades specified.

B. Excavation

1. Where existing grades are above proposed subgrade elevation, excavate materials in the building areas to line and grade as shown in the drawings being careful not to over excavate beyond the elevations needed for building subgrades;
2. Excavate organic soils from within the building area. Excavated on-site organic soils, which are unsuitable for building fill, may be used in landscaped areas. Otherwise, this material shall be disposed of off-site;
3. Unsuitable material, such as wood and any other deleterious materials determined to be unsuitable by the geotechnical engineer for use as on-site fill, shall be disposed of off site.

C. Subgrade Preparation for Fill

1. Existing grades below building areas shall be leveled prior to fill placement. The CONTRACTOR shall remove existing lawn and top soil in these areas prior to placement of any fill; and,
2. All existing grades below building areas shall be proofrolled and compacted per this section.

D. Fill Placement

1. No fill material shall be placed in areas of standing water, in areas of frozen or thawing ground, or in areas that have not been approved by the ENGINEER;
2. No fill materials shall be placed during unfavorable weather conditions. When work is interrupted by heavy rains, fill operations shall not be resumed until all saturated surficial soils are returned to satisfactory moisture content as determined by the ENGINEER;
3. Fill lift surfaces shall be made smooth and free from ruts or indentations at the end of any workday when precipitation is forecast to prevent saturation of surficial fill material. Fill surfaces shall be graded to drain and sealed with a smooth drum roller at the completion of each work day;
4. The fill shall be placed in uniform loose lifts not exceeding 12 inches and compacted in systemic method to achieve at least 6 passes of the compactor. Larger lift thickness, but no greater than 2 feet shall be permitted if broken rock is utilized and placed at least 6 feet below of finished grade;
5. Shot rock may be utilized as engineered fill as approved by the ENGINEER;
6. Each lift shall be compacted to the minimum densities listed in this section as appropriate for the project and as specified in the geotechnical engineering study;
7. The CONTRACTOR shall adjust the water content by aeration or adding water to achieve the required density. Assist drying by discing, harrowing or pulverizing until moisture content is reduced to achieve proper compaction and facilitate the construction schedule;
8. Wet, saturated material shall be air dried as necessary to achieve the field densities specified in this Section. Removal and replacement shall not occur without prior approval or OWNER. Removal and replacement shall be used if necessary to facilitate the construction schedule;

9. Remove areas of finished subgrade found to have insufficient compaction density of depth necessary and replace with suitable compacted fill as approved by the OWNER or ENGINEER. Surface of subgrade after compaction shall be hard, uniform, smooth, stable, and true to grade and cross-section; and,
10. Fill placed on slopes greater than 1 vertical to 3 horizontal shall have each lift benched onto the slope at least 3 feet.

3.20 PROOFROLLING

- A. The work covered by this subsection consists of furnishing and operating, proofrolling equipment at the direction of the ENGINEER.
- B. Proofrolling shall be under the observation of the geotechnical engineer as described herein and under the following schedule:
 1. Immediately following the completion of excavation to proposed subgrades in cut areas, proofrolling shall be performed as specified; and,
 2. Immediately **prior to and following** stone base course placement, in pavement and building pad areas for final floor slab preparation, all subgrade and stone base areas shall be proofrolled. Any areas which deflect, rut or pump under the loaded dump truck shall be undercut and replaced with compacted fill material or stone base course as directed by the ENGINEER and approved by the OWNER, at no additional cost to the OWNER.
- C. Proofrolling shall be done with 1 pass of a fully loaded tandem dump truck equal to or exceeding 50,000 lbs or other construction equipment if approved by the ENGINEER.
- D. Construction methods shall be as follows:
 1. After the subgrade or stone base course has been completed the subgrade or stone base course shall then be proofrolled. The coverage areas and methods will be identified by the ENGINEER;
 2. The equipment shall be operated at a speed that the ENGINEER can comfortably and slowly walk along side the equipment;
 3. If it becomes necessary to take corrective action, such as but not limited to underdrain installation, undercut and backfill of an unsuitable material, and aeration of excessively wet material in areas that have been proofrolled, see Paragraph 3.18. These areas shall be proofrolled again following the completion of the necessary corrections. If the corrections are necessary due to the negligence of the CONTRACTOR, the corrective work and

additional proofrolling shall be performed by the CONTRACTOR at no cost to the OWNER;

4. The CONTRACTOR shall protect all structural facilities on the project, such as but not limited to box culverts, pipe culverts, and utilities, from damage by the proofrolling equipment.

3.21 MAINTENANCE OF SUBGRADE

- A. Finished subgrades shall be verified by the CONTRACTOR to ensure proper elevation and conditions for construction above subgrade.
- B. Protect subgrade from excessive construction traffic and wheel loading including concrete and dump trucks.
- C. Remove areas of finished subgrade judged to be unsatisfactory to the depth necessary and replace in a manner that will comply with compaction requirements by use of material equal to or better than the best subgrade material on site. Surface of subgrade after compaction shall be hard, uniform, smooth, stable, and true to grade and cross-section.

3.22 CORRECTION OF GRADE

- A. Bring to required grade levels areas where settlement, erosion or other grade changes occur.

3.23 MAINTENANCE AND PROTECTION OF WORK

- A. While construction is in progress adequate drainage for the roadbed shall be maintained at all times.
- B. The CONTRACTOR shall maintain all earthwork construction throughout the life of the contract, unless otherwise provided, and shall take all reasonable precautions to prevent loss of material from the roadway due to the action of wind or water. They shall repair at their expense, except as otherwise provided herein, any slides, washouts, settlement, subsidence, or other mishap which may occur prior to final acceptance of the work.
- C. All channels excavated as a part of the contract work shall be maintained against natural shoaling or other encroachments to the lines, grades, and cross sections shown on the plans, until final acceptance of the project.

3.24 AS-BUILT SURVEY

- A. At the completion of the work and prior to final inspection of the area, the CONTRACTOR shall provide the ENGINEER with an as-built topographic survey made by a registered Professional Surveyor & Mapper, of the State of Florida.

- B. The Professional Surveyor & Mapper is to certify on the survey whether or not the as-built conditions conform to the elevations shown on the Drawings to within plus or minus one-tenth (.1) of a foot.

3.25 MEASUREMENT AND PAYMENT

- A. There shall be no special measurement or payment for the work under this section, it shall be included in the associated bid item for this work.

END OF SECTION 02300

SECTION 02305

EXCAVATION AND BACKFILLING FOR UTILITIES

PART 1 - GENERAL

1.01 RELATED DOCUMENTS

- A. All applicable provisions of the Bidding and Contract Requirements, and Division 1 - General Requirements shall govern the work under this section.

1.02 SUMMARY

- A. Work under this section shall include, but not be limited to excavating trenches for the installation of storm drains and utilities, backfilling trench with bedding material as specified and finish filling trenches with suitable material to proposed subgrade, compacting subgrade, bedding, and backfill materials, and compliance with all environmental and health and safety regulations.
- B. This work shall include all labor and materials and equipment necessary to meet all applicable requirements as specified in the contract documents.

1.03 REFERENCED SECTIONS

- A. Section 02300 - Earthwork
- B. Section 02510 - Water Distribution System

1.04 REFERENCE STANDARDS

- A. American Society for Testing and Materials (ASTM) Latest Edition
 - 1. D 422 Method for Particle Size Analysis
 - 2. D 698 Test of Moisture Density Relations of Soils - Standard Proctor Method
 - 3. D 1557 Test for Moisture-Density Relations of Soils Using 10-lb. (4.5 Kg) Hammer and 18-inch (457 mm) Drop (Modified Proctor)
 - 4. D 2216 Laboratory Determination of Moisture Content of Soil
 - 5. D 2487 Classification of Soils for Engineering Purposes
 - 6. D 2922 Tests for Density of Soil and Soil-Aggregate in Place by Nuclear Methods (Shallow Depth)

7. D 3017 Test for Moisture Content of Soil and Soil-Aggregate in Place by Nuclear Methods (Shallow Depth)
8. D 4318 Test for Plastic Limit, Liquid Limit, & Plasticity Index of Soils
- B. American Association of State Highway and Transportation Officials (AASHTO) latest edition
 1. T 88 Mechanical Analysis of Soils
 2. M 43 Standard Sizes of Coarse Aggregate for Highway
- C. National Electric Code
 1. NEC 300-5
 2. NEC 710-36

1.05 PROJECT RECORD DOCUMENTS

- A. Accurately record actual locations of all subsurface utilities, structures and obstructions encountered.
- B. Accurately record any as-built variation from the construction drawings and specifications. The CONTRACTOR shall provide final as-built drawings at time of substantial completion.
- C. If portions of the work are to be certified for use prior to the completion of the project, the CONTRACTOR shall provide final as-built drawings 30 days prior to the anticipated date of use of that portion of the utility.

1.06 QUALITY ASSURANCE

- A. An ENGINEER shall perform construction inspection and testing on backfilling operations as stated herein. This inspection will not relieve the CONTRACTOR from their responsibility to complete the work in accordance with the drawings and specifications.

1.07 SUBMITTALS

- A. The CONTRACTOR shall contact all utility companies and identify any requirements. CONTRACTOR shall provide written confirmation of the status of all utility construction to the OWNER at the time of the preconstruction conference or no later than 30 days following the project NTP.
- B. Submit a sample of each type of offsite fill and/or bedding material that is to be used in backfilling in accordance with Section 02300 - Earthwork.

PART 2 - PRODUCTS

2.01 MATERIALS

- A. Backfill material shall be as specified and approved by the OWNER and/or the ENGINEER.
- B. Bedding Material: Bedding material shall only be utilized when specified on the drawings. Bedding material shall conform to ASTM #67 aggregate free from debris, clay lumps, organic, or other deleterious material and consist of in-situ granular material or washed and graded limerock (3/8"-7/8"). Bedding material shall be placed 4" below bottom of pipe and extend to spring line of pipe.

PART 3 - EXECUTION

3.01 PREPARATION

- A. Set all lines, elevations, and grades for utility and drainage system work and maintain for the duration of work. Provide careful maintenance of benchmarks, property corners, monuments, or other reference points.
- B. Protect and maintain in operating condition, existing utilities encountered during utility installation. Repair any damage to surface or subsurface improvements shown on Drawings.
- C. Verify location, size, elevation, and other pertinent data required to make connections between existing utilities, drainage systems, and proposed construction indicated on Drawings. Coordinate all building utility connection locations and elevations with existing conditions. CONTRACTOR shall comply with all local codes and regulations.

3.02 EXCAVATION

- A. General: This work shall consist of the excavation of whatever substances shall be encountered to the depths as shown on the plans. Excavated materials not required for fill or backfill shall be removed from the work site as directed by the ENGINEER and shall be considered to be a part of the bid price of the utility pipe for which excavation and backfill is required.
- B. Contact regulatory authorities having jurisdiction and utility companies before excavation begins. Dig trenches at proper width and depth for laying pipe, conduit, or cable and in accordance with utility company requirements. Cut trench banks for safety and remove stones as necessary to avoid point-bearing.
- C. All excavation side walls shall be sloped, shored, sheeted, braced or otherwise supported by means of sufficient strength to protect the workmen within them in accordance with the applicable rules and regulations established for construction

by the Department of Labor, Occupational Safety and Health Administration (OSHA), and by regulatory authorities having jurisdiction, codes and ordinances. Such bracing or shoring shall be considered to be part of the bid price of the pipe for which excavation and backfill is required.

The CONTRACTOR shall furnish, put in place and maintain such sheeting, bracing, as may be required to support the side of the excavation, and to prevent any movement which can in any way damage the work or endanger adjacent structures. If the ENGINEER is of the opinion that supports are insufficient, they may order additional supports. The compliance with such order shall not release the CONTRACTOR from their responsibility for the sufficiency of the sheeting.

The CONTRACTOR shall leave all sheeting in place. The ENGINEER may require sheeting to be cut off at any specified elevation, but in no case will any sheeting be left closer than three (3) feet below the natural surface, nor cut off below the elevation of the top of the pipe.

- D. Provide uniform bearing and support for each section of pipe at every point along the entire length, except where necessary to excavate for bell holes, pipe joints, or other required connections. Dig bell holes and depressions for joints after trench bottom has been graded. Dig no deeper, longer, or wider than needed to make the joint connection properly.
- E. During excavation, stockpile excavated material suitable for backfilling in an orderly manner far enough from the trench to avoid overloading and slides.
- F. Any abandoned structures utilities or debris discovered during excavation shall be removed and disposed of, or capped.
- G. Utility alignments have been designed to avoid expected obstructions wherever possible. If unanticipated significant obstructions are encountered during utility installation work immediately notify the OWNER.
- H. Prevent surface water from flowing into trenches or other excavations by temporary grading or other methods, as necessary. Remove accumulated water in trenches or other excavations by pumping or other acceptable methods. Water shall not be directly pumped to the sewer system.
- I. Utility installation shall meet the following minimum pipe installation depths, or applicable codes and ordinances, measured from finished grade.
 - 1. Water Mains: 36 inches to top of pipe barrel for PVC or 30 inches to top of pipe barrel for DIP or as specified on the plans;
 - 2. Sanitary Sewer: Elevations, and grades as indicated on drawings;
 - 3. Storm Sewer: Elevations, and grades as shown on drawings;

4. Electrical Conduits: 24 inches to top of secondary service conduits, 36 inches minimum to the top of primary service conduits, or as required by NEC 300-5, NEC 710-36 codes, or the regulatory authorities having jurisdiction, and utility company requirements, whichever is deeper;
 5. Telephone Conduits: 24 inches to top of conduit, or as required by the regulatory authorities having jurisdiction and utility company, whichever is deeper; and,
- J. Excavation for structures and other accessories shall have a minimum clearance of twelve inches and a maximum clearance of twenty-four inches on all sides.
 - K. Excavation shall not be carried below the required depths as indicated by the plans. Excess excavation below the required level shall be backfilled at the CONTRACTOR's expense with sharp sand, gravel or other suitable material thoroughly compacted and approved by the ENGINEER.
 - L. Any unstable soil shall be removed and shall be replaced by material acceptable to the ENGINEER. The removal and replacement of such unstable soil shall be considered to be part of the bid price of the pipe for which excavation and backfill is required.
 - M. Water shall not be permitted to accumulate in the excavated area. It shall be removed by pumping or other means as approved by the ENGINEER. The removal of water shall be considered to be a part of the bid price of the pipe for which excavation and backfill is required.

Well points, pumps or other approved means shall be used to keep the ground water sufficiently low in the opinion of the ENGINEER to permit the placing of concrete, masonry or pipe in first class condition, and sufficiently long thereafter to protect the concrete, masonry or joints against washing or damage.

The CONTRACTOR shall also use such other means as may be necessary to keep the excavation in satisfactory condition for the construction of the work, and the use of well points, or other approved method, will not relieve the CONTRACTOR of their responsibility to make structures water tight.

Predigging of trenches in order to install well point systems shall be included in the bid price of the pipe.

- N. Banks and trenches shall be vertical unless shown otherwise on plans. The width of the trench shall be twelve inches (12"), or as approved by the ENGINEER, on each side of the pipe bell for pipe up to 16" diameter. Bell holes shall be accurately excavated by hand.
- O. If the bottom of the trench is rock, the excavation shall be carried eight inches below the invert of the pipe and backfilled with thoroughly compacted sharp

sand, gravel or other suitable material approved by the ENGINEER.

- P. Rock excavation shall include any material as described in Section 02300 "Earthwork" Paragraph 3.09 (A).
- Q. Haunching, including tamping, material, and compaction, shall be in conformance with the pipe manufacturer's recommendation.

3.03 PIPE BEDDING (When Specified)

- A. Accurately cut trenches for pipe or conduit to designated line and grade 6 inches below the bottom of the pipe, to width as specified previously. Compact trench bedding material to 98% of the maximum dry density as determined by AASTHO T-180.
- B. Over excavate wet or unstable soil, if encountered, from trench bottom as necessary to provide a suitable base for continuous and uniform bedding.
- C. Place bedding material and compact in 6-inch lifts to obtain 98% of the maximum dry density per AASTHO T-180. Accurately shape bedding material to conform to lower portion of pipe barrel. After pipe installation, place and compact bedding material as specified above in maximum 6-inch layers to the springline of the pipe.

3.04 BACKFILLING

- A. After pipes, structures and other appurtenances have been installed, the trench or opening shall be backfilled with material non-cohesive and non plastic, free of all debris, lumps, clods, wood, broken paving or any organic or unstable materials and to a quality acceptable to the ENGINEER.
- B. Backfill around the pipe and to a point twelve inches above the top of the pipe shall be placed in six-inch layers compacted with 20-pound hand tampers (mechanical compaction not allowed within twelve inches above the top of pipe). Backfilling shall follow pipe laying closely, and shall be compacted and tested at intervals of not more than one hundred (100) feet behind completed pipe laying. Backfill over pipe shall be carefully placed by experienced labor and thoroughly consolidated without shock to the pipe, and carried up uniformly on both sides of the pipe. No backfilling with bulldozers will be permitted adjacent to pipeline.
- C. Within roadway right-of-ways, or within areas where pavements are to be constructed over the pipe, the remainder of the trench shall be placed in six-inch layers (compacted thickness) and shall be compacted to 98% of maximum density as determined by AASHTO T-180. CONTRACTOR will be responsible for correcting settlement in all backfilled areas whether under the pavement or otherwise.

- D. In areas where no pavement is to be constructed, the backfill above the twelve-inch line above the pipe shall be compacted to a firmness approximately equal to that of the soil adjacent to the pipe trench or 98% of maximum density as determined by AASHTO T-180 in public rights of way. Backfill below the 12-inch line shall be compacted in 6-inch layers (compacted thickness) and shall be compacted to 98% of maximum density as determined by AASHTO T-180.

3.05 EXPLOSIVES

- A. The use of explosives will not be permitted.

3.06 PAYMENT

- A. No separate payment is provided for work covered by this Section. All costs in connection with Excavation and Backfilling, including testing, shall be included in the bid price of any item for which excavation and backfilling is required.

END OF SECTION 02305

SECTION 02310

SITE GRADING

PART 1 - GENERAL

1.01 RELATED DOCUMENTS

- A. All applicable provisions of the Bidding and Contract Requirements, and Division 1 - General Requirements shall govern the work under this section.

1.02 WORK INCLUDED

- A. The work covered by this section shall include all labor, equipment, services and materials necessary for bringing the entire site to elevations shown in the plans. The work included in this section shall include all necessary excavations for streets, ditches and swales. It shall include the construction of embankments and fills by the loading, movement, deposition and compaction of suitable fill materials resulting from above listed excavations. It shall include stockpiling of any excess material to an on-site location as specified by the OWNER.
- B. It shall include rough grading within the roadways, driveways, swales, and parking lots to the elevations or cross-section details shown on the drawings.
- C. It shall include the erection and maintenance of any barricades that are required for accident prevention and property protection.
- D. It shall include removal and disposal of muck, rock boulders or any foreign material interfering with construction.

1.03 RELATED WORK

- A. Section 02230 - Site Clearing.
- B. Section 02300 - Earthwork.

PART 2 - PRODUCTS (Not Applicable)

PART 3 - EXECUTION

3.01 GENERAL

- A. The CONTRACTOR shall acquaint himself with all work to be performed as specified and shown on the Drawings. He shall ascertain where all excavation will be required and shall be solely responsible for all excavating to complete the Contract.

3.02 PAYMENT

- A. No extra payment will be allowed for type or classification of material in excavation.

3.03 MATCHING EXISTING GRADES

- A. Where existing roadbed surfaces are not at the elevation required prior to subgrade compaction, the CONTRACTOR shall perform any such excavation, filling, earthmoving and grading as may be necessary to attain the proper compacted subgrade elevation before proceeding with base course construction.

3.04 UNSUITABLE MATERIAL

- A. All muck, large rocks and boulders encountered during the work under this Contract shall be removed and disposed of in a manner approved by the ENGINEER.

3.05 EXCAVATION

- A. All excavation shall be unclassified regardless of material encountered.
- B. The CONTRACTOR shall make probings or sounding for subsurface rock to ascertain its location and depth.
- C. It shall be the CONTRACTOR's responsibility to be familiar with soil conditions on the site. Borings, in addition to those provided by others, if any, shall be acquired by the CONTRACTOR, at the CONTRACTOR's expense.
- D. Any wet excavated materials shall be drained before hauling or moving.

3.06 EMBANKMENT (FILL)

- A. Embankment shall be constructed from suitable materials resulting from roadway or site excavation or approved materials furnished from off-site borrow areas.
- B. Embankments shall be placed in successive layers of not more than eight inches in thickness, measured loose, for the full width of the embankment.
- C. Each layer of the material used in the formation of roadbed embankments shall be compacted at optimum moisture content to a density of at least 98% of the Maximum Density as determined by Moisture-Density Tests AASHTO T-180 test results.
- D. The existing material on the site may vary as to stability. The CONTRACTOR shall satisfy himself by site inspection borings, probings, etc., prior to bidding, as to the subsurface character of the material.
- E. All unstable soil shall be removed and shall be replaced by material approved by the ENGINEER.

3.07 GRADING

- A. The material excavated shall be transported and spread over the entire work site and shall be graded so that the finished grade shall be within ± 0.04 feet of the grades indicated on the Contract Drawings. Due to the minimal slope of the roadways, swale grades shall be within ± 0.04 feet of the grades indicated on the Contract Drawings.
- B. Due to the minimal longitudinal slope of the roadways, the CONTRACTOR shall be required to demonstrate (through finish rock and first lift of asphalt as-builts) a positive flow from high points to low points along the edge of pavement and road crown as indicated on the Contract Drawings.
- C. Deviations from the proposed grades and drainage patterns as indicated on drawings will be reviewed at the discretion of the ENGINEER.
- D. The disposal of large rocks in excess of 8", within roadways and parking areas is prohibited. Where allowable, the disposal of large rocks by burial in areas designated by the ENGINEER shall have a minimum 30 inches of cover below finished grade elevation.

3.08 FINISH GRADING

- A. Following completion of the paving work, all swales, etc., adjacent to the roadway shall be shaped and graded to the elevations and cross-sections shown on the DRAWINGS. The finished surface shall be maintained until seeding and mulching work is completed.

3.09 CONSTRUCTION OF SWALES

- A. This work consists of regrading existing swales and construction of new swales adequate for conveying storm water along the right-of-way to catch basins. The swale shall be shaped according to the cross section shown on the plan. In areas adjacent to existing roadways all swales shall be regraded to match their existing condition prior to construction, unless otherwise noted.
- B. Requirements: All soft and yielding material and other portions of the swale which will not compact readily shall be removed and replaced with suitable material and the entire swale area brought to the proper grade. Stumps, roots, and other deleterious organic matter encountered during the shaping for the swale shall be removed.
- C. The bottom of all excavated areas and the top of all fills of swale areas shall be thoroughly compacted by rolling. Water shall be used as necessary to insure thorough compaction. The stability of the top 12" thickness of swale area shall be at least 50 PSI as determined by the Florida Bearing Value Method. Sufficient

stabilizing material shall be added to swale area soil as required to provide the specified stability.

- D. The CONTRACTOR shall place sod over existing areas damaged by construction. The sod shall match the existing sod type in the affected areas.

3.10 SURVEYS

- A. All initial surveys, including detail construction stakes, will be furnished by the CONTRACTOR.
- B. The CONTRACTOR will carefully maintain benchmarks, monuments, stakes and other reference points, and if disturbed or destroyed, be replaced as directed at the CONTRACTOR's expense.

3.11 MEASUREMENT AND PAYMENT

- A. Measurement and payment for this item shall be included in the unit price bid wherever Site Grading is required.

END OF SECTION 02310

SECTION 02370

EROSION CONTROL AND SLOPE PROTECTION

PART 1 - GENERAL

1.01 RELATED DOCUMENTS

- A. All applicable provisions of the Bidding and Contract Requirements, and Division 1 - General Requirements shall govern the work under this section.

1.02 WORK INCLUDED

- A. Provide all labor, materials, necessary equipment and services to complete the erosion control installation, as indicated on the drawings, as specified herein or both.

1.03 RELATED WORK

- A. Section 02300 - Earthwork
- B. Section 02922 - Sodding

1.04 INTENT

- A. The main concern associated with erosion on a construction site is the movement of soil off the site and its impact on water quality. It is the OWNER's intent that the CONTRACTOR install and maintain sufficient erosion control practices to retain sediment within the boundaries of the site in addition to complying with regulatory authorities having jurisdiction and local erosion and sedimentation control laws and ordinances. All erosion control methods and devices used shall conform to the latest requirements imposed by Federal, State and local authorities. The CONTRACTOR shall be responsible for repair of any damage caused and shall be financially responsible for any penalties imposed.
- B. If an erosion control drawing has been included in the drawings prepared by the ENGINEER, it shall be the CONTRACTOR's responsibility to review the drawing prior to implementation. If an erosion control drawing is not included in the project documents, the CONTRACTOR shall submit, for approval, a proposed sequence of operations and a compatible method of preventing erosion.
- C. The CONTRACTOR shall prepare and implement a Storm Water Pollution Prevention Plan (SWPPP) in accordance with FDEP document 62-621.300(4)(a). The CONTRACTOR shall submit the Notice of Intent (NOI) prior to start of construction and the Notice of Termination (NOT) after the completion of construction.

1.05 SUMMARY

- A. Work under this section shall include but not be limited to, installation and maintenance of both temporary and permanent soil erosion control measures, slope protection and stabilization measures, protection of all surface water and property both on and off site. This work shall include all labor, materials, and equipment necessary to meet all applicable requirements and as specified in the contract documents.

1.06 REFERENCE STANDARDS

- A. All applicable standards and requirements of all regulatory authorities having jurisdiction, including local FDEP and soil conservation agencies.

1.07 QUALITY ASSURANCE

- A. Soil erosion and sediment control measures shall be implemented in accordance with the requirements and procedures outlined in this specification, contract drawings and documents, the state standards or guidelines for soil erosion and sediment control, and all regulatory authorities having jurisdiction. Where conflict between requirements exist, the more restrictive rules shall govern.
- B. The CONTRACTOR shall provide all temporary control measures shown on the drawings, or as directed by the ENGINEER or regulatory agencies for the duration of the contract. Erosion control drawings are intended to be a guide to address the stages of work shown. Additional erosion control measures not specified on the drawings may be necessary and shall be implemented to address intermediary stages of work and any conditions that may develop during construction at no cost to the OWNER.
- C. Temporary control provisions shall be coordinated with permanent erosion control features to the extent practical to assure economical, effective and continuous erosion control throughout the construction and post-construction period.
- D. Soil erosion and sediment control measures shall at all times be satisfactory to the ENGINEER. ENGINEER will inform the CONTRACTOR of unsatisfactory construction procedures and operations if observed. If the unsatisfactory construction procedures and operations are not responded to and corrected within 48 hours, OWNER may suspend the performance of any or all other construction until the unsatisfactory condition has been corrected. Such suspension shall not be the basis of any claim by the CONTRACTOR for additional compensation nor for an extension of time to complete the work. Any complaints, fines, etc. relating to ineffective erosion control, shall be the sole responsibility of the CONTRACTOR.

- E. The CONTRACTOR shall inspect all soil erosion and sediment control measures at least at the beginning and end of each day to ascertain that all devices are functioning properly during construction. Maintenance of all soil erosion and sediment control measures on the project site shall be the responsibility of the CONTRACTOR until the project is 100% complete, and until the permanent soil erosion controls are established and in proper working condition.
- F. The CONTRACTOR shall protect adjacent properties and watercourses from soil erosion and sediment damage throughout construction.

1.08 SEQUENCE OF CONSTRUCTION

- A. The approved construction sequence, as permitted/approved shall be adhered to during the execution of work under this section. All soil erosion and sediment control measures shall be installed in accordance with the contract documents.

PART 2 - PRODUCTS

2.01 MATERIALS

- A. CONTRACTOR shall provide all materials necessary to perform the work.
- B. Hold/gro as manufactured by Gulf States Paper, Tuscaloosa, Alabama or approved equal.

PART 3 - EXECUTION

3.01 GENERAL REQUIREMENTS

- A. Review the soil erosion and sediment control drawings as they apply to current site conditions. Any deviation from the drawings must be submitted for approval to the ENGINEER in writing at least 72 hours prior to commencing that work.
- B. Notify COUNTY or municipal soil conservation district, in writing at least 72 hours prior to initial land disturbance.
- C. All soil sediment and erosion control devices shall be in place prior to any earthwork construction, in their proper sequence, and maintained until permanent protection is established.
- D. The limit of the area of any earthwork operations in progress shall be commensurate with the CONTRACTOR's capability and progress in keeping the finished grading, mulching, seeding and other such permanent control measures current and in accordance with the accepted schedule for construction phasing. Should seasonal limitations make such coordination unrealistic, as determined by the ENGINEER, temporary erosion control measures shall be provided immediately by the CONTRACTOR at no expense to the OWNER.

- E. Temporary erosion control measures shall be used to correct conditions which develop during construction that are needed prior to installation of permanent control features, or that are temporarily needed to control erosion that develops during normal construction practices, but are not associated with permanent control features on the project.
- F. The CONTRACTOR shall incorporate all permanent erosion control features into the project at the earliest practical time to minimize the need for temporary controls.
- G. A temporary construction entrance pad shall be installed and maintained at any point where construction vehicles enter a public right-of-way, street or parking area. The pad shall be used to eliminate mud from the construction area onto public right-of-way. Any mud or debris tracked on streets shall be cleaned up immediately.
- H. Any disturbed or stockpiled areas that will be left exposed more than 30 days, and not subject to construction traffic, shall immediately receive a temporary seeding. Mulch/straw shall be used if the season prevents the establishment of a temporary cover.
- I. Permanent vegetation shall be established as specified on all exposed areas within 10 days after final grading, unless otherwise directed by the OWNER and permitted by appropriate regulations. Mulch as necessary for seed protection and establishment. Lime and fertilize seedbed prior to permanent seeding.
- J. Cut slopes shall be permanently seeded and mulched as the excavation proceeds to the extent considered desirable and practical. Slopes that erode easily shall be temporarily seeded and mulched.
- K. All storm drainage outlets must be stabilized, as specified, before the discharge points become operational. Equip all inlets with inlet protection immediately upon construction.
- L. Discharge from de-watering operations for the excavated areas shall not be directed to surface waters without first properly removing the suspended sediment through filtration and/or settlement. The CONTRACTOR shall obtain any required permits associated with dewatering activities.
- M. The quantity of silt fence to be installed will be affected by the actual conditions that occur during the construction of the project. Silt fence shall be installed at locations shown on the drawings and any additional locations necessary for proper erosion control. The CONTRACTOR shall maintain the silt fence until the project is accepted and shall remove and dispose of the silt fence and silt accumulations.
- N. Soil erosion and sediment control shall include but not be limited to the approved measures. The CONTRACTOR shall be responsible for providing all additional measures that may be necessary to accomplish the intent of the drawings.

- O. Comply with all other requirements of authorities having jurisdiction.

3.02 SLOPE PROTECTION

- A. The soil and dunes, if applicable, shall be graded as called for on the drawings prior to installation. Seed and fertilizer shall be applied immediately before laying fabric.
- B. The hold/gro fabric shall be installed vertically to the slope starting from the top and running the length of the slope to the bottom. The fabric shall be overlapped a minimum of four (4) inches at all joints. The staples shall be located nine (9) inches apart along the edge and three (3) feet apart down the center. The staples shall be installed as the fabric is rolled out. Use heavy gauge staples. The fabric shall be draped over the dune, if applicable. Stretching over voids shall be avoided.
- C. When used for slope protection of sand dunes, the fabric shall be installed several days before the dune planting takes place. When planting cut an "x"-shaped opening in the fabric and insert the plant.
- D. The installer shall have a representative of the factory on site to inspect the installation.

3.03 MEASUREMENT AND PAYMENT

- A. There shall be no special measurement and payment for the work under this section; it shall be included in the lump sum price bid for item 'Environmental Protection Plan'.

END OF SECTION 02370

SECTION 02502
VALVES, GENERAL

PART 1 - GENERAL

1.01 RELATED DOCUMENTS

- A. All applicable provisions of the Bidding and Contract Requirements, and Division 1 - General Requirements shall govern the work under this Section.

1.02 WORK INCLUDED

- A. The CONTRACTOR shall provide all tools, supplies, materials, equipment, and labor necessary for furnishing, epoxy coating, installing, adjusting, and testing of all valves and appurtenant work, complete and operable, in accordance with the requirements of the Contract Documents. Where buried valves are shown, the CONTRACTOR shall furnish and install valve boxes to grade, with covers, extensions, and position indicators.
- B. The provisions of this Section shall apply to all valves and valve operators specified in the various Sections and Division 2 of these Specifications including test valves, except where otherwise specified in the Contract Documents. Valves and operators in particular locations may require a combination of units, sensors, limit switches, and controls specified in other Sections of these Specifications.

1.03 RELATED WORK

- A. Section 02305 - Excavation and Backfilling for Utilities.
- B. Section 02510 - Water Distribution System.
- C. Section 02530 - Sanitary Sewerage System.

1.04 REFERENCE STANDARDS

- A. **Codes:** All codes referenced herein and specified in Section 01420, "Reference Standards".

B. **Commercial Standards:**

ANSI B16.1 Cast Iron Pipe Flanges and Flanged Fittings, Class 25, 125, 250, and 800.

ANSI B16.5 Pipe Flanges and Flanged Fittings, Steel Nickel Alloy and Other Special Alloys.

ANSI/ASME B31.1 Power Piping.

ASTM A 36	Specification for Structural Steel.
ASTM A 48	Specification for Gray Iron Castings.
ASTM A 126	Specification for Gray Iron Castings for Valves, Flanges, and Pipe Fittings.
ASTM A 536	Specification for Ductile Iron Castings.
ASTM B 61	Specification for Steam or Valve Bronze Castings.
ASTM B 62	Specification for Composition Bronze or Ounce Metal Castings.
ASTM B 148	Specification for Aluminum-Bronze Castings.
ASTM B 584	Specification for Copper Alloy Sand Castings for General Applications.
ANSI/AWWA C500 Gate Valves for Water and Sewerage Systems.	
ANSI/AWWA C502 Dry-Barrel Fire Hydrants.	
ANSI/AWWA C503 Wet-Barrel Fire Hydrants.	
ANSI/AWWA C504 Rubber-Seated Butterfly Valves.	
ANSI/AWWA C507 Ball Valves 6 Inches Through 48 Inches.	
AWWA C508	Swing-Check Valves for Waterwork Service, 2 Inches Through 24 Inches NPS.
ANSI/AWWA C509 Resilient-Seated Gate Valves for Water and Sewage Systems.	
ANSI/AWWA C511 Reduced-Pressure Principle Backflow-Prevention Assembly.	
AWWA C550	Protective Interior Coatings for Valves and Hydrants.
SSPC-SP-2	Hand Tool Cleaning.
SSPC-SP-5	White Metal Blast Cleaning.

1.05 SUBMITTALS

- A. **Shop Drawings:** Shop drawings of all valves and operators including associated wiring diagrams and electrical data, shall be furnished as specified in Section 01330, "Shop Drawings, Product Data and Samples".

- B. **Valve Labeling:** The CONTRACTOR shall submit a schedule of valves to be labeled indicating in each case the valve location and the proposed wording for the label.

1.06 QUALITY ASSURANCE

- A. **Valve Testing:** Unless otherwise specified, each valve body shall be tested under a test pressure equal to twice its design water-working pressure.
- B. **Bronze Parts:** Unless otherwise specified, all interior bronze parts of valves shall conform to the requirements of ASTM B 62, or where not subject to dezincification, to ASTM B 584.
- C. **Coatings:** All coatings in contact with potable water shall be certified to N.S.F. 61. A proof of design certification shall be provided upon request.
- D. **Certification:** Prior to shipment, the CONTRACTOR shall submit for all valves over 12 inches in size, certified, notarized copies of the hydrostatic factory tests, showing compliance with the applicable standards of AWWA, ANSI, ASTM, NSF etc. and to these specifications.

PART 2 - PRODUCTS

2.01 VALVES, GENERAL

- A. **General:** The CONTRACTOR shall furnish all valves, gates, valve-operating units, stem extensions, and other accessories as shown or specified. All valves and gates shall be new and of current manufacture. All shut-off valves, 6-inch and larger, shall have operators with position indicators. Where buried, these valves shall be provided with valve boxes and covers containing position indicators, and valve extensions. Shut-off valves mounted higher than 5 feet-6 inches above working level shall be provided with chain operators.
- B. **Valve Flanges:** The flanges of valves shall be in accordance with Section 02510, "Water Distribution System", unless the valves are to be connected to an equipment with a flange with a different specification.
- C. **Gate Valve Stems:** Where subject to dezincification, gate valve stems shall be of bronze conforming to ASTM B 62, containing not more than 5% of zinc nor more than 2% aluminum. Gate valve stems shall have a minimum tensile strength of 60,000 psi, a minimum yield strength of 40,000 psi, and an elongation of at least 10% in 2 inches, as determined by a test coupon poured from the same ladle from which the valve stems to be furnished are poured. Where dezincification is not a problem, bronze conforming to ASTM B 584 may be used.
- D. **Protective Coating:** Except where otherwise specified, ferrous surfaces, exclusive of stainless-steel surfaces, in the water passages of all valves 4-inch

and larger, as well as the exterior surfaces of all submerged valves, shall be coated with 2-part thermal setting epoxy coatings. Flange faces of valves shall not be epoxy coated. The valve manufacturer shall certify in writing that such coating has been applied and tested in the manufacturing plant prior to shipment, in accordance with these Specifications.

- E. **Valve Operators:** Where shown, certain valves and gates shall be furnished with electric operators, provided by the valve or gate manufacturer. All operators of a given type shall be furnished by the same manufacturer. Where these operators are supplied by different manufacturers, the CONTRACTOR shall coordinate their selection to provide uniformity of each type of electric operator. All valve operators, regardless of type, shall be installed, adjusted, and tested by the valve manufacturer at the manufacturing plant.
- F. **Valve Labeling:** Except when such requirement is waived by the ENGINEER in writing, a label shall be provided on all shut-off valves exclusive of hose bibbs and chlorine cylinder valves. The label shall be of 1/16-inch plastic or stainless steel, minimum 2 inches by 4 inches in size, and shall be permanently attached to the valve or on the wall adjacent to the valve as directed by the ENGINEER.
- G. **Nuts and Bolts:** All nuts and bolts on valve flanges and supports shall be in accordance with manufacturer's recommendations. Where submerged or buried, all nuts and bolts on valve flanges and valve bodies shall be stainless steel.

2.02 GATE VALVES

- A. All buried valves shall be of the inside screw, non-rising stem type. Valves shall be capable of being repacked under line pressure. Valves 14-inch and larger installed vertical pipes with their stems horizontal shall be fitted with bronze slides, tracks, rollers, and scrapers to assist the travel of the gate assembly. Quick opening valves shall have quick opening levers and cams in lieu of handwheel operators.

- B. Gate Valves (3/4" to 3"):

1. **Manufacturer:**

a. **Per City of West Palm Beach Approved Products List**

- C. **Resilient-Seated Gate Valves:**

- 1. Resilient-seated gate valves with bi directional flow only conforming to ANSI/AWWA C509 shall be provided. Resilient-seated gate valves shall have cast iron bodies with flanged, bell, or mechanical joint ends, rubber-coated cast iron disc, flanged bonnet, bronze stem, O-ring seals, and operators with handwheel or square nut, unless otherwise shown. Maximum working pressure shall be 200 psi, tested at 400 psi.

2. **Manufacturer or Equal:**

a. **Per City of West Palm Beach Approved Products List**

2.03 AIR-VACUUM AND AIR-RELEASE VALVES

- A. **Air and Vacuum Valves:** Air and vacuum valves shall be capable of venting large quantities of air while pipelines are being filled, and allowing air to re-enter while pipelines are being drained. They shall be of the size shown, with flanged or screwed ends to match piping. Bodies shall be of high-strength cast iron. The float, seat, off-set piping, and all moving parts shall be constructed of Type 316 stainless steel. Seat washers and gaskets shall be of a material insuring water tightness with a minimum of maintenance. Valves shall be designed for minimum 150 psi water-working pressure, unless otherwise shown.
- B. **Air-Release Valves:** Air-release valves shall vent accumulating air while system is in service and under pressure and be of the size shown and shall meet the same general requirements as specified for air and vacuum valves except that the vacuum feature will not be required. They shall be designed for a minimum water-working pressure of 150 psi, unless otherwise shown.
- C. **Combination Air Valves:** Combination air valves shall combine the characteristics of air and vacuum valves and air release valves by exhausting accumulated air in systems under pressure and releasing or re-admitting large quantities of air while a system is being filled or drained, respectively. They shall have the same general requirements as specified for air and vacuum valves.

2.04 CORPORATION STOPS

- A. Unless otherwise shown, corporation stops shall be made of brass alloy for key operation, with screwed ends with corporation thread or iron pipe thread, as required. AWWA taper thread for inlet thread and compression type fittings for outlet.

PART 3 - EXECUTION

3.01 VALVE INSTALLATION

- A. **General:** All valves, gates, operating units, stem extensions, valve boxes, and accessories shall be installed in accordance with the manufacturer's written instructions and as shown and specified. All gates shall be adequately braced to prevent warpage and bending under the intended use. Valves shall be firmly supported to avoid undue stresses on the pipe.
- B. **Access:** All valves shall be installed to provide easy access for operation, removal, and maintenance and to avoid conflicts between valve operators and structural members or handrails.

- C. **Valve Accessories:** Where combinations of valves, sensors, switches, and controls are specified, it shall be the responsibility of the CONTRACTOR to properly assemble and install these various items so that all systems are compatible and operating properly. The relationship between interrelated items shall be clearly noted on shop drawing submittals.

END OF SECTION 02502

SECTION 02503

LINE STOPS

PART 1 - GENERAL

1.01 RELATED DOCUMENTS

- A. All applicable provisions of the Bidding and Contract Requirements, and Division 1 - General Requirements shall govern the work under this Section.

1.02 WORK INCLUDED

- A. The CONTRACTOR shall provide all tools, supplies, materials, equipment, and labor necessary for furnishing and installing line stops, bypass piping, equipment supports, pipe supports, restraint and appurtenances, and appurtenant work, complete and operable, in accordance with the requirements of the Contract Documents.

1.03 RELATED WORK

- A. Section 02305 - Excavation and Backfilling for Utilities.
- B. Section 02502 – Valves, General
- C. Section 02510 - Water Distribution System.

1.04 SUBMITTALS

- A. Shop Drawings: Shop drawings of all line stops, shall be furnished as specified in Section 01330, "Shop Drawings, Product Data and Samples". All materials used must be American made products.

PART 2 - PRODUCTS

2.01 GENERAL

- A. Line stopping shall consist of a mechanical plug inserted into an existing pipe through a penetration created by a tapping machine. Line stopping requiring shutdowns of the pipeline are not acceptable.
- B. The plug shall temporarily isolate the flow in the line to allow cutting into the existing pipeline and permanent capping of the existing pipe.
- C. For all potable water applications, all interior components and linings of the insert valve that come into contact with the conveyed product shall comply with the requirements of NSF/ANSI 61.

2.02 MATERIALS

- A. The fitting shall be a full encirclement, pressure retention type slit tee consisting of two steel weldments: an upper flanged outlet saddle plate and a lower saddle plate. The saddle plates shall be matched and marked with some method of identification to ensure proper alignment of the two-part fitting in the field.
- B. The upper flanged outlet saddle plate shall consist of a saddle plate with a minimum thickness of 0.375-inches, outlet nozzle and flange. The interior of the saddle plate shall be grooved to retain a gasket which shall seal the saddle plate to the exterior of the existing potable water main. The lower saddle plate shall be a minimum 0.375-inch thickness.
- C. The nozzle of the fitting shall be fabricated from steel pipe (ASTM A234). The nozzle shall be bored to accommodate the plugging head. A circular shoulder shall be machined into the nozzle to seal the circumferential gasket carried on the plugging head.
- D. The outlet of each fitting shall be machined from a 150 lb. forged steel flange (ASTM A181 or A105) or from pressure vessel steel plate (ASTM A285, Grade C); flat faced and drilled per ANSI B16.5. Suitable independently operated locking devices shall be provided in the periphery of the flange to secure the completion plug.
- E. Facing and drilling of the blind flange shall be compatible with the outlet flange. Minimum blind flange thickness shall be that of AWWA Specification 207, Class D.
- F. The completion plug shall be machined and shall contain circumferential grooves to receive the locking device from the flanged outlet and to contain a compressible O-ring to seal pressure tight against the bore of the flanged outlet.
- G. Gaskets shall be molded from elastomer compounds resistant to compression settings and compatible within a temperature range of 32 to 140 degrees Fahrenheit.
- H. Bolting materials shall be carbon steel in accordance with ASTM A307 with dimensions conforming to ANSI B18.2.1.
- I. Line stop machinery shall consist of a cylindrical plugging head that contains a flat, expandable elastomer sealing element. The plugging head is advanced into and retracted from the main by means of a linear actuator. When retracted, the plugging head and carrier are housed in an adapter, bolted tightly between the tapping valve and the actuator.

- J. The sealing element shall be monolithically molded from a suitable polyurethane compound. The element shall be flat in a plane perpendicular to the flow in the main. The minimum thickness of the element shall be 4-inches. The bottom of the element shall be semi-circular to conform to the bore of the existing water main.
- K. The diameter of the plugging head shall be slightly smaller than the flanged nozzle of the fitting. The plugging head shall have a circumferential gasket seal against the shoulder in the flanged nozzle. The gasket shall also seal against the sealing element to prevent bypass around the plugging head.
- L. All materials used must be American made products.

PART 3 - EXECUTION

3.01 INSTALLATION

- A. CONTRACTOR shall clean (through the use of power wire brush, grinding tools or other non- destructive methods) the exterior of the potable water main to ensure any debris, corrosion deposits, or other surface irregularities that could interfere with proper seating and sealing of the fitting to the water main are removed.
- B. CONTRACTOR shall provide thrust and support blocking for the tapping machinery and the existing water main prior to proceeding with installation of the line stopping equipment.
- C. CONTRACTOR shall furnish and install bypass piping (up to 50 feet in length total) between installed line stop units to maintain water main functionality. The bypass piping shall be allowed to be one pipe diameter size smaller than the existing water main that the line stop is being performed on. CONTRACTOR shall furnish and install adequate support, bracing and restraint on the bypass piping

END OF SECTION 02503

SECTION 02510

WATER DISTRIBUTION SYSTEM

PART 1 - GENERAL

1.01 RELATED DOCUMENTS

- A. All applicable provisions of the Bidding and Contract Requirements, and Division 1 - General Requirements shall govern the work under this Section.

1.02 SUMMARY

- A. This Section includes water-distribution piping and related appurtenances in the municipal potable water system up to 5 feet outside the building limits for domestic and irrigation water service.
- B. All work shall conform to the requirements of the local water authority, fire marshal, any other regulatory authorities having jurisdiction, or this specification, whichever is more stringent.
- C. All water main installations shall comply with color coding requirements of Chapter 62.555.320, F.A.C.

1.03 WORK INCLUDED

- A. Provide all labor, materials, necessary equipment and services to complete the WORK, as indicated on the drawings, as specified herein or both.

1.04 RELATED WORK

- A. Section 02300 - Earthwork.
- B. Section 02305 - Excavation and Backfilling for Utilities.
- C. Section 02502 - Valves, General.

1.05 REFERENCE STANDARDS

- A. Factory Mutual (FM)
 - 1. Approval Guide
- B. Underwriters Laboratories (UL)
 - 1. Fire Protection Equipment Directory

2. UL 1285 - Pipe and Couplings, Polyvinyl Chloride (PVC), for Underground Fire Service
 3. UL 262 - Gate Valves for Fire-Protection Service
 4. UL 246 - Hydrants for Fire-Protection Service
- C. National Sanitation Foundation (NSF)
1. NSF 14 - Plastics Piping System Components and Related Materials
 2. NSF 61 - Drinking Water System Components - Health Effects
- D. National Fire Protection Association (NFPA)
1. NFPA 70 - National Electrical Code
 2. NFPA 24 - Hydraulic Fluid Power Systems - Methods to Improve Sealing Reliability (new standard)
 3. NFPA 1963 - Screw Threads and Gaskets for Fire Hose Connections (latest revision of ANSI/NFPA 1963)
 4. NFPA 13 - Installation of Sprinkler Systems (latest edition)
- E. American Water Works Association (AWWA)
1. C151 Ductile-Iron Pipe, Centrifugally Cast, for Water (Latest revision of ANSI/AWWA C151/A21.51)
 2. C104 - Cement-Mortar Lining for Ductile-Iron Pipe and Fittings for Water
 3. C150 - Thickness Design of Ductile-Iron Pipe
 4. C110 - Ductile-Iron and Gray-Iron Fittings, 3 in through 48 in (75 mm through 1200 mm), for Water and Other Liquids
 5. C153 - Ductile-Iron Compact Fittings, 3 in. through 24 in. (76 mm Through 610 mm) and 54 in. through 64 in. (1,400 mm Through 1,600 mm), for Water Service
 6. C900 - Polyvinyl Chloride (PVC) Pressure Pipe, 4 Inch through 12 Inch for Water Distribution
 7. C500 - Gate Valves for Water and Sewage Systems
 8. C111 - Rubber-Gasket Joints for Ductile-Iron Pressure Pipe and Fittings

9. C550 - Protective Epoxy Interior Coatings for Valves and Hydrants
10. C509 - Resilient-Seated Gate Valves for Water Supply Service
11. M44 - Distribution Valves: Selection, Installation, Field Testing, and Maintenance
12. C800 - Underground Service Line Valves and Fittings
13. C702 - Cold Water Meters - Compound Type
14. C502 - Hydrants, Dry Barrel Fire
15. M41 - Ductile Iron Pipe and Fittings
16. C600 - Installation of Ductile-Iron Water Mains and Their Appurtenance
17. C605 - Water Treatment - Underground Installation of Polyvinyl Chloride PVC Pressure Pipe and Fittings for Water
18. M23 - PVC Pipe: Design and Installation
19. M17 - Fire Hydrants: Installation, Field Testing, and Maintenance
20. C651 - Disinfecting Water Mains

F. American Society for Testing and Materials (ASTM)

1. B88 - Standard Specification for Seamless Copper Water Tube
2. B813 - Standard Specification for Liquid and Paste Fluxes for Soldering Applications of Copper and Copper Alloy Tube
3. B32 - Standard Specification for Solder Metal
4. D2241 - Standard Specification for Poly Vinyl Chloride (PVC) Pressure-Rated Pipe (SDR Series)
5. D3139 - Standard Specification for Joints for Plastic Pressure Pipes Using Flexible Elastomeric Seals
6. F645 - Standard Guide for Selection, Design, and Installation of Thermoplastic Water Pressure Piping Systems

G. American Society of Mechanical Engineers (ASME)

1. B16.18 - Cast Copper Alloy Solder Joint Pressure Fittings R(1994)

- 2. B16.22 - Wrought Copper and Copper Alloy Solder Joint Pressure Fittings
- H. Manufacturer's Standardization Society (MSS)
 - 1. SP-60 - Connecting Flange Joint Between Tapping Sleeves and Tapping Valves
- I. Copper Development Association (CDA)
 - 1. Copper Tube Handbook

1.06 QUALITY ASSURANCE

- A. Regulatory Requirements: Comply with requirements of the regulatory authorities having jurisdiction; including tapping of water mains, backflow prevention, installation, testing, and disinfection. Comply with standards of the regulatory authorities having jurisdiction for fire-suppression water-service piping, including materials, hose threads, installation, and testing.
- B. Piping materials shall bear label, stamp, or other markings of specified testing agency.
- C. Electrical Components, Devices, and Accessories: UL listed and labeled as defined in NFPA 70, Article 100, by a testing agency acceptable to the regulatory authorities having jurisdiction, and marked for intended use.
- D. Comply with FM's "Approval Guide" or UL's "Fire Protection Equipment Directory" for fire-service-main products.
- E. NFPA Compliance: Comply with NFPA 13 and NFPA 24 for materials, installations, tests, flushing, and valve and hydrant supervision for fire-service-main piping for fire suppression.
- F. NSF Compliance: Comply with NSF 14 for plastic potable-water-service piping. Comply with NSF 61 for materials for water-service piping and specialties for domestic water.
- G. Comply with requirements of Section 02305 – Excavation and Backfilling for Utilities.

1.07 PROJECT CONDITIONS

- A. Existing Utilities: Do not interrupt utilities serving facilities occupied by OWNER or others unless permitted under the following conditions and then only after arranging to provide temporary utility services according to requirements indicated:

1. Notify the OWNER not less than 2 days in advance of proposed utility interruptions; and,
2. Do not proceed with utility interruptions without written permission from the OWNER.

1.08 EXISTING UTILITIES

- A. Furnish temporary support, adequate protection and maintenance of all underground and surface utility structures, drains, sewers, and other obstructions encountered in the progress of the work.
- B. Where the grade or alignment of the pipe is obstructed by existing utility structure such as conduits, ducts, pipe branch connections to main sewers, or main drains, the obstruction shall be permanently supported, relocated, removed, or reconstructed by the CONTRACTOR in cooperation with the owners of such utility structures. No deviation shall be made from the required line or grade except as directed by the ENGINEER.

PART 2 - PRODUCTS

2.01 PIPE

- A. All metallic pipe shall have bituminous outside coating conforming to:

Viscosity, KU at 25°	56-60
Dry set to touch	6 minutes
Dry hard	22 minutes
- B. Ductile iron pipe (DIP) shall be per City of West Palm Beach Approved Products List.
 1. Unless otherwise indicated, all ductile iron pipe shall be factory lined and coated.
 - a. Lining: All pipe shall be cement mortar lined in accordance with AWWA Standard C104/A21.5.
 - b. Coating: Unless specified otherwise, all pipe shall be bituminous asphalt coating per AWWA C-104/A21.4 and color coded with blue strip.
 - c. Repair: Anywhere that the coating is removed purposely or accidentally, the area shall be cleaned of any rust, grease and dirt and recoated to a minimum dry film as specified for the individual piece.

- C. Polyvinyl chloride pipe shall be per City of West Palm Beach Approved Products List. Ultra violet degradation or sun-bleached pipe will be cause for rejection. Joints for PVC pressure pipe shall be bell and spigot push on rubber gasket type only. No solvent weld or threaded joints permitted.
- D. Soft Copper Tubing, NPS 3 inches or smaller:
 - 1. Tubing shall be manufactured in accordance with ASTM B88, Type K, annealed temper. Fittings shall be in accordance with ASME B16.18, for cast-copper-alloy, solder joint pressure fitting, or ASME B16.22 for wrought-copper, and copper-alloy, solder joint pressure fitting type. Soldering flux shall be in accordance with ASTM B813, water-flushable type. Solder filler metal shall be in accordance with ASTM B 32, lead-free type with 0.20% maximum lead content.
- E. All materials used in the construction of potable water distribution/transmission system shall be in compliance with ANSI/NSF Standard 61 - Drinking Water System Components - Health Effects.

2.02 FITTINGS

- A. Shall be per City of West Palm Beach Approved Products List with pressure rating of 350 PSI for fittings.
- B. Fittings shall be cast iron or ductile iron, meeting the ANSI/AWWA Specification C-153/A21.53.
- C. Fitting must be cement lined and seal coated per ANSI/AWWA C104/A21.3.
- D. Flanged fittings shall conform to ANSI Specifications for Class 125.
- E. Ductile iron fittings shall conform to ANSI/AWWA standard specification C110-A21.10 latest revision.

2.03 JOINTS

A. BELL AND SPIGOT CONNECTIONS:

- 1. Joints in bell and spigot pipe shall be push-on, mechanical, or restrained mechanical joints in accordance with ANSI/ANWA Standard C-111/21.11, latest revision.

B. FLANGED CONNECTIONS:

- 1. All flanged pipe barrels shall comply with the physical and chemical requirements as set forth in the Handbook of Ductile Iron Pipe of the Ductile Iron Pipe Research Association. Flanges shall be in accordance

with ANSI Specification B16.1 for Class 125 flanges. Bolts shall comply with ANSI Specification B18.2.

2. Before starting fabrication of the cast iron pipe and fittings, complete detailed working drawings shall be submitted by the CONTRACTOR for approval by the ENGINEER. Such drawings shall show the piping layouts and contain schedules of all pipe, fittings, valves, expansion joints, hangers and supports and other appurtenances. Where special fittings are required, they shall be shown in large detail with all necessary dimensions. The drawings submitted shall show flanged jointed sections placed so as to be removed without disturbance to the main pipe sections.
3. Flanged pipe shall be faced and drilled to the American Standard drilling, unless special drilling is called for or required. Where tap or stud bolts are required, flanges shall be tapped. Flanges shall be accurately faced and drilled smooth and true, at right angles to the pipe axis and shall be covered with zinc dust and tallow or a rust preventive compound immediately after facing and drilling.
4. Flanged pipe with screwed-on flanges shall be furnished with long hubs and the flanges shall be screwed on the threaded end of the pipe in the shop and the face of the flange and end of pipe refaced together. There shall be no leakage through the pipe threads and the flanges shall be designed to prevent corrosion of the threads from outside.
5. Flanged joints shall be made with bolts or stud bolts and nuts. Bolts, stud bolts, and nuts shall conform to American Standard heavy dimensions, semi-finished with square or hexagonal heads and cold punched hexagonal nuts, meeting the requirements of ASTM Designation A-307. Bolt sizes shall be American Standard for the flanges specified, and bolts and nuts shall have good, true threads.

C. RESTRAINTS:

1. Mechanical Joint Pipe shall be restrained and shall be per City of West Palm Beach Approved Products List.
2. Bell Joint Pipe shall be restrained and shall be per City of West Palm Beach Approved Products List. Rods and nuts shall be 304 stainless steels with nuts coated to prevent galling.

2.04 HYDRANTS

- A. Fire hydrants shall be per City of West Palm Beach Approved Products List and have a traffic breakaway-flange; no cut bolts; non-rising stem; dry barrel; 5 1/4" main valve opening; bronze to bronze seating. Pumper nozzle to be 18" min. and 24' max. from finish grade. All hydrants to be installed with anchoring tee

and control valve. Fire hydrant shall comply with ANSI/AWWA C502-05 (or latest revision).

- B. Fire hydrants installed that have not been placed into service shall be covered with a burlap bag to indicate that they are out of service.
- C. Fire hydrants shall have a factory applied top coat of tennic series 66 yellow.
- D. All water main piping from tee to fire hydrant shall be DIP.

2.05 WATER TAPS

- A. Tapping Existing Pipelines.
 - 1. Tapping sleeves shall be per City of West Palm Beach Approved Products List.
 - 2. Cast iron tapping sleeve or tapping cross shall have mechanical joint connections. The flanged end for tapping valve shall include a recess to provide positive alignment of the tapping valve.
 - 3. Tapping valves shall conform to AWWA C509 and C500 standards. An Affidavit of Compliance shall be furnished for the valves.
 - 4. Tapping valves 16" and smaller shall be designed for operation in a vertical position with a vertical operating shaft. Tapping valves over 16" shall be designed for operation in a horizontal position and shall have a vertical operating shaft.

2.06 WATER SERVICES

- A. Water services in the public R.O.W. shall be per City of West Palm Beach Approved Product List with a minimum working pressure of 200 psi.
- B. All water service tubing and fittings shall be in conformance with "City of West Palm Beach – Approved Products List".

PART 3 - EXECUTION

3.01 INSTALLATION, GENERAL

- A. Unloading Material: The CONTRACTOR shall exercise care in unloading and handling pipe, valves, fittings, and all other material. Dropping pipe from trucks and allowing pipe to roll against other pipe will not be permitted.
- B. Excavation: Pipe line trenches shall be excavated to required depth as shown on the drawings or as directed by the ENGINEER. In general, water distribution lines shall have a minimum of 36" cover for PVC pipe and 30" cover for DIP pipe.

If rock is encountered, excavation shall be carried a minimum of 8" below bottom of pipe, and trench backfilled with sand or earth and thoroughly tamped. Width of trench shall be sufficient to allow workmen to perform all operations incidental to constructing the pipe line. Hand dug bell holes shall be provided to permit proper joint making. No section of pipe shall bear on rock or on placed blocking. All excavations will be dewatered to permit dry joints.

- C. Work shall be properly braced where necessary. Where wood sheeting or certain designs of steel sheeting are used, the sheeting shall be cut off at a level two feet above the top of the installed pipe and that portion below that level shall be left in place. If interlocking steel sheeting of a design approved by the ENGINEER is used, it may be removed providing removal can be accomplished without disturbing the bedding or alignment of the pipe. Any damage to the pipe bedding, pipe or alignment of the constructed main caused by removal of sheeting shall be cause for rejection of the affected portion of the work.

3.02 PIPE

- A. Installation of Pipe: All installation shall conform to AWWA C-600-10. Pipe shall not be rolled or pushed into the trench from the bank. Before pipe is lowered into the trench, it shall be thoroughly inspected by the CONTRACTOR, as necessary, to insure sound conditions and eliminate the possibility of leakage or bursting under test pressure.
- B. Water mains shall be laid at least 10 feet horizontally (preferred) or 6 feet minimum from any existing or proposed sewer mains. Water main may be installed at least 3 feet horizontally from any existing or proposed sewer mains where the water main is installed 6 inches above the existing or proposed sewer main. A vertical distance of at least 12" must be maintained whenever a water main pipe crosses under a sewer main with the water main being ductile iron pipe with 20-foot lengths of pipe centering on the point of crossing. If a crossing where the sewer is laid above a water line is unavoidable, then the above-mentioned precautions shall be observed regardless of the distance of vertical separation between water mains and sewer piping.
- C. Pipes and valves, fittings, and all other materials showing defects shall not be used for construction. All such defective materials shall be removed from the construction site immediately. Before pipe is lowered into the trench, it shall be swabbed or brushed to insure that no dirt or foreign matter will be in the finished line.
- D. Pipe shall be laid on a flat bottom trench and backfill tamped to 6" above the top of the pipe. Pipe installation shall conform to "Type B Method" as adopted by Committee A-21 of the American Standards Association. A firm even bearing shall be provided throughout the length of each section of pipe. Pipe shall not bear on any unyielding structures, nor shall it support any other structures. All dead ends shall be plugged or capped, anchored and held in place with

restrained joints as required. Except while work is in progress, all pipe openings shall be suitably plugged to prevent entrance of water or any foreign matter. Material deemed unstable for providing adequate support for pipe shall be removed and replaced by suitable material. Adequate backfill shall be deposited on the pipe to prevent floating. Any pipe which has floated shall be removed from the trench and reinstalled as directed by the ENGINEER.

E. Joints: All joints shall be suitable for the type of pipe being jointed and shall be made in accordance with manufacturer's recommendations.

1. Mechanical joints: Mechanical joints shall be of the stuffing box type. The gland, followed by the rubber gasket, shall be placed over the plain end of the pipe which is inserted into the socket. The gasket is then pushed into position so that it is evenly seated in the socket. The gland shall be moved into position against the face of the socket, bolts inserted and made finger-tight. Bolts shall be tightened by a ratchet wrench suitable for the size of pipe being connected alternately, bottom, then top, etc., until the joint is completed.
2. Compression Pipe joints: Compression joints shall be a rubber seal joint, made pressure tight by a molded rubber gasket and lubricated to facilitate assembly. The joint shall be made tight by inserting the plain end into the bell after lubrication. Joints shall be made up as recommended by the manufacturer.
3. Flanged joints: Flanged joints shall be made with rubber gaskets. Bolts shall have rough square heads and hexagonal nuts and made to American Standard rough dimensions and shall be recommended size trimmed. Bolts shall be recommended size for the diameter of the pipe being jointed and shall be tightened as to distribute evenly the stress in the bolts and bring the pipe into alignment.
4. Threads shall be neatly cut with sharp tools and the jointing procedure shall conform with the best practices. Before jointing, all scale shall be reamed. All pipe shall be screwed with an application of graphite and engine oil or other approved pipe compound applied to the threads. This application shall be thoroughly wiped off the inside of every joint.

3.03 INSTALLATION OF FITTINGS

- A. Applicable portions of these specifications shall apply to installation of fittings. Reaction of restrained joints shall be applied at bends and tees and where changes in pipe diameter occur at reducers or in fittings.

3.04 INSTALLATION OF FIRE HYDRANTS

- A. All hydrants shall stand plumb and burial line shall be set at finished grade. The pumper nozzle shall be set at 18" min. and 24" max. above finished grade.

3.05 INSTALLATION OF VALVES

- A. All valves shall stand plumb unless otherwise shown on the plans or directed by the ENGINEER. The operation of installing tapping sleeves and valves shall be done by an experienced organization who has been engaged in this type of work not less than one (1) year with a representative list of successful installations. All valves shall be tagged per City of West Palm Beach.

3.06 PRESSURE TESTS

- A. After pipe has been adequately backfilled, all laid pipes shall be subjected to hydro-static pressure of 150 PSI (200 PSI for firelines). The duration of the pressure test shall not be less than two (2) hours and shall not vary more than 5 PSI during the test. Test sections shall be limited to a maximum length of 2000 feet. Care shall be taken to insure that all air has been removed from the pipe previous to pressure tests. The CONTRACTOR shall provide such means of venting the pipe as are required. Any material or installation proving defective shall be replaced by the CONTRACTOR.
- B. Pressure Tests should be conducted prior to disinfection of the water main.
- C. Pressure test, disinfection and flushing shall be conducted in accordance with current AWWA standards (AWWA C651, 652, or 653).
- D. Surface waters shall not be used to conduct the pressure test or filling of water mains.

3.07 LEAKAGE TEST

- A. After the main has been brought up to test pressure, it shall be held at this pressure and make up water shall be carefully measured by use of displacement meter or by pumping water from a vessel of known volume. The pipe line shall be walked and all visible joints inspected for leakage and movement of pipe. All visible leaks shall be repaired. Should any section of pipe line disclose joint leakage greater than that permitted, the CONTRACTOR shall at their own expense, locate and repair the defective joints until leakage is within the permitted allowance.

- B. The leakage test shall be conducted in accordance with AWWA Specification C-600, latest revision. Leakage shall be less than the number of gallons per hour as determined by the formula:

$$L = \frac{SD P^{1/2}}{148,000}$$

in which L equals the allowable leakage in gallons per hour, S is the pipe length in the main tested, D is the nominal diameter of the pipe in inches, and P is the average test pressure during the leakage test, in pounds per square inch, gauge. Length of test shall not be less than two (2) hours. Average test pressure shall not be less than 150 PSI. The test shall be conducted as directed by the ENGINEER.

3.08 DISINFECTION/STERILIZATION OF COMPLETE PIPELINE

- A. Before the final acceptance of complete pipeline, all requirements of the County and Palm Beach County Public Health Department (PBCHD) shall be satisfied. Satisfactory bacteriological test results from the agencies shall be forwarded to the ENGINEER.
- B. Prior to chlorination of mains, a review set of as-builts must be submitted to ENGINEER and all dirt and foreign matter shall be removed by high velocity flushing through fire hydrants or other approved blow-offs. The main shall then be filled with a chlorine solution of at least 50 parts per million of chlorine and retained in the pipe not less than twenty-four (24) hours. Chlorine residual after retention period shall be not less than 30 parts per million. After chlorination, the mains shall be thoroughly flushed with potable water and required samples taken for bacteriological analysis. Sampling to be witnessed by the ENGINEER.
- C. Pressure test, disinfection and flushing shall be conducted in accordance with current AWWA standards (AWWA C651, 652, or 653).
- D. Sample taps on water mains or fire mains shall flow 24 hours/day during the bacteriological testing.
- E. At the time of bacteriological sampling, chlorine residual determination shall be made to insure that chlorine concentration in the main is no higher than that generally in the system (3.0 mg/l free or 5.0 mg/l combined maximum), or less than 0.20 mg/l free or 0.60 mg/l combined. If total chlorine residual exceeds 4.0 mg/l the sample is considered invalid. Tests for chlorine residual must be performed using DPD Colormetric test. Use of "chlorine test strips" is no longer allowed.
- F. Bacteriological samples must be analyzed in laboratory certified by the state Department of Health.

3.09 BACKFILL

- A. No trenches or excavations shall be backfilled until the trench and installation has been inspected and written approval given by the ENGINEER. All backfill shall be carefully placed to avoid movement of the pipeline. Backfill shall be free from rock, stones larger than 2" in any dimension, brush, or other unsuitable material as determined by the ENGINEER. It shall be placed in the trench uniformly on both sides of the pipe for full width of the trench and to the horizontal diameter of the full length of the pipe. This backfill shall be thoroughly tamped to provide support free from voids.
- B. Additional backfill shall then be placed between joints to an average depth of 12" over the top of the pipe where pipe is of 8" and smaller diameter, and 24" over larger pipe. Pipe joints shall remain exposed until completion of the pressure and leakage tests unless otherwise directed by the ENGINEER.
- C. On completion of pressure and leakage tests, the exposed joints shall be backfilled to a depth of 12" above the top of the pipe. Backfill shall be carefully compacted until 12" of cover exists over the pipe. The remainder of the backfill shall then be placed and compacted thoroughly by puddling and tamping as required. Where directed, puddling and tamping may be omitted, and backfill shall be neatly rounded over the trench to a sufficient height to allow for settlement to grade after consolidation.

3.10 RESTORATION OF SURFACE AND/OR STRUCTURES

- A. The CONTRACTOR shall restore and/or replace paving, curbing, sidewalks, fences, sod, survey points and other disturbed surfaces to a condition equal to that before the work was begun and to satisfaction of the ENGINEER, and shall furnish all labor and materials incidental thereto. Relative restoration of surfaces and/or structures, the CONTRACTOR shall comply with all governing agencies requirements including city, town, county and state.

3.11 CONNECTION TO EXISTING SYSTEM

- A. The CONTRACTOR shall make proper arrangements for compliance with the regulations for connection to any existing distribution system with the OWNER of that system. Tap-in and connection will be made in strict accordance with the ENGINEER.

END OF SECTION 02510

SECTION 02515

WATER SERVICE CONNECTIONS AND TRANSFERS

PART 1 - GENERAL

1.01 RELATED DOCUMENTS

- A. All applicable provisions of the Bidding and Contract Requirements, and Division 1 - General Requirements shall govern the work under this Section.

1.02 WORK INCLUDED

- A. This section covers the work necessary for service connections, laying service pipe, casing pipe, making connections to the new water main and to the existing service pipe, testing and flushing, and all incidental work necessary to accomplish the construction.
- B. The work includes excavation, backfill and compaction, furnishing and installing service clamps, corporation stops or valves, meter yokes or connections, service connection piping, fittings, and appurtenances within the designated limits, testing, flushing, and other incidental work as required for a complete installation
- C. The approximate location of service connections to be installed or transferred will be determined by the CONTRACTOR.

1.03 RELATED WORK

- A. Division 2 as applicable
- B. Section 02300 - Earthwork.
- C. Section 02305 - Excavation and Backfilling for Utilities.
- D. Section 02502 - Valves, General.
- E. Section 02510 - Water Distribution System.

PART 2 - PRODUCTS

2.01 EXCAVATION

- A. Excavation shall conform to the requirements of Section 02305, Excavation and Backfilling for Utilities.

2.02 BACKFILL

- A. Acceptable material excavated from the trench shall be used for trench backfill.

Select backfill material for use in the pipe zone, when required by the ENGINEER, shall contain no material larger than one (1) inch in diameter.

2.03 SERVICE CONNECTION SIZE

- A. The location and size of service connection to be transferred or installed will be as determined in the field by CONTRACTOR. The meter and meter box will be installed by CONTRACTOR. Minimum tap size shall be one (1) inch.

2.04 SERVICE SADDLES

- A. Service saddles shall have CC threads with ductile iron body and stainless-steel double-strap saddles or equal. Saddle shall be of the size required by the pipe and shall be provided with a neoprene O-ring seal and appropriately sized IP tap. All service saddles shall conform to ANSI/AWWA C111/A21.11 and ASTM A-588.
- B. Double Strap Service Saddles shall be per City of West Palm Beach Approved Products List.
- C. Double Strap Tapping Saddles shall be per City of West Palm Beach Approved Products List.

2.05 TAPPING MATERIALS

- A. The CONTRACTOR shall provide the necessary tapping machines for making the connections, and shall furnish the miscellaneous materials required for making the taps, such as cutting oil and similar materials.

2.06 CORPORATION STOPS

- A. Corporation stops for one (1) inch services shall have AWWA thread inlet and a compressive connection outlet suitable for service pipe. Corporation stops for two (2) inch services shall be ball valves and have outside iron thread inlet and a compression connection outlet suitable for service pipe. Corporation stops shall meet AWWA C800, latest revision.
- B. Corporation Stops shall be per City of West Palm Beach Approved Products List.

2.07 METER COUPLINGS

- A. Couplings shall be hose clamp type coupling, outside IP thread to plastic for connecting polyethylene pipe to corporation stop and meter yoke. Clamp pipe with two stainless steel clamps at each connection.
- B. Coupling Manufacturers per City of West Palm Beach Approved Products List:

2.08 MISCELLANEOUS SERVICE FITTINGS

- A. Miscellaneous fittings (3/4" to 2"), includes reducers and adapters.
- B. Miscellaneous Service Fittings shall be per City of West Palm Beach Approved Products List.

2.09 CURB STOPS

- A. Curb stops shall meet AWWA C800, latest revision.
- B. 1" Angle Meter Valve Curb Stop per City of West Palm Beach Approved Products List.

5/8" x 3/4" x 1" and 1"

1" x 3/4" x 3/4" and 1":

- C. 2" Angle Meter Valve Curb Stop per City of West Palm Beach Approved Products List.

2":

2" Flanged:

- D. 1" Straight Meter Valve Curb Stop per City of West Palm Beach Approved Products List:

5/8" x 3/4" x 1" and 1"

1" x 3/4" x 3/4" and 1":

2.10 ANGLE METER VALVE (FOR U BRANCH)

- A. 1" Angle Meter Valve Curb Stop per City of West Palm Beach Approved Products List:

5/8" x 3/4" x 3/4"

2.11 DUAL WATER SERVICE U BRANCH

- A. 1" Angle Meter Valve Curb Stop per City of West Palm Beach Approved Products List:

1" x 3/4" x 6.5":

2.12 METERS, BOXES, AND COVERS

- A. Meters are to be relocated to new meter box by the CONTRACTOR. Boxes and Covers are to be furnished by the CONTRACTOR. CONTRACTOR will install Meters, Boxes and Covers.
- B. Meter boxes shall be per City of West Palm Beach Approved Products List:
 - $\frac{3}{4}$ " to 1" meters
 - 1 $\frac{1}{2}$ " to 2" meters

2.13 METER FLANGE

- A. Meter Flanges shall be per City of West Palm Beach Approved Products List.:
 - 2" only

2.14 COPPER TUBING

- A. Copper tubing used for one (1) inch service connections shall be Type K with compression fittings, soft, seamless, conforming to ASTM B88, with commercially pure wrought copper solder joint fittings. Make joints with 95-5 coreless wire solder, ASTM B32, Grade 95 TA.

2.15 WATER SERVICE PIPING

- A. Water service piping shall be per City of West Palm Beach Approved Products List, 200 psi rated, and conform to AWWA 901-08. Pipe joints shall be of the compression type totally confined grip seal and coupling nut.

2.16 CASING PIPE

- A. Casing pipe shall be Schedule 40 PVC., or equal, as determined by ENGINEER.

PART 3 - EXECUTION

3.01 TRENCH EXCAVATION AND BACKFILL

- A. Conform to the requirements of Section 02305, Excavation and Backfilling for Utilities. Place only select backfill material in the trench within 6 inches of the service connection pipe or line. Cover around pipe shall be 8 inches or as indicated on the plans. Backfill and compact remainder of trench with excavated material as specified in the referenced section.

3.02 CONNECTION TO MAIN

- A. Clean exterior of main of dirt or other foreign matter that may impair the quality of the completed connection. Then place service clamp at the desired location and clamp tight by tightening alternate nuts progressively. Do not place service clamp within 1 foot of pipe joint or other clamp.
- B. Taps shall be made in the pipe by experienced workmen using tools in good repair with the proper adapters for the size main being tapped.

3.03 PREPARATION OF TRENCH

- A. Grade the bottom of the trench by hand to the line and grade to which the pipe is to be laid, with proper allowance for special bedding. All other conditions and operations as specified in Section 02305, Excavation and Backfilling for Utilities must be adhered to. The trench bottom shall form a continuous and uniform bearing support for the pipe. A 6-inch layer of imported earth or other specified material will be required over and under pipe in areas where suitable trench side material is not available.

3.04 UNDERCROSSING OF ASPHALT-SURFACED ROADS

- A. Service connection piping under asphalt-surfaced roads shall be bored or jacked. Open cutting of asphalt-surfaced roads is not permitted except at the direction of the ENGINEER. The service connection pipe shall be installed so that it has a minimum cover of 30" with a slight grade sloping away from the water main.

3.05 COPPER TUBING

- A. The copper tubing shall be cut with square ends, reamed, and flared with the proper size flaring tool, cleaned, and made up tightly. Care shall be taken to prevent the tubing from kinking or buckling on short-radius bends. Kinked or buckled sections of copper tubing shall be cut out and the tubing spliced with the proper brass fitting at the CONTRACTOR's sole expense.

3.06 POLYETHYLENE PLASTIC TUBING

- A. Install polyethylene plastic tubing in accordance with the manufacturer's recommendations.

3.07 INSTALLATION OF METER BOXES AND METERS

- A. Meters and meter boxes or vaults shall be installed by the CONTRACTOR as coordinated in field with ENGINEER and OWNER. Finish grade of completed meter enclosure shall be flush with existing ground or as shown otherwise. Meter boxes or vaults shall be set or constructed plumb with the top set to conform to the slope of the finish grade. Lightly compacted earth backfill shall be placed inside of the meter

boxes to depth indicated. Grade adjustment of the meter boxes or vaults shall be by using standard extension sections for the box or vault specified. Install meter in a horizontal position with the meter dial or dials at a depth below the cover as shown on the plans. Backfill around meter vaults as specified for adjoining pipe.

- B. Water meters shall be reinstalled by the CONTRACTOR where water meters are designated for relocation. Corporation stops shall be in the open position and angle stops shall be closed, prior to reinstallation of the meter.
- C. Withhold reinstalling meters until the new water system is ready for operation. The remainder of the service connection, excluding the meter, may be installed at any time during or after construction of the main.
- D. Where existing meters are designated for relocation, CONTRACTOR shall read, record, and submit existing meter readings on the form supplied by the OWNER prior to removal of meters, and after completion of relocation work. CONTRACTOR shall furnish ENGINEER and OWNER with copies of all meter readings on a monthly basis or as requested by the ENGINEER.

3.08 HYDROSTATIC TEST AND LEAKAGE

- A. Test service connections and service connection tubing by either testing in conjunction with the main at the test pressure required for the main, or by testing at the normal hydrostatic main pressure after the main has been completely installed and tested. Inspect visually for leaks and repair any leaks before backfilling. Duration of the test shall be at least fifteen (15) minutes.

3.09 DISINFECTION

- A. Service connection transfers shall be disinfected as follows:
 - 1. Make connection to the main pipeline which shall have been previously hydrostatically tested and disinfected.
 - 2. Prior to connecting new copper or plastic tubing to existing copper tubing or meter stop, flush new copper or plastic tubing by fully opening corporation stop and allowing water to run for 2 minutes.
 - 3. Close corporation stop and meter stop, connect new copper or plastic tubing to existing copper tubing or to meter stop, as applicable. Open corporation stop and allow to stand for a minimum of 30 minutes retention period. Open meter stop.
- B. The OWNER may put extra chlorine in the water system during the time-of-service connection transfers to provide sufficient chlorine residual to adequately disinfect service connections when the above procedure is followed.

END OF SECTION 02515

SECTION 02530

SANITARY SEWERAGE SYSTEM

PART 1 - GENERAL

1.01 RELATED DOCUMENTS

- A. All applicable provisions of the Bidding and Contract Requirements, and Division 1 - General Requirements shall govern the WORK under this Section.

1.02 SUMMARY

- A. This section includes sanitary sewer piping and related appurtenances from connection to main to within 5 feet of outside the building limits.
- B. All WORK shall conform to the requirements of the local sewer authority and any other regulatory authorities having jurisdiction, or this specification, whichever is more stringent.

1.03 WORK INCLUDED

- A. The WORK under this Section shall consist of furnishing and installing sewer pipes and service connections as indicated on the plans and in accordance with these Specifications.

1.04 RELATED WORK

- A. Section 02305 - Excavation and Backfilling for Utilities.
- B. Section 02502 - Valve - General.
- C. Section 02510 - Water Distribution System.
- D. Section 02535 - Structures and Maintenance Access Structures.

1.05 DEFINITIONS

- A. Maintenance access structures shall be designated as M.A.S., M.H., maintenance access structures or maintenance holes.

1.06 REFERENCE STANDARDS

- A. American Society for Testing and Materials (ASTM)
 - 1. A746 - Standard Specification for Ductile Iron Gravity Sewer Pipe

2. D3034 - Standard Specification for Type PSM Poly Vinyl Chloride (PVC) Sewer Pipe and Fittings
 3. F477 - Standard Specification for Elastomeric Seals (Gaskets) for Joining Plastic Pipe
 4. F679 - Standard Specification for Poly Vinyl Chloride (PVC) Large-Diameter Plastic Gravity Sewer Pipe and Fittings
 5. C476 - Standard Specification for Grout for Masonry
 6. C443 - Standard Specification for Joints for Circular Concrete Sewer and Culvert Pipe, Using Rubber Gaskets
 7. C923 - Standard Specification for Resilient Connectors Between Reinforced Concrete Manhole Structures, Pipes and Laterals
 8. D2321 - Standard Practice for Underground Installation of Thermoplastic Pipe for Sewers and Other Gravity-Flow Applications
 9. C478 - Standard Specifications for Precast Reinforced Concrete Manhole Sections
 10. C969 - Standard Practice for Infiltration and Exfiltration Acceptance Testing of Installed Precast Concrete Pipe Sewer Lines.
- B. American Society of Sanitary Engineers (ASSE)
- C. American National Standards Institute (ANSI)
- D. American Concrete Institute (ACI)
1. 318 - Building Code Requirements for Structural Plain Concrete
- E. National Sanitation Foundation (NSF)
- F. American Water Works Association (AWWA)
1. C110 - Ductile-Iron and Gray-Iron Fittings, 3 in through 48 in (75 mm through 1200 mm), for Water and Other Liquids (revision of ANSI/AWWA C110/A21.10-93)
 2. C111 - Rubber-Gasket Joints for Ductile-Iron Pressure Pipe and Fittings
C153 - Ductile-Iron Compact Fittings, 3 in. through 24 in. (76 mm Through 610 mm) and 54 in. through 64 in. (1,400 mm Through 1,600 mm), for Water Service (revision of ANSI/AWWA C153/A21.53-94)

3. C600 - Installation of Ductile-Iron Water Mains and Their Appurtenances revision of ANSI/AWWA C600-93)
 4. C150 - ANSI Standard for Thickness Design of Ductile Iron Pipe
 5. C151 - ANSI Standard for Ductile Iron Pipe
 6. C153 - ANSI Standard for Ductile Iron Pipe Compact Fittings
- G. Federal Specifications
1. SS-S-00210 - Sealing Compound Preformed Plastic for Pipe Joints
- H. Uni-Bell PVC Pipe Association
1. UNI-B-6 - Low-Pressure Air Testing of Installed Sewer Pipe
- 1.07 PERFORMANCE REQUIREMENTS
- A. Gravity-Flow, Nonpressure-Piping Pressure Ratings: At least equal to system test pressure.
 - B. Force-Main Pressure Ratings: At least equal to system operating pressure, but not less than 150 psig.
- 1.08 QUALITY ASSURANCE
- A. Regulatory Requirements: Comply with requirements of the regulatory authorities having jurisdiction; including tapping of sewer mains, installation, and testing.
 - B. Piping materials shall bear label, stamp, or other markings of specified testing agency.
 - C. Comply with requirements of Section 02305, Excavation and Backfilling for Utilities.
- 1.09 PROJECT CONDITIONS
- A. Existing Utilities: Do not interrupt utilities serving facilities occupied by OWNER or others unless permitted under the following conditions and then only after arranging to provide temporary utility services according to requirements indicated:
 1. Notify the OWNER not less than two days in advance of proposed utility interruptions; and,
 2. Do not proceed with utility interruptions without written permission from the OWNER.

1.10 COORDINATION & FEES

- A. CONTRACTOR shall be responsible for obtaining and payment of all tap and construction permit fees associated with this section.
- B. CONTRACTOR shall install all sewer lines and appurtenances as shown on the Drawings to within 5 feet of building limits. This shall include any taps, pumps, tanks, etc. If CONTRACTOR's WORK terminates at a connection point where WORK by others is complete, CONTRACTOR shall make the connection. If future connections will be required by others, CONTRACTOR shall install plugging and marking apparatus as necessary to protect, identify and locate their WORK.

PART 2 - PRODUCTS

2.01 PIPE

- A. PVC plastic pipe and fittings for gravity sanitary sewers shall be unplasticized, PVC (Green) Plastic Gravity Sewer Pipe conforming to ASTM D 3034 with SDR 26 (for pipe depths less than 12') and integral wall bell and spigot joints for conveyance of domestic sewage. Sewer pipe, including laterals and fittings shall be of the same material composed of PVC plastic having a cell classification of 12454B or 12454C as defined in ASTM D 1784. Rubber sealing rings for pipe joints shall meet the requirements of ASTM D 1869. No solvent welded pipe will be permitted.
- B. For pipe depths greater than or equal to 12', PVC C-900, 4" through 12" shall conform to ANSI / AWWA Standard C900-07 or latest revision, PVC pressure pipe shall be made from Class 12454-A or Class 12454-B virgin material and conform with a minimum wall thickness of or Series 18, ultra violet degradation or sun-bleached pipe will be cause for rejection.
- C. PVC plastic gravity sewer pipe manufacturers shall be per City of West Palm Approved Products List. Prior to delivery of PVC plastic pipe to the jobsite, CONTRACTOR shall furnish the ENGINEER complete data from the manufacturer of the type of PVC pipe and fittings they propose to install.
- D. Ductile iron pipe interior and exterior shall be coated per City of West Palm Approved Products List.
 - 1. DIP gravity main piping shall be Class 350 for pipes over 6" to 12" (per City of West Palm Approved Products List).
 - 2. DIP manufacturers for gravity main piping shall be per City of West Palm Approved Products List.

2.04 CONCRETE

- A. General: Cast-in-place concrete according to ACI 318, 4,000 psi

2.05 CLEANOUTS

- A. Cleanouts shall be provided on sewer service laterals at no more than 75' on centers. Exterior cleanout box shall be US Foundry No. 7621 reversible handhole and cover and shall be marked "S". Each cleanout box shall be level with adjacent grade and provided with 30 inches by 30 inches square, 8-inch-thick concrete apron.

PART 3 - EXECUTION

3.01 GRAVITY SEWER INSTALLATION

- A. All sewer pipes shall be true to line and grade with bells up grade. The sections of the pipe shall be so laid and fitted together that when complete, the sewer shall have a smooth and uniform invert. The pipe shall be maintained clean. All pipe shall be free from defects. Trenches shall be kept dry while the pipe is being laid.
- B. Bedding of the pipe shall consist of ASTM C33 #67 rock requiring the bottom of the trench to be shaped to fit the bottom of the pipe for distance equal to one-half of the outside diameter of the pipe. Bell holes shall be deep enough to insure proper bearing of the pipe barrel on the bedding.
- C. All joints shall be carefully fitted so as to ensure a tight waterproof joint. Joints shall not be covered until approved by the ENGINEER. The exposed end of all pipe shall be protected so as to prevent dirt or other debris from entering the pipe. Pipes shall be thoroughly flushed at the completion of the WORK.
- D. Identification: Materials and their installation are specified in Section 02300 - Earthwork. Arrange for installing green warning tapes directly over piping and at outside edges of underground structures.
 - 1. Use warning tape or detectable warning tape over ferrous piping; and,
 - 2. Use detectable warning tape over nonferrous piping and over edges of underground structures.
- E. Piping Applications: Include watertight joints.
- F. Install piping beginning at low point, true to grades and alignment indicated with unbroken continuity of invert. Place bell ends of piping facing upstream. Install gaskets, seals, sleeves, and couplings according to manufacturer's written instructions for using lubricants, cements, and other installation requirements.

- G. Use maintenance access structures for changes in direction, unless fittings are indicated. Use fittings for branch connections, unless direct tap into existing sewer is indicated.
- H. Install gravity-flow piping to within 5 feet of the building, at the building's sanitary drains, of sizes and in locations indicated. Terminate piping as indicated.
- I. Install piping at slope shown on the Drawings. If no slope is shown, minimum slope shall be 1% for 6-inch diameter pipes and 0.4% for 8-inch diameter pipes.
- J. Install piping with 36-inch minimum cover, unless otherwise noted.
- K. Pipe Joint Construction and Installation: Join and install pipe and fittings according to installations indicated.
 - 1. PVC Sewer Pipe and Fittings: Install according to ASTM D 2321; and,
 - 2. Join piping made of different materials or dimensions with couplings made for this application. Use couplings that are compatible with and that fit both systems' materials and dimensions.
- L. Maintenance Access Structures Installation: Install complete with appurtenances and accessories indicated.
 - 1. Form continuous concrete channels and benches between inlets and outlet; and,
 - 2. Set tops of frames and covers flush with finished surface of Maintenance Access Structures that occur in pavements.
- M. Protect existing piping and structures to prevent concrete or debris from entering while making tap connections. Remove debris or other extraneous material that may accumulate.
- N. Clear interior of piping and structures of dirt and superfluous material as WORK progresses.
 - 1. Place plug in end of incomplete piping at end of day and when WORK stops; and,
 - 2. Flush piping between Maintenance Access Structures and other structures to remove collected debris.

3.02 SERVICE LATERAL CONNECTIONS

- A. All connections which are for future use shall be properly capped. No pipe shall be cut for connections unless approved by the ENGINEER. Wyes for service connections shall be installed as shown on the plans or as directed by the

ENGINEER to align with existing septic tank locations or existing laterals. The upper end of service connections shall be laid at a depth not less than 36 inches or more than 48 inches below finish grade elevation, unless otherwise noted on the plans.

3.03 TESTS

A. Gravity Sanitary Sewers (Non-Live systems):

1. After the joints have been inspected and approved, backfilling may be done until backfill is one foot over the pipes. Backfilling shall be in accordance with Section 02305 - Excavation and Backfilling for Utilities of these Specifications.
2. After completion and backfilling to the aforesaid level of each block or section of gravity sanitary sewer, the CONTRACTOR shall clean the gravity sanitary sewer pipe main and the ENGINEER and a representative of the OWNER will "lamp" the lines between maintenance access structures. Each section of the sewer is to show, in examination from either end, a full circle of light between manholes. Each maintenance access structure or other appurtenance to the system shall be of the specified size and form, be water tight, neatly and substantially constructed, with the top set permanently to exact position and grade. All repairs shown necessary by the inspection are to be made; broken or cracked pipe replaced; all deposits removed and the sewers left true to line and grade entirely clean and ready for use. If this alignment is true and no pipes are broken or misaligned, the backfilling shall be completed.
3. Gravity Sanitary Sewer Main Lines:
 - a. Tests for water tightness of gravity sewers shall be made by the CONTRACTOR in the presence of the ENGINEER. The allowable limits of infiltration or exfiltration for the entire system, or any portion thereof, shall not exceed a rate of 100 gallons per inch of inside pipe diameter per mile of pipe per 24 hours. Special consideration shall be given to leakage allowance for sizes larger than 15 inches in diameter. No additional allowance will be made for house service lines. The allowable limits of infiltration or exfiltration of manholes shall not exceed a rate of four gallons per maintenance access structures per 24 hours.
 - b. Where the crown of the pipe is below the natural ground water table at the time and place of testing, the pipe shall be tested for infiltration. Prior to testing for infiltration, the system shall be pumped out so that normal infiltration conditions exist at the time of testing. Suitable watertight plugs shall be installed and sections of pipe to be tested shall be pumped dry before start of the test. The

amounts of infiltration or exfiltration shall be determined by pumping into or out of calibrated drums or by other methods approved by the ENGINEER of Record.

- c. Where the crown of the pipe is above the natural water table, the pipe shall be tested for exfiltration by installing necessary plugs and filling the portion of the system being tested with water to a level equal to the lowest part of the maintenance access structures frame (maintain a static head of water two feet minimum above the crown of the pipe during the test). Tests shall be conducted on portions of the system not exceeding three maintenance access structure runs or maximum of 1200 (feet) whichever is greater unless otherwise directed by the ENGINEER of Record. Tests shall be run continuously for two hours.

4. Gravity Sanitary Sewer Laterals:

- a. Infiltration and exfiltration testing (Two feet of Head for exfiltration; zero head for infiltration) of service connection lines shall be done in conjunction with the testing of the lateral and/or main line sewer. No additional leakage allowance will be made for service lines.
- b. Infiltration testing of service lines will not be permitted unless a minimum two feet static head of ground water exists over the shallow end of the service line at cleanout.

- 5. Where infiltration or exfiltration exceed the allowable limits specified herein, the defective pipe, joints, or other fault construction shall be located and repaired by the CONTRACTOR. If the defective portions cannot be located, the CONTRACTOR shall remove and reconstruct as much of the work as is necessary in order to conform to the specified allowable limits.
- 6. All visible leaks, regardless of results of infiltration tests, shall be repaired. All repairs shown necessary by the tests are to be made, broken or cracked pipe replaced, all deposits removed, the sewer left true to line and grade and entirely clean, free from lumps of cement, protruding gaskets, bulkheads, etc., and ready for use before final acceptance is made.
- 7. A T.V. video inspection will be performed by the CONTRACTOR after the first lift of rock is placed and compacted and after all other testing has been successfully completed by the CONTRACTOR; Any defective work or necessary corrections brought out during this inspection must be corrected by the CONTRACTOR, at his expense, before the lines can be accepted for maintenance by City of West Palm. All mud, sand, debris and other deposits shall be removed by approved methods prior to inspection.

Review and approval of the tapes must be done by NASSCO certified personnel.

The sanitary sewer lines shall meet City of West Palm criteria for allowable deflection.

Per Recommended Standards for Wastewater Facilities (RSWF) 33.85, deflection testing is required after the final backfill has been in place at least 30 days to permit stabilization of the soil-pipe system. Test requirements specify: No pipe shall exceed a deflection of 5%; using a rigid ball or mandrel for the deflection test with a diameter not less than 95% of the base inside diameter or average inside diameter of the pipe; performing the test without mechanical pulling devices.

The percent of standing water at a sag in a sewer main will determine if the pipe is acceptable or not.

- a. Sags that make up 5% or less of the pipe area are approved.
 - b. Sags that are between 5-10% of the pipe area are at the discretion of the City of West Palm to accept or reject.
 - c. Sags that are more than 10% of the pipe area are unacceptable and should be rejected unless justified by the ENGINEER of Record to City of West Palm. Acceptance is not final until agreed to by City of West Palm. A letter of credit or a performance bond will be required for sags such as this; warranty extensions without this protection are not acceptable.
8. Repair of any defects found in the system are to be completed at the expense of the CONTRACTOR.
 9. On sanitary sewers, final infiltration and exfiltration tests shall be made by the CONTRACTOR at their expense and shall provide all labor, equipment, and materials and shall conduct all testing required, under the direction of the ENGINEER after all backfilling operations and pavement restorations are completed and the sewers are cleaned and ready for use.
 10. The ENGINEER shall maintain a record showing date and time of inspection, calculation of allowable exfiltration or infiltration and amount of measured exfiltration or infiltration.

B. Gravity Sanitary Sewers (Live systems):

1. Existing service laterals shall be connected to the newly constructed sewer sanitary gravity lines immediately following disconnection. Until the

existing service laterals are connected to the new system, the untreated sewage shall be treated/handled in an approved manner.

2. After the joints have been inspected by the ENGINEER or the OWNER and approved, backfilling may be done until backfill is one foot over the pipes. Backfilling shall be in accordance with Section 02305 - Excavation and Backfilling for Utilities of these Specifications.
3. After completion and backfilling to the aforesaid level of each block or section of gravity sanitary sewer, the CONTRACTOR shall clean the gravity sanitary sewer pipe main and the ENGINEER and a representative of the OWNER will "lamp" the lines between maintenance access structures. Each section of the sewer is to show, in examination from either end, a full circle of light between manholes. Each maintenance access structure or other appurtenance to the system shall be of the specified size and form, be water tight, neatly and substantially constructed, with the top set permanently to exact position and grade. All repairs shown necessary by the inspection are to be made; broken or cracked pipe replaced; all deposits removed and the sewers left true to line and grade entirely clean and ready for use. If this alignment is true and no pipes are broken or misaligned, the backfilling shall be completed.
4. Tests for water tightness of gravity sewers shall be made by the CONTRACTOR in the presence of the ENGINEER. The sewer and connections shall be tested per the Air Testing Requirements specified below and per City of West Palm Public Services Department & Utility Department "Minimum Standards" requirements. The test shall comprise of all main line and lateral connections. Lateral connections shall be tested from the main line to the property line. The main lines and laterals shall utilize inflatable stoppers or approved plugs capable of withstanding the pressures of the test to isolate the main line section as well as the laterals to the property line.

Air Testing Requirements:

- a. Air Testing procedures shall be in accordance with ASTM F-1417, ASTM C-1244 (for sewer M.A.S.), and the following requirements.
- b. At the start of the test, the pipelines are stabilized by pumping the lines with air to achieve a constant test pressure (for piping above the ground water table, it is necessary to achieve a constant 3.5 PSI; do not exceed 5 PSI). Maintain the test pressure for 5 minutes and do not permit the pressure to drop more than 0.5 PSI below the test pressure.
- c. The test period begins when the pressure is adjusted to exactly 3.5 PSI (for piping above the water table) and the pressure supply is

shut off. When the pressure bleeds to 3.0 PSI, start the test timing. Stop the time when the pressure bleeds to 2.5 PSI. Determine the time differential and compare it to the applicable charts (when calculating the allowable times).

- d. If the bleed down time exceeds the allowable time per the chart, then the line passes. If the line reaches 2.5 PSI prior to reaching the allowable time, then it fails.
 - e. For piping that is below the water table, the above procedures are the same, except that all pressures shall be adjusted (+) 0.433 psi/ft below the water table.
5. Where the crown of the pipe is below the natural ground water table at the time and place of testing, the pipe shall be tested for infiltration. Suitable watertight plugs shall be installed and sections of pipe to be tested shall be pumped dry before start of the test. Where the crown of the pipe is above the natural water table, the pipe shall be tested for water tightness by the use of a low-pressure air test as specified above Air Testing Requirements. Air tests shall be conducted on gravity lines, building and house lateral lines.
6. All visible leaks, regardless of results of infiltration tests, shall be repaired. All repairs shown necessary by the tests are to be made, broken or cracked pipe replaced, all deposits removed, the sewer left true to line and grade and entirely clean, free from lumps of cement, protruding gaskets, bulkheads, etc., and ready for use before final acceptance is made.
7. A T.V. video inspection will be performed by the CONTRACTOR after the first lift of rock is placed and compacted and after all other testing has been successfully completed by the CONTRACTOR; Any defective work or necessary corrections brought out during this inspection must be corrected by the CONTRACTOR, at his expense, before the lines can be accepted for maintenance by City of West Palm. All mud, sand, debris and other deposits shall be removed by approved methods prior to inspection. Review and approval of the tapes must be done by NASSCO certified personnel.

The sanitary sewer lines shall meet City of West Palm criteria for allowable deflection.

Per Recommended Standards for Wastewater Facilities (RSWF) 33.85, deflection testing is required after the final backfill has been in place at least 30 days to permit stabilization of the soil-pipe system. Gravity sewer mains constructed shall be lamped by CONTRACTOR with ENGINEER and CITY present during lamping. Any pipe defects observed during lamping shall be corrected by CONTRACTOR.

The percent of standing water at a sag in a sewer main will determine if the pipe is acceptable or not.

- a. Sags that make up 5% or less of the pipe area are approved.
 - b. Sags that are between 5-10% of the pipe area are at the discretion of the City of West Palm to accept or reject.
 - c. Sags that are more than 10% of the pipe area are unacceptable and should be rejected unless justified by the ENGINEER of Record to City of West Palm. Acceptance is not final until agreed to by City of West Palm. A letter of credit or a performance bond will be required for sags such as this; warranty extensions without this protection are not acceptable.
8. The CONTRACTOR may video tape the sanitary sewer laterals from the main line to the property line in lieu of air testing or exfiltration testing the lateral after backfilling. This may be done only if requested by the CONTRACTOR in writing and approved by the ENGINEER and OWNER. The costs of any video inspection of laterals and repairs required of the lateral shall be the sole responsibility of the CONTRACTOR. All videotaping of laterals shall include the property address for identification purposes.
 9. The video inspection of the sanitary sewer gravity lines, laterals and joints will be reviewed by the ENGINEER and OWNER and all joints for tightness and abnormalities. If the ENGINEER or OWNER determines a possible defect exists, excavation, inspection and repair of any defects found in the system are to be completed at the expense of the CONTRACTOR.
 10. The ENGINEER shall maintain a record showing date and time of inspection, calculation of allowable air loss or infiltration and amount of measured air loss or infiltration.
 11. If the CONTRACTOR disputes any such claims of defect, it shall be the CONTRACTOR'S responsibility and expense to exfiltration test and or air test the line as to assure the integrity of the sanitary sewer gravity line, lateral or joint. The testing shall be arranged and coordinated to minimize any interruption to existing customers previously placed in service.

3.04 SEWER-BY-PASS PUMPING AND FLOW CONTROL

- A. The CONTRACTOR shall submit with the Schedule complete and detailed plans describing the CONTRACTOR's proposed method for manning and maintaining the flow control/by-pass pumping management 24-hours a day where and when necessary. The CONTRACTOR shall provide all necessary labor, pumps, piping and other equipment necessary to accomplish this task. By-pass or any other type of pump discharge shall be discharged into a working maintenance access structure or appropriate tank or tanker vehicle. The CONTRACTOR will be responsible for any fines or clean-up expenses incurred for any unlawful or improper discharge or spill. The CONTRACTOR shall keep adequate quantities of chemicals and equipment on site to handle emergency situations including sewage spills.

3.05 WARRANTY

- A. Any repairs or replacement necessitated by mechanical failure due to faulty materials, improper installation or poor workmanship shall be completed within five (5) days after notification by the ENGINEER. At the expiration of this time, the OWNER shall be entitled to have WORK done by others at the expense of the CONTRACTOR. Such repair WORK done by others shall not void the warranty nor the responsibility of the CONTRACTOR as to balance of the installation by the CONTRACTOR.

END OF SECTION 02530

SECTION 02535

STRUCTURES AND MAINTENANCE ACCESS STRUCTURES (M.A.S.)

PART 1 - GENERAL

1.01 RELATED DOCUMENTS

- A. All applicable provisions of the Bidding and Contract Requirements, and Division 1 - General Requirements shall govern the work under this section.

1.02 WORK INCLUDED

- A. The work covered by this section shall include the furnishing of all labor, equipment, services, materials, products and tests to perform all operations in connection with the construction of all structures as shown on the plans, defined in these specifications and subject to the terms and conditions of this contract, including, but not limited to, M.A.S., catch basins, and inlets.

1.03 RELATED WORK

- A. Section 02300 - Earthwork.
- B. Section 02305 - Excavation and Backfilling for Utilities.

1.04 SUBMITTALS

- A. The CONTRACTOR shall furnish the ENGINEER shop drawings of the precast M.A.S. for approval. Shop drawings should illustrate all dimensions, reinforcements and specifications for the complete manual.

1.05 DEFINITIONS

- A. Maintenance Access Structures shall be designated as M.A.S.

PART 2 - PRODUCTS

2.01 MORTAR

- A. Mortar for use in constructing and plastering sewer structures shall conform to ASTM C-270, "Specifications for Mortar for Unit Masonry". A Portland cement-hydrated lime mixture or a masonry cement may be used provided that the same materials are used throughout the project.
- B. Mortar materials shall be proportioned by volume and shall consist of one part Type II Portland Cement to two parts aggregate (sand). Portland Cement shall conform to ASTM C-150, "Specifications for Portland Cement". Aggregate shall conform to ASTM C-144, "Specifications for Aggregate for Masonry Units."

2.02 PRECAST CONCRETE M.A.S.

- A. Precast M.A.S. sections shall conform to the plans or ASTM C-478, Specifications for Precast Reinforced Concrete Manhole Sections as modified thereto whichever is more restrictive. Concrete shall attain a minimum compressive strength of 4,000 psi at 28 days. Minimum wall thickness shall be 8 inches.
- B. Unless otherwise specified on the plans, all joints shall be made with neoprene or rubber "O" ring compression joints; mastic joint sealing compound, or approved equal. After assembly, all joints shall be filled with mortar and pointed to provide a smooth surface without joint voids.
- C. The base and walls that compose the bottom section of precast M.A.S. shall be of monolithic construction, minimum 8 inches thick, and the edge of the base slab shall project a minimum 4 inches beyond the outside diameter of the wall.
- D. Holes for piping shall be 6 inches larger than the outside diameter of the respective pipe. After the pipe is set, the void space between the pipe and the hole perimeter shall be completely filled with non-shrinking, quick-setting, waterproof cement mortar and struck smooth.
- E. The minimum height of precast base section shall be 36 inches from the bottom of the base slab; however, no holes for piping shall be cast less than 8 inches from the top of the base section or less than 2 inches from the top of the base slab.

2.03 CASTINGS (INCLUDING FRAMES, COVERS AND GRATINGS)

- A. All castings shall be made of clean, even grain, tough grey cast iron. The castings shall be smooth, true to pattern and free from projections, sand holes, warp and other defects. The horizontal surface of the frame cover seats and the under surface of the frame cover seat which rests upon the cover seat shall be machined. After machining, it shall not be possible to rock any after it has been seated in any position in its associated frame. Machining shall be required only on those frames and covers intended for vehicular traffic.
- B. Bearing surfaces between cast frames, covers and grates shall be machined and fitted together to assure a true and even fit. Within areas of vehicular traffic, the frames, covers and gratings shall be machined-ground so that irregularity of contact will be reduced to a minimum and will be rattle-proof.
- C. All M.A.S. covers shall be provided with concealed pick holes. Manufacturer's name and catalog number shall be cast on all frames, covers, grates, etc. Covers shall be lettered "Storm" "Storm Drain" or "Storm Sewer" or "Sanitary Sewer" as applicable and shall be plainly visible. The M.A.S. frames and covers shall be flush with finished grade.

- D. Grates and covers for inlets shall be as shown on the plans, set to the grades indicated and conforming with the requirements of the castings described above. Grates shall be furnished complete with frames specifically constructed to provide full bearing at all points of contract.

PART 3 - EXECUTION

3.01 CHANNELS

- A. Channels shall be accurately and smoothly formed in accordance with the plans. Channels shall be constructed of concrete with trowel finished surfaces. The upper surface of the M.A.S. shall be sloped toward the channels as shown.
- B. Drop pipe at sanitary sewer M.A.S. shall be installed when the difference in elevation between the pipe invert and the invert at the center of the M.A.S. exceeds two feet (2'), or where directed by the ENGINEER. The drop M.A.S. shall be built according to the plans and specifications.
- C. After channels are formed and section joints are pointed, the interior of the M.A.S. shall be painted with two coats per City of West Palm Beach Approved Products List or approved equal (8 mils per coat), first coat is red and the second coat is black. The exterior shall be painted in the same manner.

3.02 M.A.S. AND STRUCTURES

- A. All joints shall be finished water tight, all openings for sewers, frames, etc., in precast M.A.S. and catch basins shall be cast at time of manufacture. Spaces around all piping entering or leaving M.A.S. shall be completely filled with Embeco mortar or equal.
- B. All M.A.S. shall be set plumb to line and grade and shall rest on a firm carefully graded subgrade which shall provide uniform bearing under base.
- C. Grout for M.A.S. bottoms shall consist of broken block, brick and 2:1 cement mortar.

3.03 CLEANING AND MAINTENANCE

- A. All structures shall be cleaned and maintained in workable condition until accepted by the ENGINEER.

END OF SECTION 02535

SECTION 02630

STORM DRAINAGE FACILITIES

PART 1 - GENERAL

1.01 RELATED DOCUMENTS

- A. All applicable provisions of the Bidding and Contract Requirements, and Division 1 - General Requirements shall govern the work under this section.

1.02 SUMMARY

- A. Work under this section shall consist of providing all labor, plant facilities, materials, tools, equipment, shop drawings and supervision necessary and required to install all of the storm drainage facilities, including piping, fittings, structures, bedding, and backfilling, as specified in accordance with the contract documents.

1.03 WORK INCLUDED

- A. Provide all labor, materials, necessary equipment and services to complete the Storm Drainage Facilities work, as indicated on the drawings, as specified herein or both, except as for items specifically indicated as "NIC ITEMS".

1.04 RELATED WORK

- A. Section 02230 - Site Clearing.
- B. Section 02300 - Earthwork.
- C. Section 02305 - Excavation and Backfilling for Utilities.
- D. Section 02535 - Structures and M.A.S.

1.05 REFERENCE STANDARDS

- A. American Society for Testing and Materials (ASTM)
 - 1. A185 - Steel Welded Wire Fabric, Plain, for Concrete Reinforcement
 - 2. A615 - Deformed and Plain Billet-Steel Bars for Concrete Reinforcement
 - 3. A760 - Corrugated Steel Pipe, Metallic-Coated for Sewers and Drains
 - 4. A798 - Installation of Corrugated-Steel Pipe for Sewers and Other Applications
 - 5. A929 - Metallic-Coated by the Hot-Dip Process for Corrugated Steel Pipe

6. C76 - Reinforced Concrete Culvert, Storm Drain, and Sewer Pipe
 7. C478 - Precast Reinforced Concrete Manhole Sections
 8. C1479 - Installation of Reinforced Concrete Pipe
 9. C990-01A - Joints for Concrete Pipe, Manholes, and Precast Box Sections Using Preformed Flexible Joint Sealants
 10. D2321 - Installation of Thermoplastic Pipe for Sewer/Gravity-Flow Applications
 11. D3034 - Type PSM Poly (Vinyl Chloride) (PVC) Sewer Pipe and Fittings
 12. D3212 - Joints for Drain and Sewer Plastic Pipes Using Elastomeric Seals
 13. F477 - Elastomeric Seals (Gaskets) for Joining Plastic Pipe
 14. F794 - Poly (Vinyl Chloride) (PVC) Profile Gravity Sewer Pipe and Fittings Based on Controlled Inside Diameter
 15. F949 - Poly (Vinyl Chloride) (PVC) Corrugated Sewer Pipe with a Smooth Interior and Fittings
- B. American Association of State Highway and Transportation Officials (AASHTO)
1. M198 - Joints for Circular Concrete Sewer and Culvert Pipe Using Flexible Watertight Gaskets
 2. M252 - Corrugated Polyethylene Drainage Tubing
 3. M274 - Aluminum-Coated (Type 2), for Corrugated Steel Pipe
 4. M294 - Corrugated Polyethylene Pipe. 12-to-14-inch Diameter
 5. M36 - Metallic Coated Corrugated Steel Culverts and Underdrains
 6. M190 - Bituminous Coated Corrugated Metal Culvert Pipe and Pipe Arches
 7. M199 - Standard Specification for Precast Reinforced Concrete Manhole Sections
- C. American Water Works Association (AWWA)
1. C110 - Ductile-Iron and Gray-Iron Fittings, 3 in through 48 in (75 mm through 1200 mm), for Water and Other Liquids (revision of ANSI/AWWA C110/A21.10-93)

2. C111 - Rubber-Gasket Joints for Ductile-Iron Pressure Pipe and Fittings
3. C151 - Ductile-Iron Pipe, Centrifugally Cast, for Water

D. American Concrete Institute (ACI)

1. 301 - Structural Concrete for Buildings, Specifications for
2. 318 - Building Code Requirements for Structural Plain Concrete

1.06 CLEARING

- A. Clearing or installation of pipe and all drainage structures shall be confined within the working limits of the trenches. Trees, utility poles, survey monuments, underground and overhead utilities shall be suitably protected and preserved.

1.07 EXISTING UTILITIES

- A. Furnish temporary support, adequate protection and maintenance of all underground and surface utility structures, drains, sewers, cables, etc., and other obstructions encountered in the progress of the work.
- B. When the grade of alignment of the pipe is obstructed by existing utility structures, such as conduits, ducts, pipes, branch connections to water or sewer mains, and other obstructions, the obstructions shall be permanently supported, relocated, removed or reconstructed by the CONTRACTOR in cooperation with the owners of such structures. No deviation shall be made from the required line or grade except as directed in writing by the ENGINEER.
- C. It shall be the responsibility of the CONTRACTOR to notify the owners of existing utilities in the area of construction a minimum of 48 hours prior to any excavation adjacent of such utilities, so that field locations of said utilities may be established.
- D. Temporary relocation of existing utilities (to be removed) to accommodate installation of storm drain pipe shall be the responsibility of the CONTRACTOR and approved by the ENGINEER. No additional payment shall be made for temporary relocation of existing utilities and shall be considered part of the bid item for the pipe.

1.08 PROJECT RECORD DOCUMENTS

- A. Accurately record as-built locations of pipe runs, connections, catch basins, cleanouts, top elevations, rim elevations and invert elevations.
- B. Identify and describe unexpected variations of subsurface conditions and location of any utilities encountered.

1.09 QUALITY ASSURANCE

- A. All costs related to re-inspection due to failures shall be paid for by the CONTRACTOR at no additional expense to the OWNER. OWNER reserves the right to direct any inspection that is deemed necessary. CONTRACTOR shall provide free access to site for inspection activities.

PART 2 - PRODUCTS

2.01 PIPE

A. REINFORCED CONCRETE CULVERT PIPE:

1. Concrete pipe shall be produced by a reputable manufacturer engaged in the full-time business of manufacturing concrete pipe. Pipe manufacturer shall produce the pipe from an approved, permanent plant acceptable to the ENGINEER.
2. All concrete pipe shall be reinforced and shall conform to the requirements of ASTM C-76. "Reinforced Concrete Culvert, Storm Drain, and Sewer Pipe". All pipe shall be a minimum of Class III. Pipe shall have an interior surface which is smooth, uniform and free from rough spots, irregularities and projections. Nominal pipe lengths shall be 8' unless authorized otherwise by the ENGINEER. Lifting holes will be permitted, one hole per length.
3. Concrete pipe may be either bell and spigot, tongue and groove or modified tongue and groove.
4. Internal rubber gasket joints shall be used. The internal rubber gasket joint shall be supplied by the pipe manufacturer and shall be completely compatible in every respect with the pipe furnished. The rubber gasket on the inside of the bell or groove shall be installed on the pipe at the plant by the pipe manufacturer. All materials and accessories for the rubber gasket joint and the methods of jointing shall be in strict conformance with the pipe manufacturer's direction and recommendation. Joint must be completely water tight.
5. Cement grout joints shall be completely water tight and acceptable to the ENGINEER. A full bed of mortar shall be placed in the bell and/or groove and on the tongue and/or spigot. The annular space in the pipe joint shall be wiped with cement mortar to insure the joint is filled and to present a smooth surface. The complete exterior periphery of the joint shall have a standard cement grout diaper joint. Diaper shall be installed with the aid of an approved cloth ring. Cement mortar joints shall be made in the dry. Mortar and grout shall be one part Portland Cement to two parts by weight of sand. Mortar shall have enough water to make a stiff mixture that can be molded and worked. Cement mortar joints shall not be covered until inspected and

approved by the ENGINEER.

PART 3 – EXECUTION

3.01 GENERAL

- A. CONTRACTOR shall only use the pipe material as specified on the plans. Alternate materials will not be allowed unless approved by the ENGINEER in writing.
- B. The CONTRACTOR shall install all drainage structures and pipe in the locations shown on the drawings and/or as approved by the OWNER. Pipe shall be of the type and sizes specified on the drawings and shall be laid accurately to line and grade. Structures shall be accurately located and properly oriented.
- C. Excavation and Backfilling for Utilities - The provisions in Section 02305, Excavation and Backfilling for Utilities shall govern all work under this Section.
- D. Storage and Handling of Pipe – All pipe shall be protected against impact, shock and free fall, and only equipment of sufficient capacity and proper design shall be used in the handling of the pipe. Storage of pipe on the job shall be in accordance with the pipe manufacturer's recommendations.
- E. Damage to Pipe
 - 1. Pipe which is defective from any cause, including damage caused by handling, and determined by the OWNER as un-repairable, shall be unacceptable for installation and shall be replaced at no cost to the OWNER and as directed by the OWNER; and,
 - 2. Pipe that is damaged or disturbed through any cause prior to acceptance of the work, shall be repaired realigned or replaced as directed by the OWNER, at the CONTRACTOR's expense.
- F. Manholes, catch basins and drain inlets shall be constructed as soon as the pipe laying reaches the location of the structures. Should the CONTRACTOR continue his pipe laying without making provisions for completion of the structures, the OWNER shall have the authority to stop the pipe laying operations until the structure is completed.
- G. Any structure, which is mis-located or oriented improperly, shall be removed and rebuilt in its proper location, alignment and orientation at the CONTRACTOR's expense.

3.02 EXCAVATIONS

- A. Trenches shall be kept as nearly vertical as possible and, if required, shall be properly sheeted and braced. Where, in the opinion of the ENGINEER, damage

could result from withdrawing sheeting, the sheeting shall be left in place. Not more than 100 feet of trench shall be opened at any one time or in advance of pipe laying unless permitted by the ENGINEER.

1. Except in rock, water-bearing earth or where a granular or concrete base is to be used, mechanical excavation of trenches shall be stopped above the final grade elevation so that the pipe may be laid on a firm, undisturbed native earth bed. If overdigging occurs, all loosened earth shall be removed and the trench bottom brought back to grade with granular material.
2. Excavations and trenches in rock shall be carried to a depth of not less than 8 inches below the pipe bottom. This space shall be filled with granular material or washed rock.
3. Width of trenches shall be such as to provide adequate space for placing and jointing pipe properly, but in every case the trench shall be kept to a minimum width.
4. Any unstable soil encountered shall be removed and replaced with gravel, crushed rock or rock and sand suitably compacted.

3.03 PREPARATION TO TRENCH BOTTOM

- A. Water shall not be allowed in the trenches while the trench bottom is being prepared or while pipe is being installed, unless directed by the ENGINEER.
- B. A continuous trough shall be shaped to receive the bottom quadrant of the pipe barrel. Bell holes shall be excavated so that after placement, only the barrel of the pipe receives bearing pressure from the trench bottom.
- C. Where unsuitable soil conditions are encountered, the trench bottom shall be excavated to a minimum of 8 inches below the proposed bottom of the pipe, and a trough as described above shall be formed with sharp sand or bedding rock to uniformly support the bottom quadrant of the pipe barrel.

3.04 BEDDING

- A. Bedding material, when required, shall be in accordance with Section 02305, Excavation and Backfilling for Utilities for work described within this Section.

3.05 PIPE INSTALLATION

- A. Comply with Section 02305, Excavation and Backfilling for Utilities
- B. Laying Pipe
 1. Unloading and Handling: All pipes shall be unloaded and handled with reasonable care. Pipes shall not be rolled or dragged over gravel or rock

during handling. The CONTRACTOR shall take necessary precautions to ensure the method used in lifting or placing the pipe does not induce stress fatigue in the pipe and the lifting device used uniformly distributes the weight of the pipe along its axis or circumference.

2. Each length of pipe shall be inspected for defects and cracks before carefully lowered into the trench. Any damaged or any pipe that has had its grade disturbed after laying shall be removed and replaced.
3. Lay pipe on prepared foundation starting at the downgrade end according to line and grade with the necessary drainage structures, fittings, bends and appurtenances as shown on the drawings. Rigid pipes shall be laid with the bell or groove ends upgrade with the spigot or tongue fully inserted.
4. Pipe sections shall be firmly joined together with appropriate gaskets or bands.
5. Pipe shall be protected during handling against impact shocks and free falls. Pipe shall be kept clean at all times and no pipe shall be used that does not conform to the Specifications.
6. Pipe joints shall be completely wrapped in filter fabric.
7. The laying of the pipe shall be commenced at the lowest point with spigot ends pointing in the direction of flow. All pipe shall be laid with ends abutting and true to line and grade. They shall be laid in accordance with manufacturer's requirements as approved by the ENGINEER.
8. Pipe shall be laid accurately to the line and grade as designated on the plans. Preparatory to making pipe joints, all surfaces of the portions of the pipe to be jointed, or of the factory-made jointing material, shall be clean and dry. Lubricant, primers, adhesive, etc., shall be used as recommended by the pipe or joint manufacturer's specifications. The jointing materials or factory fabricated joints shall then be placed, fitted, joined and adjusted in such a manner as to obtain a water tight line. As soon as possible after the joint is made, sufficient backfill material shall be placed along each side of the pipe to prevent movement of pipe off line and grade.
9. The exposed ends of all pipe shall be suitably plugged to prevent earth, water, or other substances from entering the pipe when construction is not in progress.

3.06 BACKFILLING TRENCHES

- A. No trenches or excavations shall be backfilled until the trench and installation has been inspected and approval given by the ENGINEER. Under no circumstances shall water be permitted to rise in unbackfilled trenches after pipe has been placed.

Trenches shall be backfilled with approved material, free of large clods, stones or rocks and carefully deposited in layers not to exceed 6 inches until enough fill has been placed to provide a cover of not less than 1 foot above the pipe. Each layer shall be placed, then carefully and uniformly tamped, so as to eliminate the possibility of pipe displacement. The remainder of backfill materials shall then be placed, moistened and compacted in 8-inch layers to 98% maximum AASHTO T-180 density.

- B. Whenever the trenches have been improperly filled or if settlement occurs, they shall be refilled, compacted, smoothed off and made to conform to grade. Unless otherwise directed or shown on the plans, backfill in trenches in or through roadways shall be made as specified above, except that the entire fill above 1 foot over the pipe shall be deposited in layers not to exceed 8 inches in thickness, moistened, and compacted to density equal to or greater than that of adjacent material so that pavement can be placed immediately.

3.07 CONCRETE ENCASEMENT OF DRAINAGE PIPE

- A. Trenches in which encasement for pipe are to be placed may be excavated completely with mechanical equipment. Prior to formation of the encasement, temporary supports consisting of timber wedges or masonry shall be used to support the pipe in place. Temporary supports shall have minimum dimensions and shall support the pipe at no more than two places, one at the bottom of the barrel of the pipe adjacent to the shoulder of the socket and the other near the spigot end.

3.08 DRAINAGE STRUCTURES

- A. All structures shall be built to the line and grade shown on drawings. All reinforced concrete work shall be in strict conformance with the concrete specifications contained herein. After the drainage structure installation, the CONTRACTOR must have inspection and approval from the ENGINEER before backfilling. The CONTRACTOR shall backfill and be placed in layers not exceeding 8 inches in depth measured loose and compacted to 98% of the maximum density as determined by the modified proctor, AASHTO T-180. No defects of any kind in the pipe section will be accepted. All pipe stubs shall be made of the same type of pipe. Pipe stubs shall be sealed with a concrete plug, water tight. The ends of the pipes which enter masonry shall be neatly cut to fit the inner face of the masonry. Cutting shall be done before the pipes are built in.

3.09 INFILTRATION AND EXFILTRATION TESTS

- A. Tests for water tightness shall be made by the CONTRACTOR. Leakage of completed storm sewer system shall not exceed 500 U.S. gallons per day per inch diameter per mile of pipe under minimum hydrostatic pressure of 2 feet. Test shall be conducted in a manner satisfactory to the ENGINEER. Any portion of the project not conforming to the above requirements shall be corrected by the CONTRACTOR, at his own expense, prior to acceptance by the ENGINEER.

3.10 RESTORATION OF SURFACES AND/OR STRUCTURES

- A. The CONTRACTOR shall restore and/or replace paving, curbing, sidewalks, fences and survey points, or any other disturbed surfaces or structures to a condition equal to that before the work was begun and to the satisfaction of the ENGINEER. Relative to restoration of surfaces and/or structures, the CONTRACTOR shall comply with all requirements of governing agencies including city, town, county and state.

3.11 PROTECTION AND CLEANING

- A. The CONTRACTOR shall maintain all pipe installations and drainage structures in a condition such that they will function continuously and shall be kept clean of silt, debris and other foreign matter from the pipe and drainage structure is installed until the project is accepted.

3.12 FINAL INSPECTION

- A. All storm sewers shall be lamped and televised by the CONTRACTOR prior to acceptance of the work. Repairs or misalignment shown necessary by the tests shall be corrected at the CONTRACTOR's expense. All sewers shall be thoroughly cleaned before being placed into use and shall be kept clean until final acceptance by the ENGINEER.
- B. Upon completion of the work and before final acceptance by the OWNER, the entire drainage system shall be subject to a final inspection in the presence of the OWNER and/or ENGINEER. The work shall not be considered as complete until all requirements for line, grade, cleanliness, and workmanship have been completed.

END OF SECTION 02630

SECTION 02741
ASPHALTIC CONCRETE PAVING

PART 1 - GENERAL

1.01 RELATED DOCUMENTS

- A. All applicable provisions of the bidding and Contract Requirements, and Division 1 - General Requirements shall govern the WORK under this section.

1.02 WORK INCLUDED

- A. This section of the specifications covers the control and general conduct of asphalt paving construction for roads, parking, walks and court areas.
- B. All WORK within the Right of Way shall be constructed using materials and methods in accordance with the DRAWINGS and Florida Department of Transportation Standard Specifications for Road and Bridge Construction, January 2019.
 - 1. Grade deviations from Contract and DRAWINGS shall conform to Section 02310, Site Grading.
- C. Provide all labor, materials, necessary equipment and services to complete the Asphaltic Concrete Paving WORK, as indicated on the DRAWINGS, as specified herein or both, except as for items specifically indicated as "Not in Contract (N.I.C.) ITEMS".
- D. Including, but not necessarily limited to the following:
 - 1. Preparation of subgrade.
 - 2. Installation and compaction of base course.
 - 3. Spreading of asphalt surface course.

1.03 RELATED WORK

- A. Section 02300 - Earthwork.
- B. Section 02310 - Site Grading
- C. Section 02751 - Portland Cement Concrete Paving.

1.04 REFERENCE STANDARDS

- A. Florida Department of Transportation Standard Specifications for Road and Bridge Construction, January 2019
 - 1. Section 330 Hot Mix Asphalt - General Construction Requirements

2. Section 334 Superpave Asphalt Concrete
3. Section 337 Asphalt Concrete Friction Courses
4. Section 339 Miscellaneous Asphalt Pavement

1.05 TRAFFIC CONTROL

- A. The CONTRACTOR shall provide and maintain access to and from all properties along the line of the WORK. The CONTRACTOR shall also provide temporary by-passes and maintain them in a safe and usable condition whenever detouring of traffic to parallel routes cannot be done without hardship or excessive increases in travel by the public.

1.06 SPECIAL SUBGRADE CONDITIONS

- A. When special subgrade conditions are encountered for which these "Asphaltic Concrete Paving Specifications" are not applicable, portions of these specifications shall be deleted or revised to provide a properly finished paved surface. A requested revision or deletion of the specifications shall be accompanied with reports and laboratory tests on existing field conditions. Any change from these "Asphaltic Concrete Paving Specifications" shall be approved by the CONSULTANT and shall be in effect only for a specified area or paving project.

1.07 QUALITY ASSURANCE

- A. FDOT Standard Specifications.
 1. WORK and materials within FDOT Right of Way shall conform to all applicable requirements of Florida Department of Transportation Standard Specifications for Road and Bridge Construction, January 2019 (referred to herein as FDOT, Latest Edition unless otherwise stated).
 2. Asphalt shall meet 2019 FDOT Standard Specification and shall meet the latest FDOT Standard Specification.

1.08 SUBMITTALS

- A. Job Mix Designs: CONTRACTOR shall submit a mix design for each pavement course proposed for construction for the OWNER's review and approval 45 days prior to schedule production and lay down of the mix. The design mix submittal shall be formatted as indicated in the Florida Department of Transportation Standard Specifications for Road and Bridge Construction, January 2019; and shall include type/name of mix, gradation analysis, grade of asphalt cement, Marshall Stability in pounds flow, effective asphalt content in percent (%), and corresponding copies of governing Florida Department of Transportation (FDOT) material specifications or regulatory authorities having jurisdiction for each proposed material.

- B. Material Certificates: CONTRACTOR shall submit certificates stating that asphalt mix to be supplied complies with the specifications of the governing Florida Department of Transportation (FDOT) or regulatory authority having jurisdiction, as well as copies the regulatory specifications corresponding to the asphalt mix formula and material. The certificates shall be signed by the asphalt mix producer and the CONTRACTOR.

1.09 JOB CONDITIONS

- A. Apply prime and tack coats when ambient temperature is above 50 degrees, and when temperature has not been below 35 degrees for 12 hours immediately prior to application. Do not apply when base is wet or contains an excess of moisture.
- B. Construct asphalt concrete surface course only when atmospheric temperature is above 40 degrees, and when base is dry. Base course may be placed when air temperature is above 30 degrees, and rising.

1.10 LOCATIONS, LAYOUT AND GRADES

- A. Locate and layout paved areas and right-of-ways with reference to benchmarks, property lines or buildings according to the DRAWINGS and as accepted by the CONSULTANT. CONTRACTOR shall not utilize electronic files from the CONSULTANT for layout.
- B. Determine locations of paved edges and right-of-way line from surveyor's permanent reference monuments and information on the Horizontal Control DRAWINGS.
- C. Where permanent reference monuments are not available, obtain proper line locations from authorities having jurisdiction.
- D. Establish and maintain required lines and elevations.
- E. Furnished rock as-builts shall demonstrate a positive flow along the edge of pavement and road crown from the high point to the low point (catch basin /inlet) as indicated on the contract DRAWINGS.

PART 2 - PRODUCTS

2.01 FILL

- A. All fill shall be clean rock and sand (maximum rock size = 1 inch).
- B. Fill shall be compacted thoroughly as per Section 02300 - Earthwork.

2.02 LIMEROCK

- A. Limerock shall be obtained from pits for which all overburden has been removed previous to blasting and shall show no tendency to air slake and must undergo the following chemical requirements.

1. Carbonates of Calcium Min.70.0 percent (Miami Limerock) and Magnesium (24 feet roadway)

Min 60.0 percent (Miami Limerock) and Magnesium.
(22 feet roadway)

Min. 95.0 percent (Ocala Limerock)
 2. Oxides of Iron and Aluminum Max. 2.0
 3. Organic Matter Max. 0.5
 4. Any constituents of other than the above shall be silica or inert material.
 5. The material shall be crushed to such size that not less than 97 percent shall pass a 3-1/2 inches sieve and it shall be graded uniformly down to dust. All fine material shall consist entirely of dust of fracture.
 6. Limerock from on-site may be used if the material meets the requirements of this section of the specifications.
- B. All limerock shall comply with requirements set forth under Section 230, Florida Department of Transportation Standard Specifications for Road and Bridge Construction, January 2019.
- C. Equipment: The equipment for constructing the rock base shall be in first class working condition and shall include:
1. Vibratory compactor weighing not more than three tons. If approved in writing by the CONSULTANT, larger vibratory compaction equipment may be allowed if operated in static mode only.
 2. Self-propelled blade grader weighing not less than three tons. The wheel base shall be not less than fifteen feet and blade length not less than ten feet.
 3. Scarifiers shall have teeth space not to exceed 4-1/2 inches.
 4. Provision for furnishing water at the construction site by tank or hose at a rate not less than 50 gallons per minute.

2.03 PRIME COAT

- A. Prime coat shall be in accordance with Section 300, Florida Department of Transportation Standard Specifications for Road and Bridge Construction, January 2019.
- B. Prime coat shall have full compatibility with surface treatment asphalt.
- C. The sand for cover shall be clean dry sand.

2.04 TACK COAT

- A. The bituminous material to be used for the tack coat shall conform to the requirements of the Florida Department of Transportation Standard Specifications for Road and Bridge Construction, January 2019, Section 300.

2.05 ASPHALT

- A. The asphaltic concrete outside of FDOT Right of Way shall be in accordance with Florida Department of Transportation Standard Specifications for Road and Bridge Construction, January 2019 Specifications for Asphaltic Concrete Surface Course.
- B. Pavement within public road and alley rights-of-ways which has been disturbed by this construction shall be replaced with Super Pave per FDOT specifications.
- C. Final lift of asphaltic concretes shall be virgin material only and shall be placed at the end of the project. (First lift may be R.A.P. (reclaimed asphaltic paving) in accordance with FDOT standards).
- D. The asphaltic concrete within FDOT Right of Way shall be in accordance with FDOT specifications for Super Pave.

2.06 SEAL COATING

- A. Homogeneous mixture of emulsified coal tar pitch, asbestos, sand and other inert fillers. It shall be easily remixed if settlement occurs in storage (except in the case of freezing). It shall be capable of application and complete coverage by rubber squeegee, brush, or approved mechanical method, to the surface of bituminous pavements at the spreading rate of 0.2 to 0.3 gallons per square yard in two coats.
- B. Approved product: "TARFEX" manufactured by Bitucote Products Co. or approved equal.

PART 3 - EXECUTION

3.01 COLD MILLING

- A. Milling of existing asphalt pavement shall be at the depth and location as indicated on the Construction DRAWINGS or as directed by the OWNER.
- B. The milled surface shall be reasonably smooth and free of excessive scarification marks, gouges, ridges, continuous grooves, or other damage. The milled pavement surface shall be thoroughly cleaned of all loose aggregate particles, dust, and other objectionable material by the use of power brooms, power blowers, power vacuums or other means.
- C. The CONTRACTOR shall coordinate the adjustment of maintenance access structures, meter boxes, drainage inlets, and valve boxes with the milling

operation.

- D. All milled material shall become the property of the CONTRACTOR and shall be disposed of off-site or used in conformance with Section 02300, Earthwork, or for utilization as Reclaimed Asphalt Pavement, in conformance with the specification provided above, as approved by the OWNER.

3.02 PATCHING

- A. Hot-Mix Asphalt Pavement: Saw cut perimeter patch and excavate existing pavement section to sound base. Excavate rectangular or trapezoidal patches, extending 12 inches into adjacent sound pavement, unless otherwise indicated or directed by the OWNER. Re-compact existing unbound-aggregate base course to form new subgrade.
- B. Tack Coat: Apply uniformly to vertical surfaces abutting or projecting into new, hot-mix asphalt paving at a rate of 0.05 gallon per square yard.
- C. Patching: Fill excavated pavements with hot-mix asphalt base mix, and while it is still hot, compact flush with adjacent surface.

3.03 BARRICADES

- A. Provide substantial temporary barricades around all areas of operation and maintain until WORK under this section is completed and approved.
- B. Install temporary traffic markers, signals, and signs as per FDOT and Palm Beach County Traffic Specifications to:
 - 1. Eliminate potentially hazardous conditions.
 - 2. Maintain adequate traffic patterns free of conflict with WORK under this Contract.

3.04 PREPARATION OF SUBGRADE

- A. This WORK consists of bringing the bottom of excavations and top of embankments of the roadway between the outer limits of the shoulders or base course to a surface conforming to the grades, lines, and cross sections shown on the plans. The subgrade shall be of uniform density ready to receive the rock base of the paving course.
- B. All soft and yielding material and other portions of the subgrade which will not compact readily shall be removed and replaced with suitable material and the entire subgrade brought to line and grade to provide a foundation of uniform compaction and supporting power.
- C. Stumps, roots, and other deleterious organic matter encountered in the preparation of the subgrade shall be removed.

- D. Where fills are required on areas covered or partly covered by existing paving, the entire area of such existing paving shall be scarified to a depth of at least six inches, and the scarified material spread evenly over the area to be filled to a width not less than that of the proposed paving.
- E. Material for fills shall consist of sand or other suitable material approved by the CONSULTANT free from stumps, roots, brushes, and other deleterious organic matter.
- F. Where fill is more than 1 foot in depth, the backfill material above the ground water table shall be compacted in 8-inch depth lifts. Each individual layer of fill under the rock base shall have a density of 98 percent of the maximum density as determined by the AASHTO T-180 unless shown otherwise on the plans. Each individual layer of fill under the shoulder area shall have a density of 98 percent of the maximum density as determined by AASHTO T-180, unless shown otherwise on the plans.
- G. The bottom of all excavated areas and the top of all fills where rock base is to be constructed shall be thoroughly compacted by rolling. Water shall be used to insure thorough compaction. The stability of the top 12-inch thickness of the subgrade immediately under the base, for the full base width plus 1 foot on each side, shall be minimum LBR 40.
- H. Bring subgrade which has been properly filled and shaped to a firm unyielding surface, by rolling an entire area with an approved power roller:
 - 1. Thoroughly compact area inaccessible to the roller with approved hand tamper.
 - 2. Apply water sufficiently to compact the subgrade where the subgrade is of a dry, sandy nature and cannot be rolled.
- I. The subgrade shall be maintained free from ruts, depressions or other irregularities until rock base material is spread.
- J. For all roads, streets and paved areas other than State Highway, the stabilized subgrade shall have a minimum Limerock Bearing Ratio (LBR) of 40, unless otherwise noted on the plans.
- K. Where the bearing value of the existing subgrade is adequate without addition of stabilizing material, the subgrade shall be scarified and disked, harrowed, bladed or tilled for removal of boulders, roots, etc. to assure uniformity and thorough mixing of material to the full width and depth of required stabilization. The compacted subgrade shall conform to the lines, grades and cross-section shown on the plans.
- L. Test subgrade for crown and elevation after preparation and immediately before base of paving course is laid:

1. Remove or add material and compact to bring to a correct elevation and uniform bearing if the subgrade is found not to be at the specified elevation at all points.
2. Adjust the maintenance access structure rims, catch basin frames and valve boxes where necessary to match proposed finish grade.

3.05 CONSTRUCTION OF BASE COURSE

- A. This WORK consists of construction of lime rock base course for the asphaltic concrete wearing surface. The base course shall be constructed on the prepared subgrade in 8 inches thick limerock bases constructed in two four-inch lifts as shown on the DRAWINGS. Twelve (12) inch thick limerock bases shall be constructed in two six-inch lifts. The limerock base shall be a minimum LBR of 100.
- B. Spreading Rock: The rock shall be transported to the points where it is to be used over rock previously placed, and dumped on the end of the preceding spread. It shall then be spread uniformly with hand tools, or mechanical equipment. In no case shall rock be dumped directly on the subgrade. No hauling shall be done over the subgrade.
- C. Compacting Rock:
 1. Following spreading, the rock shall be rolled with a three-wheel roller weighing not less than ten tons, water being added as required, until the entire depth of base is compacted into a dense unyielding mass.
 2. No greater area of rock base shall be placed during any one day than that which can be rolled and compacted on the same day.
- D. Finishing Base:
 1. After watering and rolling, the entire surface shall be thoroughly scarified to a depth not less than 4 inches and shaped to exact crown and cross section, re-watered and again thoroughly rolled. Rolling shall continue until the entire depth of base is bonded and compacted into a dense, unyielding mass, true to grade and cross section.
 - a. Any irregularities which may develop in the surface during such finishing shall be corrected by the removal or addition of rock as the case may be.
 - b. If at any time the subgrade material becomes churned up and mixed with the base rock, the CONTRACTOR shall dig out and remove the mixture, reshape and compact the subgrade and replace the materials removed with clean rock which shall be watered and rolled until satisfactorily compacted.

- c. Where cracks or checks appear in the base either before or after priming, which in the opinion of the CONSULTANT would impair the structural efficiency of the base course, the CONTRACTOR shall remove such cracks or checks by re- scarifying, reshaping, watering, rolling and adding rock where necessary.
 - d. During final compacting operations, if grading 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 tests on the finished base.
- E. Inferior Rock: If in the opinion of the CONSULTANT at any time during the progress of the WORK, rock of inferior quality is being delivered to the construction site, a laboratory analysis of the rock shall be made. Should the results of such tests indicate that the rock does not conform to specifications, the CONTRACTOR shall, without any expense to the OWNER, remove such inferior material from the area indicated and deliver and spread satisfactory rock on said area.
- F. Testing Surface: The finished surface of the rock base shall be true to the required cross section. Any irregularities in the grade greater than $\frac{1}{4}$ inch, as determined by placing a ten-foot straight edge parallel with the centerline and use of full width crown board, shall be corrected by scarifying to a depth of 3 inches, removing or adding rock as may be required and again watering, rolling, and compacting the scarified area. In testing the surface for irregularities, the measurements under the straight edge shall not be taken in small holes caused by individual pieces of rock having been pulled out by the road grader. The finished rock base shall provide positive flow from the high point to the low point (catch basin/inlet) as indicated on the Contract DRAWINGS.
- G. Thickness Determination: Thickness of the base shall be measured by intervals as required by the CONSULTANT. Measurements shall be taken at various points on the cross section. The measurements shall be taken in holes through the base of not less than 3 inches in diameter. Where the base is more than $\frac{1}{2}$ inch less than the required compacted thickness, the CONTRACTOR shall correct such areas by scarifying and adding rock. The affected areas shall then be watered, rolled and brought to a satisfactory state of completion, and of required thickness and cross section.
- H. Density: Density determinations shall be made by the CONTRACTOR or at intervals required by the CONSULTANT. An average required density shall be 98 percent of maximum density obtainable under AASHTO Method T-180. No section of base shall be accepted when more than 10 percent of tests fall below 98 percent of maximum density and in no case shall a density of less than 96 percent of maximum be accepted.

- I. Testing: The CONTRACTOR shall coordinate with CONSULTANT for all testing. One test shall be made in accordance with AASHTO T-180 for each class of material in the subgrade and base:
 1. In place density tests in accordance with AASHTO T-147 shall be made in the locations shown on the plans. Two copies of the test reports will be sent directly to the CONSULTANT for evaluation.
 2. Any material which fails to meet these specifications shall be removed, replaced, and retested, all at the CONTRACTOR's expense.
 3. Tests shall be taken at least every 1,000 square yards and taken at locations and lifts as directed by the CONSULTANT.

3.06 PRIME COAT FOR BASE COURSE

A. Cleaning the prepared base:

1. Before any bituminous material is applied, all loose material (dust, dirt, caked clay and foreign matter) which might prevent proper bond with the existing surface shall be moved to the shoulders, to the full width of the treatment, by means of revolving brooms or approved mechanical sweepers and by mechanical blowers, of approved types, supplemented by hand sweeping. Dust and other loose materials not removed by mechanical means shall be removed with hand brooms. Particular care shall be taken to clean the outer edges of the strip to be treated in order to insure that the prime coat will adhere. Sweeping and blowing shall be continued until all the loose dust and dirt is removed from the surfaces.
2. Application of bituminous material shall be made during the same day surface has been swept and as soon as practical thereafter.

B. Application for prime coat:

1. The bituminous material shall be applied to the clean dry surface of the rock base at such temperature as will insure uniform distribution. The amount applied will be at the rate of approximately 0.10 to 0.20 gallons per square yard of base area. The application shall be made by means of self-propelled pressure distributor operating under a pressure not less than 20 pounds per square inch. Application of bituminous material shall be made on only one-half of the width of base at one time.
2. The primed base shall then be covered with a uniform layer of clean sand, and kept thoroughly and uniformly covered by additional sand or sweeping until it shows no signs of picking up under traffic. For a period of one week after priming, the CONTRACTOR shall again broom any area where insufficient cover sand or excess of bituminous material causes "bleeding" and, if necessary, spread additional sand on such area.

- C. Prime coat finish: After prime has cured or sat and been sanded, the shoulder shall be shaped to conform to all grade lines and cross sections and the entire area shall be rolled and compacted with a rubber-tired roller or a power roller before asphalt surface is laid on the finished base.

3.07 BITUMINOUS TACK COAT

- A. Before applying any bituminous material, all loose material: dust, dirt and foreign material, which might prevent proper bond with the existing surface, shall be removed for the full width of the application.
- B. Application for tack coat:
 - 1. The surface to receive the tack coat shall be clean and dry. The tack coat shall be clean and dry. The tack coat shall be applied with a pressure distributor except that on small jobs, if approved by the CONSULTANT, the application may be made by other approved mechanical methods or by hand methods. The pressure distributor shall operate at a pressure not less than 20 pounds per square inch and at a consistency such that it can be properly pumped and sprayed uniformly over the surface.
 - 2. The bituminous material shall be applied in a thin uniform layer. The rate of application shall be between 0.02 and 0.10 gallon per square yard. The tack coat shall be applied sufficiently in advance of the laying of the wearing surface to permit drying, but shall not be applied so far in advance that it might lose adhesiveness as a result of being covered with dust or other foreign material. The tack coat surface shall be kept free from traffic until the wearing surface is laid.

3.08 ASPHALTIC CONCRETE WEARING SURFACE COURSE

- A. Cleaning and preparing base:
 - 1. Prior to the laying of the asphaltic concrete, the base of pavement to be covered shall be cleaned of all loose deleterious material by the use of power brooms or blowers. A tack coat shall be applied on all pavement. The tack coat shall not be applied so far in advance of laying operations as to allow shifting and sand or weather conditions to nullify its effectiveness.
 - 2. After the surface has been thoroughly cleaned, all holes shall be filled with asphaltic concrete, if necessary, and thoroughly compacted to conform to the existing surface and to form a smooth surface.
- B. Placing asphaltic concrete: The asphaltic concrete surface course applied after the tack coat and be permitted a reasonable time for drying, but not to an extent that the tack coat is allowed to lose its adhesiveness:
 - 1. Machine spreading: Upon arrival the mixture shall be dumped into the

approved mechanical spreader and immediately spread and struck off to the full width required and to such appropriate loose depth for each successive course that when the WORK is completed the required weight of the mixture per square yard or the specified thickness will be secured. An excessive amount of mixture shall be carried ahead of the screen at all times. Hand raking shall be done behind the machine as required.

2. Hand spreading: In limited areas, where, on account of irregularities or unavoidable obstacles, the use of mechanical spreading and finishing equipment is impractical, the mixture may be spread by hand, when so authorized by the CONSULTANT.
3. The mixture shall be laid only when the surface to be covered is dry and only when weather conditions are suitable.
4. All structures which will be in actual contact with asphaltic mixture, including the face or surface of curbs or gutters and their vertical faces of existing pavements, shall be painted with a uniform coating of asphalt material to provide a closely bonded, watertight joint.
5. Where necessary, due to the traffic requirements, the mixture shall be laid in strips in such manner as to provide for the passage of traffic.
6. Any mixtures caught in transit by a sudden rain may be laid at the CONTRACTOR's risk. In no case shall the mixture be laid while rain is falling or when there is water on the surface to be covered.
7. The depth of the layer being spread shall be gauged as directed, and where the thickness fails to average the specified thickness, immediate steps shall be taken to correct the depth.
8. Before any rolling is started, the course surface shall be checked, any inequalities adjusted, and all drippings, fat sand accumulations from the screed and fat spots from any source shall be removed and replaced with satisfactory material.
9. Straight-edging and back-patching shall be done after initial completion has been obtained and while the material is still hot. Any irregularity greater than ¼ inch either longitudinally or transversely shall be corrected at this time.
10. No skin patching shall be done. When a depression is to be corrected while the mixture is hot, the surface shall be well scarified before the addition of fresh mixture. If irregularities occur and are not corrected while the mixture is still hot, the irregularities shall be cut out the full depth of the layer and replaced with fresh mixture.

C. Compacting mixture: After the spreading, the mixture shall be rolled when it has

set sufficiently or come to the proper condition to be rolled, and when the rolling does not cause undue displacement or shoving:

1. The motion of the roller shall at all times be slow enough to avoid displacement and shall at once be corrected by the use of rakes and fresh mixture where required. The rolling shall include all transverse, longitudinal, and diagonal rolling, as may be necessary to obtain the maximum density.
2. The seal rolling with tandem steel rollers weighing from five to eight tons shall follow as close behind the spreader as is possible without picking up, or displacing or blistering the material.
3. Rolling with the self-propelled pneumatic-tired rollers shall follow as soon as possible and as close behind the seal rolling as the heat of the mixture will permit. The rolling shall be done while pavement temperature is between 175 degrees and 240 degrees F, and to such an extent that the self-propelled traffic roller shall cover every area of the surface with at least ten passes. Final rolling with tandem steel rollers shall be done after the rolling with self-propelled pneumatic tired rollers is completed. This final rolling shall be done before the pavement temperature is lower than 175 degrees F, and shall be continued until all roller marks or tire marks are eliminated.
4. Self-propelled pneumatic rollers shall be used for the rolling of patching and leveling courses. At the option of the CONTRACTOR, a steel-wheeled roller may be used to supplement the self-propelled pneumatic-tired rollers but not more than one steel- wheeled roller may be used in conjunction with the necessary number of self-propelled pneumatic-tired rollers. After final completion, the finished pavement shall at no point have a density less than 95 percent of the laboratory compacted density.
5. Rolling with the self-propelled pneumatic-tired roller shall proceed at a speed from six to twelve miles per hour and the rate of rolling shall not exceed 3,000 square yards per hour per roller. A sufficient number of self-propelled pneumatic-tired rollers shall be used so that the rolling of the surface for the required number of 10 passes within this maximum rolling rate shall not delay any other phase of the placing operation and not result in excessive cooling of the mixture before the rolling is complete. In the event that the rolling is not properly maintained to schedule as outlined above, the laying operation shall be discontinued until the rolling operations are sufficiently caught up.
6. In all places inaccessible to a roller, such as adjacent to curbs, headers, gutters, bridges, maintenance access structures, etc., the required compaction shall be secured with tamps. Depressions which may develop before the completion of the rolling shall be remedied by loosening the

mixture laid and adding new material to bring such depressions to a true surface.

7. Should any depressions remain after final compaction has been obtained, the mixture shall be removed sufficiently and new material added to form a true and even surface. All high spots, high joints and honeycombs shall be adjusted as directed by the CONSULTANT.
 8. The mixture, after compaction, shall be of the thickness shown on the plans. After compaction, the surface shall not show an excess of asphalt. Any area showing such excess or other defect shall be cut out and replaced with fresh mixture and immediately compacted to conform with the surrounding area. Any mixture which becomes loose or broken, mixed with dirt in the wearing course shall be removed and replaced with fresh mixture which shall be immediately compacted to conform with surrounding areas.
 9. Gasoline or oil from rollers shall not be allowed to deposit on the pavement and any pavement damaged by such deposits shall be removed and replaced as directed by the CONSULTANT.
 10. Any mixture remaining unbonded after rolling shall be removed and replaced.
- D. Protection of pavement: After the completion of the pavement, no vehicular traffic of any kind shall be permitted on the pavement until it has set sufficiently as approved by the CONSULTANT.

3.09 ASPHALT OVERLAY

- A. Clean existing asphalt and clear of loose aggregate. Road edges shall be milled to a minimum depth of 1 inch.
- B. Risers shall be installed to bring existing maintenance access structure rims, valves, basins, etc. to grade.
- C. Structural patching necessary to seal existing cracks or pot holes shall be done prior to tack coat. Tack coat shall be applied to ensure proper adhesion between the old surface and new asphalt.
- D. Hot mix asphalt shall be applied at the depth specified on the plans. All edges and ends shall be sloped to create a smooth seam between old and new pavement surfaces.

3.10 ABUTTING EXISTING PAVING

- A. Meet elevation of existing paving and structures, facilities and utilities where applicable by feathering the thickness of the new surface course for not more than 1 foot in the periphery of the structure, facility or utility. Do not cover access

covers, maintenance access structure tops, water meters or other similar devices.

3.11 PAVEMENT EDGES

- A. Make edges of paved area conform to details and sections as shown on DRAWINGS.

3.12 SEAL COATING

- A. Preparation of surface: Pavement to be sealed must be sound and free of loose dust, dirt, stones, or other foreign matter:
 - 1. Repair any breaks or holes.
 - 2. Scrape off accumulations of oil or fuel drippings and scrub with detergent and water. Remove all traces of detergent.
 - 3. Soft or damaged spots must be repaired.
 - 4. Flush entire area with clean water.
 - 5. Pavement should be damp (no puddles or excess water) when seal coating is applied.
- B. MIXING: Stir seal coating to a uniform consistency, use no solvents for thinning. Dilute seal coating with 10 percent to 20 percent clean water, stirring to uniform consistency.
- C. Application:
 - 1. Seal coat may be applied to dampened surface with a rubber squeegee, soft bristled push broom, or approved mechanized equipment.
 - 2. Seal coating may be poured directly onto pavement in a ribbon or windrow. Squeegee is placed on pavement at a slight angle to edge line of pavement and pulled in a window along pavement in parallel lines, always working excess material toward bottom edge of squeegee.
 - 3. Seal coating should be applied in two (2) thin coats. After first coat is completely dry to touch, a second coat may be applied at right angles to the first. Rate of application will depend on porosity of surface.
 - 4. Allow to cure for 24 hours before opening to traffic.
 - 5. Do not apply seal coating when temperature is below 50 degrees F, or falling, before sealer is dry, or rain appears imminent or forecast.
 - 6. Apply in strict accord with manufacturers published instructions.

3.13 FIELD QUALITY CONTROL

- A. Test in place asphalt concrete course for compliance with requirements for thickness and surface smoothness. Repair or remove and replace unacceptable paving as directed by CONSULTANT:
 - 1. In-place compacted thickness will not be acceptable if exceeding following allowable variation from required thickness:
 - a. Base Course: Not greater than $\frac{1}{2}$ inch of specified thickness.
 - b. Wearing Course: Not greater than $\frac{1}{4}$ inch of specified thickness.
 - 2. Test finished surface of each asphalt concrete course for smoothness, using 10 feet straight edge applied parallel with, and at right angles to centerline of paved area. Surfaces will not be acceptable if exceeding the following tolerances for smoothness.
 - a. Base Course Surface: $\frac{1}{4}$ inch.
 - b. Wearing Course Surface: $\frac{1}{8}$ inch.
- B. Check surface area at intervals as directed by the CONSULTANT.
- C. Finish grade of asphaltic concrete wearing course shall be within +0.04 feet of the grades indicated on the plans.

3.14 CLEAN UP

- A. Remove all debris and excess material immediately from project site.
- B. Take down all barricades and temporary traffic markers, signals and signs only after all WORK included in this section is finished and inspected, and only after so directed by the CONSULTANT.
- C. Leave project area clean, orderly and free of any hazardous conditions.

END OF SECTION 02741

SECTION 02750

WASTEWATER FLOW CONTROL

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" Pipe20% of pipe diameter

12" - 24" Pipe25% of pipe diameter

Above 24" Pipe.....30% of pipe diameter

2. Maximum Depth of Flow – Joint Testing/Sealing

6" - 12" Pipe25% of pipe diameter

15" - 24" Pipe30% 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 02750

SECTION 02751

PORTLAND CEMENT CONCRETE PAVING

PART 1 - GENERAL

1.01 RELATED DOCUMENTS

- A. All applicable provisions of the Bidding and Contract Requirements, and Division 1 - General Requirements shall govern the work under this Section.

1.02 SUMMARY

- A. This Section includes all Portland concrete pavement, including but not limited to:
 - 1. Driveways and roadways
 - 2. Parking lots
 - 3. Curbs and gutters
 - 4. Sidewalks
 - 5. Drainage Aprons

1.03 WORK INCLUDED

- A. Provide all labor, materials, necessary equipment and services to complete the Portland Cement Concrete Paving work, as indicated on the drawings, as specified herein or both.
- B. Including, but not necessarily limited to the following:
 - 1. Fill, subgrade, and limerock base.
 - 2. Concrete formwork.
 - 3. Concrete reinforcement.
 - 4. Isolation and contraction joints.
 - 5. Concrete paving.

1.04 RELATED WORK

- A. Section 02300 - Earthwork.
- B. Section 02741 - Asphaltic Concrete Paving - General.

1.05 REFERENCE STANDARDS

A. American Society of Testing Materials (ASTM)

1. A82 - Standard Specification for Steel Wire, Plain, for Concrete Reinforcement
2. A185 - Standard Specification for Steel Welded Wire Fabric, Plain, for Concrete Reinforcement
3. A615/A615M - Standard Specification for Deformed and Plain Billet-Steel Bars for Concrete Reinforcement
4. C33 - Standard Specification for Concrete Aggregates
5. C94 - Standard Specification for Ready-Mixed Concrete
6. C150 - Standard Specification for Portland Cement
7. C171 - Standard Specification for Sheet Materials for Curing Concrete
8. C260 - Standard Specification for Air-Entraining Admixtures for Concrete
9. C309 - Standard Specification for Liquid Membrane-Forming Compounds for Curing Concrete
10. C494/C494M - Standard Specification for Chemical Admixtures for Concrete
11. C979 - Standard Specification for Pigments for Integrally Colored Concrete
12. C1116 - Standard Specification for Fiber-Reinforced Concrete and Shotcrete
13. D1751 - Standard Specification for Preformed Expansion Joint Filler for Concrete Paving and Structural Construction (Nonextruding and Resilient Bituminous Types)
14. D1752 - Standard Specification for Preformed Sponge Rubber and Cork Expansion Joint Fillers for Concrete Paving and Structural Construction
15. D3405 - Standard Specification for Joint Sealants, Hot-Applied, for Concrete and Asphalt Pavements
16. D5249 - Standard Specification for Backer Material for Use with Cold- and Hot-Applied Joint Sealants in Portland-Cement Concrete and Asphalt Joints

17. D5893 - Standard Specification for Cold Applied, Single Component, Chemically Curing Silicone Joint Sealant for Portland Cement Concrete Pavements

B. American Concrete Institute (ACI)

1. 301R-99 - Specifications for Structural Concrete
2. 304R - Placing and Handling Concrete, etc.
3. 309R-96 - Guide for Consolidating of Concrete
4. 330.1 - Standard Specifications for Plain Concrete Parking Lots
5. 330R-92 - Guide for Design & Construction of Concrete Parking Lots
6. 211.1R-91 - Standard Practice for Selecting Proportions for Normal, Heavyweight and Mass Concrete

B. American Association of State Highway and Transportation Officials (AASHTO)

1. M182 - Standard Specifications for Burlap Cloth made from Jute for Kenaf
2. M153 - Standard Specifications for Preformed Sponge Rubber and Cork Expansion Joint Filler

1.06 QUALITY ASSURANCE

- A. Requirements of Regulatory Agencies: Perform work in accordance with local building and other applicable codes.
- B. Installation: Performed only by skilled workmen with satisfactory record of performance on completed projects of comparable size and quality.
- C. Inspection and Testing: Performed in accordance with Sections 01330, and 01410 unless otherwise specified:
 1. Test cylinders - as per ASTM C-39.
 - a. Minimum of three (3) concrete test cylinders shall be taken for every 75 or less cubic yards of concrete placed.
 - b. Minimum of one (1) additional test cylinder shall be taken during any cold weather concreting, and be cured on job site under same conditions as the concrete it represents.

2. Slump test - as per ASTM C-143:

- a. Minimum of one (1) slump test shall be taken for each set of test cylinders taken.

1.07 SUBMITTALS

- A. Test Reports: Reports of concrete compression, yield, air content, and slump tests.
- B. Certificates:
 - 1. Manufacturer's certification that materials meet specification requirements.
 - 2. Material content on a cubic yard basis of each class of concrete furnished.
 - a. Dry weights of cement.
 - b. Saturated surface-dried weights of fine and coarse aggregate.
 - c. Quantities, type and name of admixtures.
 - d. Weight of water.
 - 3. Ready-mix delivery tickets, ASTM C-94.
- C. Shop Drawings:
 - 1. Show sizes and dimensions for fabrication and placing of reinforcing steel and bar supports.
 - 2. Indicate bar schedules, stirrup spacing, and diagrams of bend bars.

1.08 DELIVERY, STORAGE AND HANDLING

- A. Deliver reinforcement to project site in bundles marked with metal tags indicating bar size and length.
- B. Handle and store materials to prevent contamination.

1.09 JOB CONDITIONS

- A. Allowable concrete temperatures:
 - 1. Hot weather: Maximum 90°F as per ASTM C-94.
- B. Do not place concrete during rain, unless protection is provided.

PART 2 - PRODUCTS

2.01 FILL

- A. As specified in Section 02741 - Asphaltic Concrete Paving - General

2.02 SUBGRADE

- A. As specified in Section 02741 - Asphaltic Concrete Paving - General

2.03 LIMEROCK BASE

- A. As specified in Section 02741 - Asphaltic Concrete Paving - General

2.04 READY-MIXED CONCRETE

- A. Cement: ASTM C-150, normal Type 1.
- B. Aggregate: ASTM C 33, uniformly graded, from a single source.
- C. Water/Ready Mix Concrete: ASTM C 94.
- D. Admixtures: Certified by manufacturer to contain not more than 0.1 % water-soluble chloride ions by mass of cement and to be compatible with other admixtures, as follows:
 - 1. Air-Entraining Admixture: ASTM C 260;
 - 2. Water-Reducing Admixture: ASTM C 494, Type A;
 - 3. Water-Reducing and High-Range Admixture: ASTM C 494, Type F;
 - 4. Water-Reducing and Accelerating Admixture: ASTM C 494, Type E; and,
 - 5. Water-Reducing and Retarding Admixture: ASTM C 494, Type D.
 - 6. Fly ash and pozzolans: ASTM C-618.
- E. Coarse aggregate: Not less than 50% clean, hard, crushed stone conforming to requirements of Table 2, size number 467 ASTM C-33.
- F. Slump Range: 2-4 inches - tested according to ASTM designation C-143 (AASHTO-T119).
- G. Air content: 5% ± 1%.
- H. Mix proportioning:
 - 1. 28-day compressive strength of cured laboratory samples 3,000 psi.

2. Minimum cement content 5 sacks/cubic yard.
- I. Calcium Chloride: The use of calcium chloride or admixtures containing more than 0.05% chloride ions is prohibited.
 - J. Curing Materials:
 1. Absorptive Cover: AASHTO M 182, Class 2, burlap cloth made from jute or kenaf, weighing approximately 9 oz./sq. yd. dry;
 2. Moisture-Retaining Cover: ASTM C 171, polyethylene film or white burlap-polyethylene sheet;
 3. Water: Potable;
 4. Evaporation Retarder: Waterborne, monomolecular film forming, manufactured for application to fresh concrete;
 5. Clear Solvent-Borne Liquid-Membrane-Forming Curing Compound: ASTM C 309, Type 1, Class B;
 6. Clear Waterborne Membrane-Forming Curing Compound: ASTM C 309, Type 1, Class B;
 7. White Waterborne Membrane-Forming Curing Compound: ASTM C 309, Type 2, Class B.
 - K. Mixes:
 1. ASTM C-94.
 2. Mix concrete only in quantities for immediate use.
 3. Do not retemper or use set concrete.

2.05 CONCRETE MIXES AND MIXING

- A. Concrete Mixes: Prepare design mixes, proportioned according to ACI 211.1R-91 and ACI 304, with the following properties:
 1. Compressive Strength (28 Days): 3,000 psi;
- B. Coloring Agent: When required, add coloring agent to mix according to manufacturer's written instructions.
 1. Expansion and Isolation-Joint-Filler Strips: ASTM D 1751, asphalt-saturated cellulosic fiber, or ASTM D 1752, cork or self-expanding cork; and,

- 2. Coloring Agent: ASTM C 979, synthetic mineral-oxide pigments or colored water-reducing admixtures; color stable, nonfading, and resistant to lime and other alkalis.
- C. Ready-Mixed Concrete: Comply with requirements and with ASTM C 94 and ASTM C 1116.
- D. Project-Site Mixing: On-site mixing must be approved by the OWNER. Comply with requirements and measure, batch, and mix concrete materials and concrete according to ASTM C 94. Mix concrete materials in appropriate drum-type batch machine mixer.

2.06 REINFORCEMENT

- A. Reinforcing Steel Bars: 60 ksi yield strength; deformed billet steel bars; ASTM A-615, plain finish.
- B. Welded Steel Wire Fabric: Plain type, ASTM A-185, hot dip galvanized, plain finish.
- C. Tie Wire: FS QQ-W-461-G, annealed steel, black, 16 ga. minimum.
- D. Bar Supports: Conform to "Bar Support Specifications," CRSI Manual of Standard Practice.

2.07 FORMWORK AND ACCESSORIES

- A. Formwork: Matched, tight fitting and adequately stiffened to support weight of concrete without deflection detrimental to tolerances and appearance of concrete, conform with ACI 347, Chapter 3, Material and Form Work.
- B. Lumber:
 - 1. Softwood framing lumber: Kiln dried, PS-20.
 - 2. Boards less than 1-1/2 inch thick and 2 inches wide, used for basic forms and form liners: Kiln dried.
 - 3. Grade marked by grading rules agency approved by American Lumber Standards Committee.
 - 4. Light framing or studs for board or plywood forms, 2 inches to 4 inches width and thickness, construction standard grade.
 - 5. Boards for basic forms, construction standard grade.
 - 6. Board surface: Smooth.

C. Plywood:

1. Exterior type softwood plywood, PS 1-66.
2. Each panel stamped or branded indicating veneer grades, species, type and identification.
3. Wood faced plywood for Architectural concrete surfaces.
 - a. Panel veneer grades: B-C.
 - b. Mill-oiled sides and mill-sealed edges of panels.

D. Ties:

1. Material: Steel
2. Type: Snap ties
3. Depth of breakback: 1 in.
4. Maximum diameter, 1/4 in.

E. Form coatings:

1. Non-staining type.
2. Agent: Pine oil derivative.

2.08 ISOLATION AND CONTRACTION JOINTS

- A. Minimum 3/4-inch-thick asphaltic impregnated fiberboard as per ASTM D-1751.

2.09 JOINTS, FILLERS, AND SEALANTS

- A. Joint-Sealant Backer Materials: ASTM D5249, non-staining, compatible with joint substrates, sealants, primers, and other joint fillers; and approved for applications indicated by joint sealant manufacturer based on field experience and laboratory testing.
- B. Joint Sealant: Non-priming, pourable self-leveling silicone sealant for concrete and asphalt.
1. Cold-Applied Joint Sealant ASTM D5893, self leveling silicone sealant. Crafco Inc. "Roadwaver Silicone-SL"; Dow Corning "888, or 890-SL"; Sonneborn "Sonomeric 1 Sealant"; Tremco "Vulkem 45"; or approved equal and,

2. Hot-Applied Joint Sealant: ASTM D3405, Polymeric sealant. Crafcro Inc. "ROADSAVER 22"; W.R. Meadows, Inc. "SEALTIGHT HI-SPEC", or approved equal.
- C. Joint Fillers: Resilient pre-molded bituminous impregnated fiberboard units complying with ASTM D 1751, asphalt-saturated cellulosic fiber, ASSHTO M 153, Type I: or ASTM D 1752, cork or self-expanding cork.
- D. Exterior Concrete Sealant: Sonneborn "Kure-N-Seal 30" exterior acrylic sealer, or Euclid "Super Rez-Seal", or approved equal.

PART 3 - EXECUTION

3.01 BARRICADES

- A. Provide substantial temporary barricades around all areas of operation and maintain until work under this section is completed and approved.
- B. Install temporary traffic markers, signals, and signs as per D.O.T. Standard Specifications to:
 1. Eliminate potentially hazardous conditions.
 2. Maintain adequate traffic patterns free of conflict with work under this Contract.

3.02 PREPARATION OF SUBGRADE

- A. Ensure rough grading has brought subgrade to required elevations.
- B. Fill soft spots and hollows with additional fill.
- C. Level and compact subgrade, to receive limerock base for concrete walks, curbs and gutters, to 98% compaction as per AASHTO T-180.

3.03 FORMWORK

- A. CONTRACTOR is responsible for the design, construction, removal and complete safety of formwork and shoring.
- B. Form construction shall be provided to shape, lines dimensions of members shown: substantial, tight enough to prevent leakage, and properly braced or tied to maintain position and size, form sides and bottoms of members unless specifically excepted.
- C. Fill voids of plywood joints with sealant and tool smooth.

- D. Form vertical surfaces to full depth and securely position to required lines and levels. Ensure form ties are not placed so as to pass through concrete.
- E. Arrange and assemble formwork to permit easy dismantling and stripping, and to prevent damage to concrete during formwork removal.
- F. Set, brace, and secure edge forms, bulkheads, and intermediate screed guides for pavement to required lines, grades, and elevations.
 - 1. Maintain sufficient quantity of forms to allow continuance of work so that forms remain in place a minimum of 24 hours after concrete placement;
 - 2. Forms shall be cleaned and casted with form release agent thoroughly after each use and before concrete is placed; and,
 - 3. Flexible or curved forms shall be used on curves. Forms shall be of full depth of the concrete and of a strength when staked, sufficient to resist the presence of the concrete and the loads resulting from the finish operations without springing, setting or losing their shape.

3.04 REINFORCING

- A. Reinforce concrete curbs and gutters. Allow for minimum 1-1/2-inch concrete cover.
- B. Do not extend reinforcing through expansion and contraction of joints. Provide dowelled joints through expansion and contraction joints, with one end of dowels fitted with capping sleeve to allow free movement.

3.05 FORMING EXPANSION AND CONTRACTION JOINTS

- A. Construct pre-molded expansion and contraction joints, tied construction joints, thickened edge expansion joints, isolation joints, and construction joints, straight with face perpendicular to concrete surface. Construct transverse joints perpendicular to centerline unless otherwise detailed.
 - 1. Expansion joints and contraction joints, pre-molded as indicated on the drawings:
 - a. Provide joint filler for the entire depth of the slab section and not less than 1 inch below finished surface so as to allow for joint sealer.
 - b. Provide thickened edge expansion joint as indicated on the drawings.
 - c. Provide 1/2-inch contraction joints for curb and gutter at 10 feet on center.

- d. Provide 1/2-inch expansion joints for curb and gutter and sidewalk at 100 feet on center.
- 2. Tied construction joints: As indicated on drawings;
- 3. Control joints: Depth shall be equal to $\frac{1}{4}$ of the concrete thickness or 1 inch, whichever is deeper. For sidewalks, control joint spacing shall be equal to the sidewalk width. For concrete pavement, control joint spacing shall be placed as shown on the drawings, no greater than 15 feet on center either way;
 - a. Form tooled joints in fresh concrete by grooving top portion with recommended tool and finishing edges with jointer.
 - b. Form sawed joints using powered saws equipped with shatterproof abrasive or diamond-rimmed blades. Cut joints into hardened concrete within 24 hours of the concrete placement and as soon as surface will not be torn, abraded, or otherwise damaged by cutting action.
- 4. Construction Joints: Place construction joints at end of placements and at locations where placement operations are stopped for period of more than $\frac{1}{2}$ hour, except where such placements terminate at expansion joints. Construct joints using standard metal keyway-section forms or as shown on the drawings;
- 5. Isolation Joints: Locate isolation joints as indicated on the drawings. Provide premolded joint filler for isolation joints abutting site lighting poles, concrete curbs, catch basins, maintenance access structures, inlets, structures, walks and other fixed objects;
- 6. Joint Fillers: Extend joint fillers full-width and depth of joint, and not less than $\frac{1}{2}$ inch or more than 1 inch below finished surface where joint sealer is indicated. Furnish joint fillers in one-piece lengths for full width being placed, wherever possible. Where more than one length is required, lace or clip joint filler sections together; and,
- 7. Joint Sealants: All joints shall be sealed with approved exterior pavement joint sealants and shall be installed per manufacturer's recommendations.

3.06 INSPECTION

- A. Assure that excavation and formwork are completed, and excess water is removed.
- B. Check that reinforcement is secured in place.

- C. Verify that expansion joint material, anchors, and other embedded items are secured in position.

3.07 PREPARATION FOR PLACEMENT

- A. Notify the ENGINEER and other inspectors at least 36 hours prior to inspection.
- B. Equipment forms, and reinforcing shall be clean and wet down, reinforcing firmly secured in place, runways set up and not resting on or displacing reinforcing.

3.08 PLACING CONCRETE

- A. Concrete Placement: Comply with recommendations in ACI 304R for measuring, mixing, transporting, and placing concrete. Place concrete in a continuous operation within planned joints or sections.
 - 1. Moisten subbase to provide a uniform dampened condition at time concrete is placed;
 - 2. Consolidate concrete by mechanical vibrating equipment supplemented by hand-spading, rodding, or tamping according to recommendations in ACI 309R;
 - 3. Screed and initial-float concrete surfaces with darby or bull float before excess moisture or bleed water appears on the surface;
 - 4. Protect concrete from cold or hot weather during mixing, placing, and curing; and,
 - 5. All concrete walks and aprons shall be a minimum of 4 inches thick as shown on the drawings, with a turned down edge as detailed.
- B. Evaporation Retarder: Apply to concrete surfaces if hot, dry, or windy conditions exist. Apply according to manufacturer's written instructions after placing, screeding, and bull floating or darbying concrete, but before float finishing.
- C. Pavement Tolerances: Comply with tolerances in ACI 330.1, Specification for Plain Concrete Parking Lots.
- D. Place concrete, screed and wood float surfaces to a smooth and uniform finish, free of open texturing and exposed aggregate.
- E. Avoid working mortar to surface.
- F. Round all edges, including edges of expansion and contraction joints, with 1/2 inch of radius edging tool.

- G. Where concrete curbs are adjacent to pavement slabs, make concrete curbs and gutters integral with slabs. Make expansion and contraction joints of curbs coincide with slab joints.
- H. Ensure finished surfaces do not vary from true lines, levels or grade by more than 1/8 inch in 10 feet when measured with straightedge.
- I. Apply curing compound on finished surfaces immediately after finishing. Apply in accordance with manufacturer's recommendations.

3.09 FINISHES AND CURING

- A. All exterior concrete shall receive a medium broom finish.
- B. Curing: Begin curing after finishing concrete, but not before free water has disappeared from concrete surface. Cure concrete by one or a combination of the following methods:
 - 1. Moisture cure concrete by water, continuous fog spray, continuously wet absorptive cover, or by moisture-retaining-cover curing. Keep surfaces continuously moist for not less than 7 days; and,
 - 2. Curing Compound: Apply uniformly in continuous operation by power spray or roller according to manufacturer's written instructions. Recoat areas subjected to heavy rainfall within three hours after initial application. Maintain continuity of coating and repair damage during curing period.
- C. All exterior concrete surface shall receive one coat of exterior sealer.

3.10 REPAIRS AND PROTECTION

- A. Remove and replace concrete pavement that is broken, damaged, or defective, or does not meet requirements in this Section.
- B. Protect concrete from damage. Provide adequate traffic control to prevent traffic from pavement for at least 14 days after placement.
- C. Maintain concrete pavement free of stains, discoloration, dirt, and other foreign material. Sweep concrete pavement not more than 2 days before date scheduled for substantial completion inspections.
- D. Protection of Completed Work: During curing period, protect concrete from damaging mechanical disturbances, water flow, loading, shock, and vibration.

3.11 QUALITY ASSURANCE

- A. Manufacturer Qualifications: Manufacturer of ready-mixed concrete products complying with ASTM C 94 requirements for production facilities and equipment.

- B. ACI Publications: Comply with ACI 301R-99 and ACI330R-92, unless modified by the requirements of the Contract Documents.
- C. The CONTRACTOR shall provide and pay for testing services. A slump test and air test shall be performed for each load delivered. Four standard test cylinders shall be taken for each 55 cubic yards of concrete or each days pour, whichever is more frequent. Two cylinders shall be broken at 7 days and two cylinders shall be broken at 28 days.

3.12 CLEAN UP

- A. Remove all debris and excess material immediately from project site.
- B. Take down all barricades and temporary traffic markers, signals and signs only after all work included in this section is finished and inspected, and only after so directed by OWNER or ENGINEER.
- C. Leave project area neat, orderly and free of any hazardous conditions.

END OF SECTION 02751

SECTION 02752

TELEVISION SURVEY FOR CURED IN-PLACE PIPE LINING

PART 1 - GENERAL

1.1 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 entire barrel of storm sewers up to 30 inches in diameter.
- B. The survey shall show all defects and determine amount of infiltration entering the sanitary sewer and storm sewer system.

1.2 GENERAL

- A. After preparatory Cleaning (including special cleaning involving the mechanical removal of roots, grease, and/or tuberculation where authorized), and before and after rehabilitation work, the pipe sections shall be visually surveyed by means of closed-circuit television in the presence of the ENGINEER and/or OWNER. The survey shall be performed one manhole-to-manhole / catch basin-to-catch basin section at a time and the flow in the section being surveyed shall be suitably controlled per City of West Palm Beach.
- B. Pre- and post-construction survey video on CD-ROM shall be delivered to the ENGINEER and OWNER on a "one line per CD-ROM" basis and pre- and post-TV log, for each storm 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.
- C. The television equipment operator shall be certified under the NASSCO (National Association of Sewer Survey Companies) PACP (Pipe Line Assessment and Certification Program).

1.3 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 ENGINEER and/or 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 / Catch Basin Identification (both manholes / catch basins)
6. On-going Footage Counter

1.4 SUBMITTALS

A. The CONTRACTOR shall submit shop drawings and other information in accordance with Section 01340 - 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

3.1 PRECONSTRUCTION SURVEY

A. Procedure

1. Prior to any repair work, the entire storm sewer line (from manhole to manhole / catch basin to catch basin) 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 / catch basin walls and the pipe connection to the wall at both the upstream and downstream manhole / catch basin.
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 storm 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 storm sewer conditions shall be used to move the camera through the storm sewer line. If the camera is being pulled through the storm 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 / catch basin section, the CONTRACTOR shall set up his equipment so that the survey can be performed from the opposite manhole / catch basin.

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 / catch basins 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 / catch basin, 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 / catch basin 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 / catch basin of each infiltration point observed during survey. Upstream footage at face of manhole / catch basin (0) and downstream footage at face of manhole / catch basin (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/catch basin numbers
- b. Correct address of manhole / catch basin location
- c. Pipe size, length and material
- d. Manhole / catch basin depth (up and downstream)
- e. UAZ (Utilities Analysis Zone) number
- g. CD number and index
- h. Footage locations, descriptions and estimated leak rates for visible point sources of infiltration inflow
- i. Footage locations and descriptions of structural defects such as obstructions, any remaining root intrusion, offset joints, cracked pipe, fractured pipe, holes, collapses, sags, protruding service connections and/or blockages in the pipe.

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 ENGINEER and OWNER.

2. Photographs. Digital photographs of the television picture of problems shall be taken by the CONTRACTOR upon request of the ENGINEER and/or 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 ENGINEER and/or 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. The CD shall be clearly labeled with the lift station number and individual manhole / catch basin numbers clearly listed. The CDs are to be furnished to the ENGINEER and 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 pre/post TV survey for Job No. 12-009 (provided by the OWNER), City of West Palm Beach”. State date, time, operator’s name, area, upstream manhole / catch basin number to downstream manhole / catch basin number, pipe size and material, upstream manhole / catch basin 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 / catch basin number to downstream manhole / catch basin number, and total linear footage.

3.2 POST CONSTRUCTION SURVEY

A. Procedure

1. The same procedures shall be used as indicated in Section 3.01 PRECONSTRUCTION SURVEY.
2. In addition, the CONTRACTOR shall stop camera at all point repairs, sectional repairs, and reinstated laterals, and inspect entire repaired pipe section.
3. The CONTRACTOR shall invert white foreground to black as needed in the line section with light background.
4. In the case of a post-liner survey, the CONTRACTOR shall fully televise both ends of the liner at the manhole / catch basin 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.
5. The post-liner television survey shall be done within 2 weeks of liner installation.

B. Documentation

1. The same documentation shall be provided as indicated in Section 3.01 PRECONSTRUCTION SURVEY.

END OF SECTION

SECTION 02753

PREPARATORY CLEANING AND ROOT REMOVAL

PART 1 - GENERAL

1.1 SCOPE

- A. This Section covers the preparatory cleaning of sewer lines and manholes as needed prior to the internal survey of the sewer lines by closed-circuit television. It also covers the preparatory cleaning and root removal from sewer lines and laterals and the cleaning of manholes prior to rehabilitation. The CONTRACTOR shall furnish all necessary material, labor, equipment and services required for cleaning the specific sewer lines.

1.2 GENERAL

- A. Sewer Line Cleaning: The intent of sewer line cleaning is to remove foreign materials from the lines and restore the sewer to a minimum of 95% of the original carrying capacity or as required for proper lining operation. Since the success of other phases of work depends a great deal on the cleanliness of the lines, the importance of this phase of the operation is emphasized.

1.3 HYDRAULIC CLEANING EQUIPMENT

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

either a sectional or continuous rod type capable of holding a minimum of 750 feet of rod. The rod shall be specifically heat-treated steel. To insure safe operation, the machine shall be fully enclosed and have an automatic safety clutch or relief valve.

PART 2 – PRODUCTS (Not Used)

PART 3 - EXECUTION

3.1 GENERAL

- A. The designated sewer manhole sections shall be cleaned using hydraulically propelled, high-velocity jet, or mechanically powered equipment. The equipment shall be capable of removing dirt, grease, rocks, sand, and other materials and obstructions from the sewer lines and manholes. If cleaning of an entire sewer section cannot be successfully performed from one manhole, the equipment shall be set up on the other manhole and cleaning again attempted.

3.2 CLEANING PRECAUTIONS

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

3.3 MATERIAL REMOVAL

- A. All sludge, dirt, sand, rocks, grease, roots, and other solid or semisolid material resulting from the cleaning operation shall be removed at the downstream manhole of the section being cleaned. Passing material from manhole section to manhole section, which could cause line stoppages, accumulations of sand in wet wells, or damage pumping equipment, shall not be permitted.
- B. Under no circumstances shall sludge or other debris removed during these operations be dumped or spilled into the streets, ditches, storm drains or other sanitary sewers.

- C. The CONTRACTOR is advised that he shall not dispose of this material by legal or illegal dumping on private or public property, by sale to others, or any means other than those given in 3.04 Disposal of Materials. Any load of material, or any portion thereof, disposed of in a non-permitted fashion will result in a charge to the CONTRACTOR in the amount of \$500.00 per load, or any portion thereof, which sum will be deducted by the OWNER from any monies due the CONTRACTOR.
- D. The CONTRACTOR shall keep his haul route and work area(s) neat and clean and reasonably free of odor, and shall bear all responsibility for the cleanup of any spill which occurs during the transport of cleaning/surface preparation by-products and the cleanup of any such material which is authorized by or pursuant to this Contract and in accord with applicable law and regulations. The CONTRACTOR shall immediately cleanup any such spill, or waste. If the CONTRACTOR fails to cleanup such spill, or waste immediately, the OWNER shall have the right to cleanup or arrange for its cleanup and may charge to the CONTRACTOR all costs, including administrative costs and overhead, incurred by the OWNER in connection with such cleanup. The City may also charge to the CONTRACTOR any costs incurred or penalties imposed on the OWNER as a result of any spill, dump or discard. Under no circumstances is this material to be discharged into the waterways or any place other than where authorized to do so by the appropriate authority. The term "CONTRACTOR" as used in this section shall include the CONTRACTOR's subcontractors and other Contractors.
- E. The general requirements for vehicles hauling such waste materials are as follows: Transport vehicles must be of type(s) approved for this application by the political jurisdictions involved. General requirements are that the vehicles have watertight bodies, that they be properly equipped and fitted with seals and covers to prohibit material spillage or drainage, and that they be cleaned as often as is necessary to prevent deposit of material on roadways. Vehicles must be loaded within legal weight limits and operated safely within all traffic and speed regulations.
- F. The routes used by the CONTRACTOR for the conveyance of this material on a regular basis shall be subject to approval by the governing authority having jurisdiction over such routes.

3.4 DISPOSAL OF MATERIALS

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

totally enclosed containers and as acceptable to the ENGINEER.

3.5 ROOT REMOVAL

- A. Roots shall be removed in the designated sections and manholes where root intrusion is present. Special attention should be used during the cleaning operation to assure almost complete removal of roots from the joints. Procedures may include the use of mechanical equipment such as rodding machines, bucket machines and winches using root cutters and porcupines, and equipment such as high-velocity jet cleaners. CONTRACTOR shall capture and remove all roots from the line.

3.6 ACCEPTANCE OF CLEANING OPERATION

- A. Acceptance of sewer line cleaning shall be made upon the successful completion of the television survey and shall be to the satisfaction of the ENGINEER. If television survey shows the cleaning to be unsatisfactory, the CONTRACTOR shall be required to reclean and reinspect the sewer line until the cleaning is shown to be satisfactory.
- B. In addition, on all those lines which have sags or dips, to an extent that the television camera lens becomes submerged for three (3) or more feet during the television inspection, the CONTRACTOR shall pull double squeegee and/or sponges through the line in order to remove the water from those dips or sags. Water removal through squeegees and/or sponges shall be performed until the television camera lens will no longer be submerged. This requirement may be waived by the ENGINEER if the water in which the camera lens is submerged, is clear enough to allow the identification of pipe defects, cracks, holes and location of service taps.

END OF SECTION

SECTION 02759

REPLACEMENT OF SANITARY SERVICE LATERAL AND CLEANOUT

PART 1 - GENERAL

1.1 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.

1.2 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 ENGINEER 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 City of West Palm Beach minimum standards shall be the same size and shall be laid between the replacement mainline pipe and the existing service pipe which remain in place acceptable to the ENGINEER unless decided otherwise by the ENGINEER. 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 ENGINEER. 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.

1.3 SUBMITTALS

- A. The CONTRACTOR shall submit shop drawings in accordance with Section 01330 – Shop Drawings.

PART 2 - PRODUCTS

2.1 GENERAL

- A. Pipe materials are specified in Division 2 – Site Work.

PART 3 - EXECUTION

3.1 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.
- B. Lateral sewers shall be installed in accordance with all the applicable requirements for pipe installation. Lateral connection to the new sewer shall be made by using transitional couplings to the branch saddle as it is constructed during pipe bursting.
- C. The existing laterals shall be hand excavated to the joint at the property line, saw cut, clean and square and the appropriate adapter installed to connect the replacement laterals in accordance with the City Standard Detail. 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 ENGINEER to be in acceptable condition.
- D. 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.
- E. Placement of bedding / cover materials in the trench shall be the same for laterals as provided in Section 02225 – Trench Backfill and Compaction.

3.2 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 - 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 ENGINEER. After the testing, survey or repair is complete, service shall be restored to normal level.

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 down-stream manhole.
3. Bypassing shall be accomplished using sewer plugs with pump connections or by other methods acceptable to the ENGINEER. 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.
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.

3.3 EXCAVATION AND BACKFILL

- A. The CONTRACTOR shall excavate and backfill in accordance with Section 02225 – Trench Backfill and Compaction. 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.

3.4 DEWATERING, SHEETING AND BRACING

- A. The CONTRACTOR shall dewater, sheet and or brace all excavations in accordance with Section 02225 – Trench Backfill and Compaction. 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.

3.5 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 specials 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.

3.6 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 ENGINEER.
- 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 ENGINEER 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 02225 – Trench Backfill and Compaction.
- 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 by-pass pumping as described in other Sections of these Specifications, or by any other method proposed by the CONTRACTOR and acceptable by the ENGINEER.
 - 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 over-excavated 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 ENGINEER, 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.

3.7 PIPE-TO-PIPE CONNECTIONS

- A. Pipe-to-pipe connections shall be made by using flexible banded couplings or adapters, couplings with compression joints in compliance with ASTM C 425.

3.8 TELEVISION SURVEY

- A. Television survey, including 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

1.1 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 service laterals.
- B. The survey shall show all defects and determine amount of infiltration entering the service laterals.

1.2 GENERAL

- A. The lateral shall be visually surveyed by means of closed-circuit television in the presence of the ENGINEER. The survey shall be performed one lateral at a time.

1.3 EQUIPMENT

- A. The television camera used for the lateral survey shall be one specifically designed and constructed for such survey. 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 ENGINEER; and if unsatisfactory, equipment shall be removed and replaced with adequate equipment.
- 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, Apositioning@ camera to observe and place the mini color, push, Ainspection@ 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.
- 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)
5. Upstream Manhole Number & Distance to Lateral
6. On-going Footage Counter

1.4 SUBMITTALS

- A. The CONTRACTOR shall submit shop drawings and other information in accordance with Section 01340 – Shop Drawings, Product Data and Samples. The CONTRACTOR's submittals shall include video tape 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

2.1 VIDEO DVD

- A. Extra High Grade DVD shall be supplied for all television surveys.
- B. All DVD's shall be submitted to the ENGINEER and will become the property of the OWNER.

2.2 VIDEO LOGS

- A. Video reports or logs are to be neat and completely filled out and submitted to the ENGINEER along with the DVD.

PART 3 - EXECUTION

3.1 POST CONSTRUCTION SURVEY

- A. Procedure
 1. 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 taping.
 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. All costs of material, equipment, labor, and other costs due to unspecified field conditions shall be borne by the CONTRACTOR.
5. The CONTRACTOR shall invert white foreground to black as needed in the line section with light background.

B. 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 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. 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: Instant developing, 35 mm, or other standard-size photographs of the television picture of problems shall be taken by the CONTRACTOR upon request of the ENGINEER.
3. Videotape Recordings: The purpose of video recording shall be to supply a visual and audio record of problem areas of the lines that may be replayed. Videotape 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 videotaped, the tapes become property of the OWNER. The CONTRACTOR shall have all videotapes and necessary playback equipment readily accessible for review by the OWNER during the Project.
4. Audio: All tapes shall have audio record. As a preamble, at the beginning of the tape, the CONTRACTOR shall state the following: "(Contractor's Name) is performing a post TV survey for City of West Palm Beach. 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.

END OF SECTION

SECTION 02761
PAVEMENT MARKINGS

PART 1 - GENERAL

1.01 RELATED DOCUMENTS

- A. All applicable provisions of the bidding and Contract Requirements, and Division 1 - General Requirements shall govern the work under this section.

1.02 WORK INCLUDED

- A. The work covered by this section shall include the furnishing of all labor, equipment and materials necessary to construct and install all existing pavement markings and striping damaged during construction, in accordance with these specifications.

1.03 RELATED WORK

- A. Section 02741 - Asphaltic Concrete Paving - General.
- B. Section 02751 - Portland Cement Concrete Paving.

1.04 PROJECT CONDITIONS

- A. Pavement-Marking Paint: Proceed with pavement marking only on clean, dry surfaces and at a minimum ambient or surface temperature of 40 degrees F for oil base materials, 50 degrees F for water-based materials, and not exceeding 90 degrees F.
- B. Surface Preparation: The surface shall be clean and free of dirt, grease, oil, or other contaminants which could interfere with adhesion.

1.05 QUALITY ASSURANCE

- A. Perform all work in accordance with the requirements of local agencies.

PART 2 - PRODUCTS

- 2.01 Chlorinated rubber-alkyd type, as per Fed Spec. No. TT-P-115, Type III, or shall be Code T-1, conforming to Section 971-12.2 of the Florida Department of Transportation Standard Specifications.

- A. Paint shall be factory mixed, quick drying and non-bleeding type.
- B. Color shall be as per D.O.T. requirements.

- C. Striping, arrows, lane markers and stop bars shall be provided with paint containing reflective additive.
- 2.02 Thermoplastic paint shall conform to the applicable Technical Specifications (Section 711) of the Florida Department of Transportation, City of West Palm Beach, and Palm Beach County Standards.
- 2.03 Traffic paint shall conform to the applicable Technical Specifications (Section 710) of the Florida Department of Transportation, City of West Palm Beach, and Palm Beach County Standards.
- 2.04 Reflectors shall be in accordance with City of West Palm Beach and Palm Beach County Minimum Standards.

PART 3 - EXECUTION

3.01 TRAFFIC AND LANE MARKINGS

- A. Sweep dust and loose material from the sealed surface.
- B. Apply paint striping as indicated on the drawings, with suitable mechanical equipment to produce uniform straight edges.
 - 1. Apply in not less than (2) two coats as per manufacturer's recommended rates of applications.
- C. Protect pavement markings until completely dry in accordance with manufacturers recommendations.
- D. 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.
- E. 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.
- F. 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.

- G. Any portions of the stripes damaged during construction shall be repainted at the CONTRACTOR's expense.
- H. 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. Thermoplastic pavement markings may be placed 15 days after final asphalt lift. The thermoplastic compound shall be as specified in Section 711 of the DOT Specifications, latest edition. 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.
- I. 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.
- J. Reflective pavement markings (R.P.M's) shall be placed at locations of fire hydrants and watermain valves as required by OWNER standards.

3.02 TEMPORARY PAVEMENT MARKINGS

- A. Temporary paint shall be applied in accordance with permanent pavement marking specifications. However, only 1 coat of paint shall be required to a clean, dry surface using template or a striping machine. The CONTRACTOR may also propose to utilize temporary/removable pavement marking tape, as approved by the OWNER.
- B. Markings shall be applied using butyl adhesive pads or paint to clean dry pavement surfaces which are free of cracking, checking, spalling, or failure of underlying base material.

- C. When required, removable marking tape or pavement marking paint shall be applied on clean dry surfaces at designated locations. Tape that has become damaged and is no longer serviceable shall be replaced without additional compensation.
- D. All temporary markings and striping shall be removed when no longer required. Any pavement area that has been determined to be damaged as a result of the removal operation shall be repaired at no cost to the OWNER.

3.03 PAVEMENT MARKING REMOVAL

- A. Existing pavement marking lines and symbols shall be removed as to not materially or structurally damage the surface or texture of the pavement. A motorized abrasive device shall be utilized by means of sand or water blasting to remove existing markings. The CONTRACTOR shall repair any damage to the pavement at no expense to the OWNER. The pavement surface shall be left in a condition that will not mislead or misdirect customers or motorists. Pavement marking removal within public rights of way shall be completed in accordance with the regulatory authority having jurisdiction and the specifications.

END OF SECTION 02761

SECTION 02763
CHEMICAL GROUTING

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 in accordance with all governing codes and laws.
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.
3. When so directed by the OWNER, prior to performing chemical grouting, the CONTRACTOR shall remove roots and clean the sewer in accordance with Section 02753 - Preparatory Cleaning and Root Removal.

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 five 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 and 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 insure 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'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 Preconstruction Survey, 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 02763

SECTION 02764
CURED-IN-PLACE SECTIONAL PIPE LINING

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 two 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 two (2) 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:

<u>Item</u>	<u>Criteria</u>
1. Solids Content	100% by weight
2. Pot Life	90 minutes at 70 degrees F
3. Shelf Life	at least 1 year (sealed)
4. Viscosity	18,000 cps (average at 70 degrees F)
5. Density	12 pounds per gallon (max.)

- C. The cured epoxy resin material shall have the following properties:

<u>Item</u>	<u>Test Value</u>	<u>Reference Standard</u>
Flexural Strength	5,000 psi	ASTM D 790
Flexural Modulus	400,000 psi	ASTM D 790

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
<i>*Denotes information which can be provided here or in inspection video tapes or project construction plans. Multiple line segments may require a table of values.</i>	

- 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 02753 - Preparatory Cleaning and Root Removal.

3.02 TELEVISION SURVEY

- A. Television survey shall be performed in accordance with Section 02752 - Television Survey, including Preconstruction and 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 recommend a point repair excavation in accordance with the City of West Palm Beach, to uncover and remove or repair the obstruction. Such recommendation shall be reported in writing to the OWNER.

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 -

SECTION 02765

CURED-IN-PLACE-PIPE (CIPP) LINING FOR GRAVITY PIPE

PART 1 – GENERAL

2.1 WORK INCLUDED

- A. 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 gravity mains. The finished pipe liner shall be fabricated from materials which when cured will, be chemically resistant to withstand internal exposure to the typical fluid within the host pipe (domestic sewage or stormwater) and designed to handle all internal and external pressures.
- B. Furnish all labor, materials, equipment, and incidentals required to conduct testing, pre- and post-rehabilitation CCTV inspections, and other requirements described herein for final gravity main lining acceptance
- C. CIPP installation of the primary main will take place prior to all manhole coating work and adjacent lateral/service lining work. Lined-through manholes shall be opened prior to manhole coating work.

2.2 RELATED REQUIREMENTS SPECIFIED ELSEWHERE

- A. Drawings and general provisions of the Contract, including the General Conditions and Terms and Division 1 Specification sections, apply to this section.
- B. The following sections are referenced in this specification:
 - 1. 01340 – Submittals
 - 2. 02750 – Wastewater Flow Control
 - 3. 02753 – Preparatory Cleaning and Root Removal
 - 4. 02752 – Television Survey for Cured In-Place Pipe Lining
 - 5. 02760 – Service Lateral Television Survey
 - 6. 02770 - Cured-In-Place-Pipe (CIPP) Lining for Laterals
 - 7. 02771 – Manhole Rehabilitation

2.3 REFERENCED DOCUMENTS

This specification references standards from the American Society for Testing and Materials.

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

- B. ASTM D638 (Standard Test Method for Tensile Properties of Plastics)
- C. ASTM D695 (Standard Test Method for Compressive Properties of Rigid Plastics)
- D. ASTM D696 (Standard Test Method for Coefficient of Linear Thermal Expansion of Plastics Between -30°C and 30°C with a Vitreous Silica Dilatometer)
- E. ASTM D790 (Test Methods for Flexural Properties of Un-Reinforced and Reinforced Plastics and Electrical Insulating Materials)
- F. ASTM D1044 (Standard Test Method for Resistance of Transparent Plastics to Surface Abrasion)
- G. ASTM D2990 (Tensile, Compressive, and Flexural Creep and Creep- Rupture of Plastics)
- H. ASTM D5813 (Cured In Place Thermosetting Resin Sewer Pipe) ASTM F1216 (Rehabilitation of Existing Pipelines and Conduits by the Inversion and Curing of a Resin Impregnated Tube)
- I. ASTM F1743 (Rehabilitation of Existing Pipelines and Conduits by Pulled- in- Place Installation of Cured-in-Place Thermosetting Resin Pipe (CIPP))
- J. ASTM F2454 (Sealing Lateral Connections and lines from the mainline Sewer Systems by the Lateral Packer Method, Using Chemical Grouting)
- K. City of West Palm Beach Approved Materials List
- L. ASTM F1216 (Standard Practice for Rehabilitation of Existing Pipeline and Conduits by the Inversion and Curing of a Resin – Impregnated Tube)

All of the above 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.

2.4 CONTRACTOR SUBMITTALS

Furnish Submittals in accordance with Section 01340 – Submittals and the following supplemental requirements:

This specification references standards from the American Society for Testing and Materials.

- A. Certification showing the Contractor or lining Subcontractor is currently licensed by the National Association of Sewer Service Companies (NASSCO) to perform CIPP installation. All certifications shall be submitted to the Engineer before any materials are ordered.

- B. Shop drawings, plans, equipment catalog data, and written descriptions detailing short and long-term properties (providing all supporting test data) of all components, materials and composite materials, and recommendations for material storage and temperature control, CIPP handling, insertion, curing, trimming, and finishing, and QA/QC procedures. The Contractor shall submit design calculations to the Engineer for review after field verification of sizes and prior to ordering any material from the manufacturer for the required minimum thickness for the CIPP to be installed in each pipe reach based on the internal inspection data and the CIPP manufacturer's specifications:
1. CIPP lining supplier's name and a list of material manufacturers.
 2. CIPP lining schedules including field-verified lengths and diameters for all CIPP linings and appurtenances required. Plans should include map(s) showing insertion points, equipment and storage locations, and field wet-out locations for all CIPP installations.
 3. Detailed installation procedures including CIPP lining production schedule, acceptable inversion heads and pressures, inversion procedures, curing and cool-down procedures and temperatures, and times for each process stage.
 4. If a field wet-out procedure will be used for liner impregnation, submit a complete description of the proposed wet-out procedure with detailed information on equipment and material storage locations, resin volumes and/or weights, liner length, start times, finish times, resin injection locations, and any other pertinent data documenting the wet-out procedure.
 5. Design data and specification data sheets listing all parameters used in the CIPP liner design and thickness calculations based on ASTM F1216.
 6. Certification stating CIPP tube has been manufactured in accordance with ASTM F 1216 and resin is suitable for its intended use and this specification.
 7. Procedure and materials to reinstate connecting sewers and laterals and for sealing at manhole and lateral connections.
 8. Detailed method for addressing CIPP sampling requirements including location and size of each sample, method of removal, and method of liner repair and procedure for testing CIPP Liner.
 9. Pre-installation and post-installation CCTV Inspection reports.
 10. A complete list of service laterals, including relevant footage and diameter shall be submitted to the Owner and Engineer prior to initiating CIPP lining.
 11. Stormwater and sewage bypass plans in accordance with the City of West Palm Beach.

12. Test Results. Prior to using any materials, furnish the proposed material's test results from an independent laboratory in conformance with these specifications. All submitted test data shall have been performed on field installed samples within the last 12 months. Testing by an independent laboratory shall verify the products to be used meet all minimum strength standards as set forth in ASTM F1216, Table 1. Testing shall also verify any product to be used on the project meets the minimum chemical resistance requirements as established in ASTM F1216, where the testing is in accordance with ASTM D543.
 13. Pipe Cleaning Narrative. Submit a narrative describing in sufficient detail the proposed methods for root cutting and cleaning the existing gravity mains. Prepare such narrative to include the degree of cleaning as recommended by the lining manufacturer. Such narrative shall indicate the lining manufacturer's technical representative's approval for the proposed cleaning methods.
 14. Manufacturers' shipping, storage, and handling recommendations for all CIPP system components.
 15. A safety plan and MSDS sheets (Safety Data Sheets) for all hazardous chemicals used or expected to be on-site including resin, catalyst, cleaners, and repair agents.
 16. Technical procedure or information regarding the control and mitigation of shrinkage and wrinkling during installation and cure of CIPP liner. Copies of previous physical properties tests as well as chemical resistance tests.
 17. An odor control plan describing how odors will be minimized at the project site upon request from the OWNER.
 18. All pipelines and structures shall be listed by the OWNER's asset name in all submittal documentation.
 19. CIPP manufacturer's statement accepting five (5) years warranty responsibility.
- C. All gravity main lining design calculations shall be sealed and signed by a Florida registered professional engineer.
- D. Submit a copy of the initial customer notification as described in Section 3.01.
- E. Post-lining inspection data. Submit the final television inspection that shows the rehabilitated pipe per Section 02760.

2.5 QUALITY ASSURANCE

- A. The Contractor shall have a minimum of three (3) years of continuous experience installing the CIPP liners in pipe of a similar size, length and configuration as contained in this contract and a minimum of five (5) years of continuous

experience installing the CIPP liners in pipe of a similar size, length and configuration as contained in this contract if the project includes any of the following: pipes with a diameter of 36-in or larger, pipes installed with 10-ft or more of cover, pipes installed outside of the Owner's right-of-way and pipes installed within a railroad right-of-way. A minimum of 200,000 linear feet of liner installation experience in Florida is required including past completed project references. The lead personnel including the superintendent, the foreman and the lead crew personnel for the CCTV inspection, resin wet-out, the CIPP liner installation, liner curing and the robotic service reconnections must have a minimum of three (3) years of total experience with the CIPP technology proposed for this contract and must have demonstrated competency and experience to perform the scope of work contained in this contract.

- B. The CIPP liner manufacturer shall have a minimum installation history of two (2) years 100,000 linear feet of furnished product in the sizes applicable for this Project. Verifiable experience shall be submitted to the Owner upon request.
- C. All CIPP linings (including lining for laterals) shall be from a single manufacturer. The Engineer and/or Owner may inspect the CIPP lining after delivery and reject any or all of the lining products if they fail to meet the requirements specified herein.

2.6 WARRANTY

- A. The liner shall be certified by the manufacturer for specified material properties for a particular job. The manufacturer shall warrant the liner to be free from defects in raw materials for five (5) years-from the date of acceptance. The Owner may conduct TV inspections within the warranty period. During the warranty period, any defects that 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. Any defects replaced at that time shall be fully warranted by the Contractor and manufacturer for one year from the date the defect was repaired. During the non-prorated warranty period, any defects which affect the integrity, strength or water tightness of the installed pipe shall be repaired at the Contractor's expense.
- B. Wrinkles, blisters, dry spots in resin, or other defects in the finished gravity main, which in the Owner's opinion, negatively affect the gravity main's integrity or strength or the pipe's flow capacity or performance of solids passage are unacceptable. Contractor will be responsible to remove and repair, at Contractor's expense, all such defects in a manner satisfactory to the Owner. Defects also include but are not limited to the following:
 - 1. Leakage through the lining or between lining and pipe
 - 2. More than 10 percent reduction in the lining thickness
 - 3. Lining separating from the pipe

4. Excessive wrinkles inhibiting flow (greater than 3% outside of lower 120 degrees of pipe and greater than 2% within lower 120 degrees of pipe or at Owner's discretion).
 5. Foreign Inclusions
 6. Dry spot (area devoid of resin)
- C. The lining shall be as free as commercially practicable from visual defects such as foreign inclusions, dry spots, pinholes, and delamination. The lining shall have a smooth surface free from leaks, cracks, and crazing. Some minor waviness that, in the Owner's opinion, will not appreciably decrease the flow cross-section or affect the flow characteristics shall be permissible.

2.7 DELIVERY, STORAGE AND HANDLING

- A. If the flexible tube is impregnated with resin at the factory, it shall be transported, installed, and cured before expiration of the shelf life.
- B. The certified CIPP Contractor or Subcontractor shall be responsible for the delivery, storage and handling of all materials for CIPP lining in accordance with the written requirements of the manufacturer.
- C. The Contractor shall exercise adequate care during transportation, handling and installation to ensure the CIPP material is not torn, cut, or otherwise damaged. If any part or parts of the CIPP material becomes torn, cut or otherwise damaged before or during insertion, it shall be repaired or replaced in accordance with the manufacturer's recommendations and approval by the Engineer before proceeding.
- D. The CIPP lining shall be maintained at a proper temperature in refrigerated facilities and protected from ultraviolet light at all times prior to installation to prevent premature curing. Any CIPP lining showing evidence of premature curing shall be rejected for use and immediately removed from the site.

PART 2 - PRODUCTS

2.1 CIPP LINER

- A. The CIPP liner is to be provided per the City of West Palm Beach's Approved Materials List or approved equivalent.
- B. The outside reach of CIPP liner tube shall be labeled by the liner manufacturer with the location of the liner manufacturer, the liner thickness, and the liner diameter. The outside of the flexible tube shall be marked along its full length at regular intervals not to exceed five (5) feet.
- C. The flexible tube shall be one or more layers of needled felt or equivalent non-

woven material manufactured under quality- controlled conditions set by the manufacturer and be capable of holding resin and withstanding installation pressures and curing temperatures. The tube shall be compatible with the resin system used and shall contain no intermediate layers that delaminate after resin curing. The liner tube will be lined on one side with a translucent impermeable chemically resistant waterproof coating that is compatible with the tube/resin material. This coating will be on the inside of the lined pipe after curing is completed. The coating will provide a smooth and seamless inner wall.

- D. Tube material shall be able to stretch to fit irregular pipe sections and negotiate bends. The tube shall be fabricated to a size so that, when installed, it will fit snugly inside the circumference and length of the existing gravity main and produce the required thickness after the resin is cured. Allowance should be made for circumferential stretching during installation and shrinkage of resin during curing and aging so that the final cured product is snug against the wall of the host pipe and free of fins and buckles.
- E. The minimum length of the flexible tube shall be as necessary to effectively and fully span the distance between manholes, with allowance for proper stretching or shrinkage due to pressure or expansion.
- F. 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 the layers separate during field sample testing, new samples will be required to be obtained from the installed pipe. Any reoccurrence may cause rejection of the work.
- G. The felt tubing shall be vacuum impregnated with a thermosetting resin system. The resin used shall be compatible with CIPP system used and designated for use in the host pipe (sewer or storm).
- H. The resin will be a corrosion resistant thermo-set polyester, vinyl ester or epoxy resin designed for use in the host pipe (sewer or storm) applications including all required catalysts, initiators that when cured within the tube create a composite that satisfies the requirements of ASTM F1216, ASTM D5813 and ASTM F1743, the physical properties herein, and those which are to be utilized in the submitted and approved design of the CIPP for this project. The resin shall not contain fillers, except those required for viscosity control or fire retarding. The resin shall be formulated to have a gel (pot) life appropriate for the scope of the work. The resin shall be heat cured by an internal exothermic chemical reaction initiated by steam. The resin shall produce a CIPP that will comply with the structural and chemical resistance requirements of this specification. The resin shall be resistant to abrasion from solids, grit, and sand in wastewater and stormwater. The resin shall have proven resistance to the municipal wastewater environment.
- I. The reinforced / seam stitched / heat welded seam tape / felt liner tube and resin

will meet and or exceed prior to and upon installation minimum testing standards as required by ASTM (ASTM F1216 and ASTM D5813) and ANSI/NSF International. All materials must have 3rd. party testing provided by an independent laboratory. The materials must be ANSI/NSF Standard-14 approved.

- J. The wet-out tube shall have a relatively uniform thickness that when compressed at installation pressures will equal or exceed the calculated minimum design CIPP wall thickness.
- K. The CIPP shall be designed as per ASTM F1216, Appendix X.1. The CIPP design shall assume no bonding to the original pipe wall. Contractor shall submit to the Engineer the design calculations for approval prior to procuring materials for the project.
- L. The Contractor must have performed long-term testing for flexural creep of the CIPP pipe material installed by his/her 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 as defined within the relevant ASTM standard. A percentage of the instantaneous flexural modulus value (as measured by ASTM D790 testing) shall be used in design calculations for external buckling. The percentage, or the long-term creep retention value utilized, shall be verified by this testing. Retention values exceeding 50% of the short-term test results shall not be applied unless substantiated by qualified third party test data to the Owner's satisfaction. The materials utilized for the 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 the CIPP design.
- M. The cured pipe material (CIPP) shall conform to the structural properties, as listed below.

<u>Required Cured-In-Place Lateral Lining Standards</u>	<u>Minimum</u>
Flexural Strength (ASTM D-790)	4,500 PSI
Flexural Modulus (ASTM D-790)	250,000 PSI
Tensile Strength (ASTM D-638)	3,000 PSI
Compressive Strength (ASTM D-695)	5,400 PSI
Chemical Resistance (ASTM D-543) < 20% loss Leakage Test* (NSF Standard 14) 0/gal/in/day	

* Leakage test performed by ANSI/NSF International

The required structural CIPP wall thickness shall be based as a minimum, on the physical properties above or greater values if substantiated by independent lab testing and in accordance with the design equations in the ASTM F1216, Appendix X1, and the following design parameters:

- Design Safety Factor (typically used value) = 2.0
- Maximum long-term deflection shall be 5 percent.
- All material properties used in design calculations shall be long-term (time-corrected) values.
- The CIPP shall be designed for fully deteriorated conditions.
- Retention Factor for Long-Term Flexural Modulus to be used in Design = 50%
- Ovality = Based on greater of actual ovality found during CCTV inspection and 2% (i.e. 2% minimum)
- Enhancement Factor, K = 7 min.
- Groundwater Depth (above invert of existing pipe) = Greater of 8 ft. or depth shown on plan
- Soil Depth (above crown of existing pipe) = Greater of 8 ft. or depth shown on plan
- Soil Density = 120 pcf (moist)
- Live Load = H20 Highway minimum; increase as needed for railroad crossing loads
- Designed for 50-year service life.
- Additional design requirements may be required for the following: pipes with a diameter of 36-in or larger, pipes installed with 10-ft or more of cover, pipes installed outside of the Owner's right-of-way and pipes installed within a railroad right-of-way.
- The design for the CIPP shall recognize any non-uniform cross section and the liner bifurcation present at the spring line of the pipe. Accounting for this condition using an ovality reduction factor alone is unacceptable.
- 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.

N. Chemical Resistance:

1. The liner shall be fabricated from materials which, when complete, are chemically resistant to and will withstand internal exposure to domestic sewage having a pH range of 5 to 10.5 and temperatures up to 125-degrees Fahrenheit.

2. CIPP liners shall meet the minimum chemical resistance requirements in accordance with ASTM D 543 and meet the chemical resistance requirements of ASTM F1216, Appendix X2.1 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.
- O. Hydraulic Capacity - Overall, the hydraulic cross-section shall be maintained to the greatest extent practical. The CIPP shall have a minimum of the full flow capacity of the original pipe before rehabilitation. Calculated capacities may be derived using a commonly accepted roughness coefficient for the existing pipe material taking into consideration its age and condition.

2.2 END SEALS

- A. End seals shall be utilized at manhole connections and at lateral connections if needed. The rubber end seal shall be an extended hydrophilic rubber compounded from chloroprene (Neoprene) rubber and hydrophilic resin that expands on contact with water.
- B. The end seals must be in a tubular form which when installed will form 360-degree seal between the host pipe and the newly installed liner and must be a minimum 3- inches wide. The use of caulking, rope, or band type of an end seal will not be allowed unless approved by the Owner/Engineer.
- C. On contact with water, the rubber shall swell and mold itself to completely fill any gaps and exert pressure evenly to ensure the seal.

2.3 LATERAL CONNECTIONS/SEALS

- A. Lateral connections (and/or storm services if connected directly to storm pipe) should be reconnected and sealed after the main gravity line has been lined. If the laterals off a main line are also being lined, the connection between the lateral and main line should be sealed with brim seal connection style, or full-wrap style lining as part of the lateral lining work in accordance with Section 02770 - Cured-In- Place-Pipe (CIPP) Lining for Laterals. If not, in addition to the brim seal and full-wrap connection, the connection can also be sealed via chemical grouting in accordance with ASTM F2454.
- B. For brim seal (top hat)/full-wrap connections, the reconnection should be performed by installation and curing of a resin-impregnated, flexible insert with sealing epoxy element in the form of a tube or top hat that will be installed into the existing service lateral utilizing a pressure apparatus and curing devise positioned in the mainline pipe in accordance with applicable ASTM standards as determined by the Owner. The resin shall be rapidly cured to transform the flexible insert into a hard, impermeable brim seal or full-wrap seal around and in the lateral connection.

- C. The seal insert shall be fabricated to a size that when installed will key into the internal surface irregularities of the lateral joint and neatly fit tight to the internal circumference of the lateral. The insert shall be of a material that allows for circumferential stretching and angular alignment with the lateral pipe connection geometry during insertion.
1. The finished brim seal/full-wrap product shall be a material and resin which when cured is chemically resistant to domestic sewage over the expected lifetime of the rehabilitated pipe.
 2. The installed product shall be compatible with the lining system utilized for the main and/or lateral sewer lines.
 3. Should have structural properties in accordance with ASTM F1216 and should meet the 50-year design life of the CIPP main (and lateral) liner.
 4. Unless otherwise specified, the installer shall furnish a specially formulated polyester resin and catalyst system compatible that provides cured physical strength at least to the same level as required for the main and lateral liner.
 5. A secondary epoxy-sealing component shall be used to form a sealing bond between the seal insert product and the host lateral and main pipe walls.

2.4 MATERIAL TESTING

Testing shall be carried out prior to the commencement of the Work to confirm that the materials used comply with the specification. Tests shall be carried out by an independent body approved by the Engineer.

- A. The following tests shall be carried out and corresponding progress reports and results provided to the Engineer, on samples of cured resin/felt composite conforming to this specification:
1. Tensile Strength
 2. Tensile modulus of elasticity
 3. Flexural strength
 4. Flexural modulus of elasticity
 5. Compressive strength
 6. Long term flexural creep test
- B. In addition to the tests identified in 2.04 (A), the following tests shall also be required for the following: pipes with a diameter of 36-in or larger, pipes installed with 10-ft or more of cover, pipes installed outside of the Owner's right-of-way and pipes installed within a railroad right-of-way.

1. Density
 2. Hardness (Barcol)
 3. Impact resistance
 4. Shear strength
 5. Abrasion resistance
 6. 100 day acid test
- C. Details of standard test procedures shall conform to the relevant ASTM standard.
- D. Additional requirements are detailed below:
1. Tensile Strength Testing: Samples shall be without end pieces. The rate of grip separation shall be 1 mm/minute. The tensile modulus of elasticity shall be measured over the linear portion of the load extension curve. If the load extension curve contains no straight portion, the modulus shall be taken as the slope of the tangent to the curve over the first 0.2% strain ignoring the initial strain required to straighten the sample. Samples of single layer felt/resin composite and multi-layer (2 or 3 layers of felt) composite shall be tested. The test report shall contain full particulars concerning the test and shall also include load extension curves for each sample.
 2. Flexural Testing: Samples of single layer felt/resin composite and multi-layer (2 or 3 layers of felt) composite shall be tested. The modulus of elasticity shall be measured in accordance with Tensile Strength Testing above. The test report shall be measured in accordance with Tensile Strength Testing above. The test report shall contain all particulars in accordance with the relevant standard.
 3. Density: Determine the hardness of single layer and multi-layer samples of cured resin/felt composite in accordance with the relevant standard.
 4. Hardness: Determine the hardness of single layer and multi-layer samples of cured resin/felt composite in accordance with the relevant standard.
 5. Impact Resistance: The impact resistance of samples of multi-layer resin/felt composite shall be determined. A minimum of ten specimens shall be tested. The test report shall include all relevant particulars required by the relevant standard.
 6. Shear Strength: Determine the shear strength of a cured single layer sample of resin/felt composite. The samples shall be tested with the axis of the punch perpendicular to the sheet from which the samples were machined. The test report shall contain all relevant particulars the relevant standard.
 7. Abrasion Resistance: The abrasion resistance of the resin/felt composite

shall be measured in accordance with ASTM D-1044 using a Tabor abrader with H- 18 Calibrase wheels and 1-kilogram weights. The material shall be tested with the surface dry, and again with the surface wet. After 2000 cycles the depth of wear shall be measured and recorded.

8. Coefficient of Thermal Expansion: The coefficient of the thermal expansion of the resin/felt composite shall be measured in accordance with ASTM D-696 or VDE 0304. The method adopted shall be maintained for all tests performed throughout the Contract.
9. Compression Testing: Samples shall be Type 1, and the speed of testing shall be 1 mm/minute. The test report shall contain all particulars required by the relevant standard.
10. 100 Day Acid Test: Samples of single layer and multi-layer or resin/felt composite shall also be subjected to a 100-day acid test. Samples shall be prepared to tensile and flexural testing as heretofore specified and shall be immersed in 10% V/V sulfuric acid at 40°C for 100 days. After removal from the acid samples shall be washed, dried, and tested for tensile and flexural properties. The values of the tensile and flexural strengths obtained from such tests shall not be less than 75.1% of the minimum values specified by the tests.
11. All the above tests shall be carried out at 35°C ± 2°C (In addition, Tests (1) to (4), above, i.e. tensile and short-term creep tests, shall be carried out in parallel from the same samples at 25°C ± 2°C (ambient laboratory temperature) for correlation purposes. A report on the form of correlation shall be submitted to the Engineer's along with other test progress reports and results.

PART 3 - EXECUTION

3.1 GENERAL

- A. The contractor shall provide appropriate maintenance of traffic to complete the work including securing appropriate right of way and MOT permits from the City of West Palm Beach and other governing agencies as applicable. If water is needed to facilitate the installation, the contractor shall secure a hydrant meter from the City of West Palm Beach and pay for the meter deposit, set up and usage fees.
- B. Public Notification - The Contractor shall make every effort to maintain sewer service usage throughout the duration of the project. In the event that a connection will be out of service, the longest period of no service shall be 8 hours. 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. Written notice to be delivered to each home or business a minimum of 5 business days prior to the beginning of work being conducted on the section, and a local telephone number of the Contractor they can call to discuss the project or any potential problems.
2. Personal contact with any home or business, which cannot be reconnected within the time stated in the written notice.

3.2 BYPASSING

- A. The Contractor shall notify the Engineer and Owner a minimum of 72 hours prior to commencing any previously approved bypass operations for the sanitary or storm systems. The Contractor shall be solely responsible for clean-up, repair, property damage costs and claims resulting from failure of the diversion system.
1. Sanitary System: The Contractor shall provide for the continuous flow of sewage around the section or sections of pipe designated for repair in accordance with Section 02750 – Wastewater Flow Control. Plugging the line at an existing upstream manhole and pumping the flow into a downstream manhole or adjacent system shall make the bypass.
 2. Storm System: The Contractor shall provide a plan to divert stormwater flow during the liner insertion and manhole rehabilitation work in accordance with the City of West Palm Beach. The plan should include the liner insertion and stormwater flow diversion pumping locations and methods with sufficient detail to assure that the work can be performed without incident. The stormwater flow diversion plant shall include an emergency response plan in the event of a failure of the pumping system.

3.3 PRE-INSTALLATION INSPECTION AND CLEANING

- A. The CONTRACTOR shall carry out his/her operations in a safe manner and in accordance with all applicable state and federal requirements and regulations in accordance with Section 02753 – Preparatory Cleaning and Root Removal and 02752 – Television Survey for Cured In-Place Pipe Lining. Contractor shall notify the OWNER if any specialty work is required to clean the pipe and shall have written approval from the OWNER before commencing this work.
- B. The Contractor shall take field measurements to verify the existing pipe diameter, ovality and length prior to manufacturing liners. If the pipe is more than 3 percent out of round, immediately notify the ENGINEER. The manufacturer shall incorporate these measurements into the manufacturing process of the liner.
- C. Initial Cleaning of Gravity Lines - The Contractor shall remove all internal debris out of the main that will interfere with the installation of the CIPP liner. The

Contractor shall legally dispose of all debris removed from the pipes during the cleaning operation.

- D. Inspection of Pipelines - Inspection of pipelines shall be performed by experienced personnel trained in locating breaks, obstacles and service connections using close circuit television (CCTV) inspection techniques. The pipeline interior shall be carefully inspected to determine the location of any conditions that may prevent proper installation of CIPP. These shall be noted and corrected.
 - 1. The Contractor shall be responsible for confirming the locations of all laterals, branch service connections and potential obstructions prior to installing the CIPP.
 - 2. A video recording and suitable written log for each line section and the complete list of service laterals shall be produced for later reference by the Owner.
- E. Line Obstructions - It shall be the responsibility of the Contractor to clear the line of obstructions such as solids and roots that will prevent the insertion of CIPP.
 - 1. If the invert of a gravity main is eroded more than 2 inches, it shall be filled with grout to match the surrounding pipe surface. Location and distance from the upstream and downstream manholes of all internal and external point repairs shall be determined before rehabilitation commences. All point repairs must be completed prior to CIPP lining. If pre-installation inspection reveals an obstruction such as a protruding service connection, dropped joint, or a collapse that will prevent the installation process, that was not evident on the pre-bid video and it cannot be removed by conventional cleaning equipment, then the Contractor shall make a point repair excavation to uncover and remove or repair the obstruction. Such excavation shall be approved in writing by the Owner's representative prior to the commencement of the work.
 - 2. The Contractor shall trim intruding laterals so when completed, the service connection is flush to within ¼ inch of the internal pipe wall. Lateral cutting shall be documented by internal inspection methods.
 - 3. The Contractor shall ensure that the host pipe is not damaged during lateral trimming operations and document each location subjected to lateral trimming in the (CCTV) inspection.

3.4 INSTALLATION PROCEDURES

- A. Installation shall be accomplished by inversion or pulled-in-place methods and cured in place by circulating hot water or steam to produce a hard, jointless, impermeable pipe repair. UV cured CIPP will not be permitted without prior written approval from the Owner.

- B. Installation procedures shall be in accordance with the manufacturer's recommendations.
- C. If a field "wet out" procedure is used for resin impregnation, the Contractor shall designate a location where the liner tube will be vacuum impregnated prior to installation subject to approval of the Owner. The Contractor shall allow the Engineer to inspect the materials and "wet out" procedure. Sufficient excess resin shall be used in accordance with the latest version ASTM F1216. A roller system shall be used to uniformly distribute the resin throughout the tube.
- D. Before installation begins, the tube manufacturer shall provide the minimum pressure required to hold the tube tight against the existing conduit, and the maximum allowable pressure so as not to damage the tube. Once the installation has started, the pressure shall be maintained between the minimum and maximum pressures until the installation has been completed.
- E. Insert the hydrophilic sealant material at each manhole connection to seal the liner to the manhole wall once the liner is installed.
- F. The curing of the CIPP must take into account the existing pipe material, the resin system, and ground conditions (temperature, moisture level, and thermal conductivity of soil). The post-cure temperature should be held for a period as recommended by the resin manufacturer, during which time the recirculation of the water and cycling of the head source to maintain the temperature continues.
- G. The bond between all CIPP layers shall be uniform. All layers, after cure, shall be completely saturated with resin.
- H. The CIPP shall be cooled to a temperature below 100-degrees F before relieving the hydrostatic head. Care should be taken in release of the static head so that a vacuum will not be developed that could damage the newly installed liner. Provide piping, valves, and other equipment to discharge curing water. Where practicable, liners can be installed in continuous runs through manholes where there are two or more continuous gravity main segments requiring lining, especially to connect several short segments with continuous lining. The temperature of water discharged to the sewer system from processing liners shall not exceed 125-degrees F maximum, or the level allowed by State or local standards if less than 125-degrees F. Temperature gauges shall be placed as needed to monitor the temperatures during the cure cycle.
- I. Cut and trim the new lining at each manhole wall. Seal the lining to the manhole wall with hydrophilic sealant material.
- J. The CONTRACTOR shall furnish on-site on a continuous basis at least one (1) additional operational robotic cutter assembly train and key spare components as a "stand-by" unit in the event of primary equipment breakdowns.

3.5 FINISHED CIPP LINER PRODUCT

- A. The finished CIPP shall be continuous over the entire length of a manhole- to - manhole section of pipe and be free from visual defects such as foreign inclusions, dry spots, pinholes, delamination, fins and wrinkles larger than 2 percent of the pipe diameter.
- B. The liner shall conform to the shape of the pipe existing prior to liner insertion and not be out of round by more than 3 percent.
- C. Defects beyond the specification allowances, determined by the Engineer as affecting the integrity or strength of the CIPP, or as adversely affecting the hydraulic capacity of the pipe, shall be repaired, or replaced at the Contractor's expense. Method of repair shall be proposed by the Contractor and submitted to the Engineer for review and approval. The repairs shall be smooth and sealed with an epoxy resin compatible with the CIPP liner system.
- D. Fins and wrinkles in the finished CIPP beyond the specification allowances are unacceptable and shall be ground, removed or otherwise repaired and sealed by the Contractor at no additional cost to the Owner.
 - 1. Methods of repair shall be proposed by the Contractor and submitted to the Engineer for review and approval.
- E. Separations of liner seams in the finished liner pipe are unacceptable and shall be removed or repaired by the Contractor at no additional cost to the Owner.
 - 1. If a separation of a liner seam exists, the Contractor shall repair or replace that section of the pipe at no additional cost to the Owner.
 - 2. Methods of repair shall be proposed by the CONTRACTOR and submitted to the Engineer for approval.
- F. There shall be no visible infiltration through the liner at the service connection, or around the liner at manhole connections. The Contractor shall repair all visible leaks in a manner approved by the Engineer.

3.6 POST INSTALLATION

- A. After installation of the liner in a full segment pipe, a minimum of one (1) inch of the liner material shall be left to protrude from the wall of the entrance and the exit manholes.
- B. The upstream and downstream manholes shall be inspected and any holes or voids in the manhole wall immediately surrounding the new liner shall be sealed with a hydrophilic rubber joint seal and chemical grout. The CIPP shall make a tight seal at the manhole opening with no annular gaps and no infiltration. The

Engineer shall approve the seal. The liner shall be cut and trim the liner at each manhole connection upon approval.

- C. The lining's field acceptance shall be based on the Owner's evaluation of the installation including post-lined digital CCTV inspection and reviewing certified test data for the installed pipe samples. A post-liner inspection of the rehabilitated line shall be completed in accordance with Section 02752 – Television Survey for Cured in-Place Pipe Lining.
- D. Where liners of any type are installed in two or more continuous manhole segments, the liner invert through the trough of intermediate manholes shall be left intact. Final finishing of the installation in those intermediate manholes shall require removal of the top of the exposed liner and neat trimming of the liner edge where it touches the lip of the manhole bench.
- E. Portions of any piece of liner material removed during installation shall be available for inspection and retention by the Engineer.
- F. The Contractor shall take photographs of Hydrophilic Rubber End Seals at each manhole connection.
- G. The liner shall be cut and trim the liner at each manhole connection upon approval.
- H. The Contractor shall complete connections to manholes. This work shall be coordinated with manhole rehabilitation work if that work is also being performed in accordance with Section 02535 – Structures and Maintenance Access Structures (MAS).
 - 1. Reinstate openings for all drop assemblies after relining the mainline sewer.
 - 2. Use Class 5 concrete according to FDOT to form a smooth transition with a reshaped invert and a raised manhole bench to eliminate sharp edges of CIPP, concrete bench, and channel invert.
 - 3. Build up and smooth invert of manhole to match flow line of new CIPP.
- I. Service connections shall be reinstated without excavation as specified herein.

3.7 REINSTATEMENT OF EXISTING SERVICE LATERALS

- A. After curing is complete, existing service connections shall be reinstated.
- B. Reinstate service laterals using only remote internal methods (prior to CIPP liner acceptance).

- C. Where the CIPP liner does not create dimples at the service connections or in other ways indicate the locations, the exact location shall be determined from the internal inspection data. It is the Contractor's responsibility to accurately locate and reinstate all service connections after the CIPP installation and curing has been completed. All service connections shall be reinstated to a minimum of 95% of the original opening, matching invert of the lateral.
- D. The Contractor shall seal all laterals after reinstatements are 100% cut and brushed. Service lateral connections may be a combination of tees, wyes or break-in taps of varying sized and angle from 30 to 90 degrees and may include over-cut lateral openings, pilot holes or defects in relined main gravity pipe. Service Lateral Connections shall be sealed as specified and installed in accordance with the manufacturer's recommended installation instructions.
1. For sealing with chemical grout, the sealing is to be in compliance with ASTM F2454. The lateral sealing area is to include the first joint or 18" into the lateral pipe whichever is more. A test is necessary after the annular space is sealed in keeping with the ASTM Standard. If the test fails any resealing will be done at the expense of the contractor. All grout sealing required (lateral connections and manholes penetrations) are to be 100% complete before the final video is done to document that the completed section is ready to be submitted for payment.
 2. For brim seal full-wrap connections/seals, the insert laminate shall seal to the inside wall of the gravity main 3 inches around the lateral opening and to the lateral wall 6 inches up into the lateral pipe from the main (or entire length if lateral is being lined). The brim seal/full-wrap connection should be in compliance with applicable ASTM standards as determined by the Owner. The installed product shall extend from the mainline into the lateral connection in a continuous tight fitting, watertight pipe within-a-pipe to eliminate any visible ground water leakage and future root growth at the lateral to mainline connection. If, within the warranty period, the product installed in the gravity system is not acceptable due to leakage or any other defects, although originally accepted, the Contractor shall repair or replace the affected portion at no cost to the OWNER. It is understood that if the Contractor fails to do such work as required, the Contractor shall be responsible for said costs of repair or replacement.
 3. In addition, during the sealing and testing of the lateral connections the Contractor is to have an inspector present to document the procedure. The contractor is also directed to video record the seal and complete testing as follows: To be paid for lateral reinstatement the video must show 1) a 5 second video prior to sealing, 2) a 15 second video of the test pressure showing the lateral passed the pressure test. The screen must have the lift station number, manhole to manhole numbers and the station footage of the lateral on the main. The video must not run the entire time, just as described above. The Contractor shall submit a list of reinstated

service connections to Engineer for approval.

4. The Engineer will compare list of reinstated service connections with approved submittal of lateral locations made prior to installation of CIPP. Any omitted service reinstatements must be thoroughly investigated by the Contractor and if needed, additional reinstatements shall be made at no additional cost to OWNER. 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.

3.8 FIELD SAMPLING AND TESTING

- A. The Contractor shall prepare a sample of the installed CIPP liner for subsequent testing of its physical properties.
- B. Sampling shall be performed for each separate installation of CIPP on one (1) test per batch-order of liner. As an example – one sample from each pipeline reach where the liner is installed shall be provided.
- C. The Owner reserves the right to take five (5) random core samples of the installed CIPP liner at no additional cost in accordance with the procedures in ASTM D5813, as is applicable. The method of repair will be as recommended by the Manufacturer.
- D. The cured liner thickness shall be accurately measured as described in ASTM F1743 and shall not be less than 95 percent of the thickness specified.
- E. The liner shall be visually inspected in accordance with ASTM F1743 to ensure the number of layers of felt conforms to the specified number of layers and thickness. The Contractor shall calculate the resin-to-felt ratio by weight and the ratio shall fall in the range of 1.10:1 to 1.15:1.
- F. The sample shall be prepared using the flat plate sampling method in accordance with the procedures in ASTM F1216.
- G. The flat plate sample shall be large enough to provide five sample specimens each for short term flexural (bending) properties, as per ASTM D790. The sample will be clamped in a mold and placed in the downtube during the curing of the CIPP tube.
- H. The sample shall be removed after all the water is removed from the cured pipe tube. The samples shall be identified by: Date, Project Name, Size, Thickness, Location, Resin and Catalyst. The cured sample shall be tested by an independent testing laboratory as recommended by the CIPP liner manufacturer and approved by the Engineer for the short term flexural (bending) properties and tensile properties, per ASTM D790 and ASTM D638, respectively. The

sample shall be double bagged and sealed.

- I. The Contractor shall provide liner test results for long-term properties in accordance with ASTM D2990.
- J. The Contractor shall be responsible for any deviation from the specified physical properties and those evaluated through testing. Failure to meet the specified physical properties shall result in the CIPP liner being considered defective work and shall be rejected.
- K. The Contractor shall be responsible for all costs associated with the testing of the liner physical properties.

3.9 POST-INSTALLATION AND FINAL ACCEPTANCE

- A. In addition to any specific acceptance criteria specified in the contract, the following standards shall be satisfied before final acceptance of the liner installation:
 - 1. Finish - The finished pipe shall be continuous over the length of a run and be free from defects.
 - 2. Defects - Any defects which will affect the integrity of the installed pipe, will be repaired as directed by the owner.
 - 3. Leakage - No visible leakage through the liner will be allowed.
- B. The Contractor shall refrain from removing the sewer and stormwater bypass pumping system until both the Engineer and Owner have formally notified the Contractor that the work and finished product is accepted.
- C. Correction of failed CIPP or CIPP deemed defective from post-installation inspection or test reports for structural values, thickness, etc., shall be repaired at no extra cost to the Owner. Method of repair, which may require field or workshop demonstration, shall be approved by the Owner.

3.10 CLEANUP

- A. After the liner installation has been completed and accepted, the Contractor shall cleanup the entire project area. The Contractor shall dispose of all excess material and debris not incorporated into the permanent installation.

END OF SECTION

SECTION 02770

CURED-IN-PLACE-PIPE (CIPP) LINING FOR LATERALS

PART 1 – GENERAL

2.1 WORK INCLUDED

- A. 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 existing service laterals. Service laterals shall be lined from the connection with the main sewer to the property line or easement edge, unless otherwise noted or approved by the OWNER. The finished pipe liner shall be fabricated from materials which when cured will, be chemically resistant to withstand internal exposure to the sewage and designed to handle all internal and external pressures.
- B. A brim seal connection style, or full-wrap style lining shall be used to address the connection between the main sewer and the service lateral.
- C. Furnish all labor, materials, equipment, and incidentals required to conduct testing, pre and post-rehabilitation CCTV inspections, and other requirements described herein for final service lateral lining acceptance.
- D. This specification shall also apply to installing CIPP lining for laterals discharging directly into manholes, if the pipe diameter is 6-inch or less.
- E. Service laterals may be a combination of tees, wyes, or break-in taps of varying sizes (4-inch to 8-inch) with angles generally ranging up to 90 degrees. The CONTRACTOR shall install a cleanout at the property line or easement edge in accordance with details provided if required for a successful installation of the lateral liner.
- F. If any active service laterals are identified as defective and the CONTRACTOR is unable to line the lateral from the main sewer to the property line or easement edge, the CONTRACTOR shall inform the OWNER about the lateral's condition and shall propose a rehabilitation method that maximizes the lateral's rehabilitated length while minimizing the extent of surface disruption. The OWNER will direct the CONTRACTOR as to the acceptable approach for rehabilitating or replacing the service lateral in question.
- G. CIPP installation of the primary main will take place prior to adjacent lateral/service lining work.

2.2 RELATED REQUIREMENTS SPECIFIED ELSEWHERE

- A. Drawings and general provisions of the Contract, including the General Conditions and Terms and Division 1 Specification sections, apply to this section.

B. The following sections are referenced in this specification:

1. 01340 – Submittals
2. 02750 – Wastewater Flow Control
3. 02753 – Preparatory Cleaning and Root Removal
4. 02752 – Television Survey for Cured In-Place Pipe Lining
5. 02759 – Replacement of Sanitary Service Lateral and Cleanout
6. 02760 – Service Lateral Television Survey
7. 02765 - Cured-In-Place-Pipe (CIPP) Lining for Gravity Mains
8. 02535 – Structures and Maintenance Access Structures (MAS).

2.3 REFERENCED DOCUMENTS

This specification references standards from the American Society for Testing and Materials.

- A. ASTM D543 (Standard Practices for Evaluating the Resistance of Plastics to Chemical Reagents)
- B. ASTM D638 (Standard Test Method for Tensile Properties of Plastics)
- C. ASTM D695 (Standard Test Method for Compressive Properties of Rigid Plastics)
- D. ASTM D696 (Standard Test Method for Coefficient of Linear Thermal Expansion of Plastics Between -30°C and 30°C with a Vitreous Silica Dilatometer)
- E. ASTM D790 (Test Methods for Flexural Properties of Un-Reinforced and Reinforced Plastics and Electrical Insulating Materials)
- F. ASTM D1044 (Standard Test Method for Resistance of Transparent Plastics to Surface Abrasion)
- G. ASTM D2990 (Tensile, Compressive, and Flexural Creep and Creep- Rupture of Plastics)
- H. ASTM D5813 (Cured In Place Thermosetting Resin Sewer Pipe) ASTM F1216 (Rehabilitation of Existing Pipeline and Conduits by the Inversion and Curing of a Resin Impregnated Tube)
- I. ASTM F1216 (Standard Practice for Rehabilitation of Existing Pipeline and Conduits by the Inversion and Curing of a Resin – Impregnated Tube)
- J. ASTM F1743 (Rehabilitation of Existing Pipelines and Conduits by Pulled- in-Place Installation of Cured-in-Place Thermosetting Resin Pipe (CIPP))
- K. ASTM F2454 (Sealing Lateral Connections and lines from the mainline Sewer

Systems by the Lateral Packer Method, Using Chemical Grouting)

L. City of West Palm Beach Approved Materials List

All of the above 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.

2.4 CONTRACTOR SUBMITTALS

Furnish Submittals in accordance with Section 01340 – Submittals and the following supplemental requirements:

This specification references standards from the American Society for Testing and Materials.

- A. Certification showing the CONTRACTOR or lining Subcontractor is currently licensed by the appropriate licenser to perform CIPP installation. All certifications shall be submitted to the ENGINEER before any materials are ordered.
- B. Shop drawings, plans, equipment catalog data, and written descriptions detailing short and long-term properties (providing all supporting test data) of all components, materials and composite materials, and recommendations for material storage and temperature control, CIPP handling, insertion, curing, trimming, and finishing, and QA/QC procedures. The CONTRACTOR shall submit design calculations to the ENGINEER for review after field verification of sizes and prior to ordering any material from the manufacturer for the required minimum thickness for the CIPP to be installed in each pipe reach based on the internal inspection data and the CIPP manufacturer's specifications:
 - 1. CIPP lining supplier's name and a list of material manufacturers.
 - 2. CIPP lining schedules including field-verified lengths and diameters for all CIPP linings and appurtenances required. Plans should include map(s) showing insertion points, equipment and storage locations, and field wet-out locations for all CIPP installations.
 - 3. Detailed installation procedures including CIPP lining production schedule, acceptable inversion heads and pressures, inversion procedures, curing and cool-down procedures and temperatures, and times for each process stage.
 - 4. If a field wet-out procedure will be used for liner impregnation, submit a complete description of the proposed wet-out procedure with detailed information on equipment and material storage locations, resin volumes and/or weights, liner length, start times, finish times, resin injection locations, and any other pertinent data documenting the wet-out procedure.
 - 5. Design data and specification data sheets listing all parameters used in the CIPP liner design and thickness calculations based on ASTM F1216.

6. Certification stating CIPP tube has been manufactured in accordance with ASTM F 1216 and resin is suitable for its intended use and this specification.
7. Procedure and materials to seal the connections between laterals and gravity main and/or manholes.
8. Detailed method for addressing CIPP sampling requirements including location and size of each sample, method of removal, and method of liner repair and procedure for testing CIPP Liner.
9. Pre-installation and post-installation CCTV Inspection reports.
10. A complete list of service laterals, including relevant footage and diameter shall be submitted to the OWNER and ENGINEER prior to initiating CIPP lining.
11. Sewage bypass plans in accordance with this specification and with Section 02750 – Wastewater Flow Control.
12. Test Results. Prior to using any materials, furnish the proposed material's test results from an independent laboratory in conformance with these specifications. All submitted test data shall have been performed on field installed samples within the last 12 months. Testing by an independent laboratory shall verify the products to be used meet all minimum strength standards as set forth in ASTM F1216, Table 1. Testing shall also verify any product to be used on the project meets the minimum chemical resistance requirements as established in ASTM F1216, where the testing is in accordance with ASTM D543.
13. Pipe Cleaning Narrative. Submit a narrative describing in sufficient detail the proposed methods for root cutting and cleaning the existing laterals. Prepare such narrative to include the degree of cleaning as recommended by the lining manufacturer. Such narrative shall indicate the lining manufacturer's technical representative's approval for the proposed cleaning methods.
14. Manufacturers' shipping, storage, and handling recommendations for all CIPP system components.
15. A safety plan and MSDS sheets (Safety Data Sheets) for all hazardous chemicals used or expected to be on-site including resin, catalyst, cleaners and repair agents.
16. Technical procedure or information regarding the control and mitigation of shrinkage and wrinkling during installation and cure of CIPP liner. Copies of previous physical properties tests as well as chemical resistance tests.
17. An odor control plan describing how odors will be minimized at the project site upon request from the OWNER.
18. All pipelines and structures shall be listed by the OWNER's asset name in

all submittal documentation.

19. CIPP manufacturer's statement accepting five (5) years warranty responsibility.

- C. All lateral lining design calculations shall be sealed and signed by a Florida registered professional engineer.
- D. Submit a copy of the initial customer notification as described in Section 3.01.
- E. Post-lining inspection data. Submit the final television inspection that shows the rehabilitated pipe per Section 02760.

2.5 QUALITY ASSURANCE

- A. The CONTRACTOR shall have a minimum of three (3) years of continuous experience installing the CIPP laterals liners in pipe of a similar size, length and configuration as contained in this contract. The lead personnel including the superintendent, the foreman and the lead crew personnel for the CCTV inspection, resin wet-out, the CIPP liner installation, liner curing and the robotic service reconnections must have a minimum of three (3) years of total experience with the CIPP technology proposed for this contract and must have documented the following minimum criteria to be deemed commercially acceptable:

Product	Unit	Florida Minimum Requirement	U.S. Minimum Requirement
Lateral Liner	LF	15,000	50,000
Main/Lateral Connections	EA	200	1,000
Stack Single or Double Wye	EA	25	25
Lateral Transitions	EA	50	100

- B. All CIPP linings (including lining for laterals) shall be from a single manufacturer. The ENGINEER and/or OWNER may inspect the CIPP lining after delivery and reject any or all of the lining products if they fail to meet the requirements specified herein. Lining rejected after delivery shall be marked for identification and removed from the job site at once.
- C. Final Installed Lining Thickness. The final installed lining thickness shall not be less than or more than 10 percent greater than the required thickness. The final installed lining thickness measurement shall be determined from lining sample coupons retrieved from the sewer, plate samples or as deemed necessary by the ENGINEER. It shall be the CONTRACTOR's responsibility to consider site conditions and their installation process to determine the proper lining thickness to install.

- D. Non-Compliance. If the flat plate samples do not meet the required 4,500 psi flexural strength and 250,000 psi flexural elasticity modulus as outlined, actual installed samples must be taken. The installed samples shall be taken as directed by the OWNER and in accordance with applicable ASTM standards as determined by the OWNER. From these samples, the installed thickness shall be determined by taking an average of at least 10 thickness measurements. Installed samples shall then be prepared for re- testing in accordance with these specifications.

2.6 WARRANTY

- A. The liner shall be certified by the manufacturer for specified material properties for a particular job. The manufacturer shall warrant the liner to be free from defects in raw materials for free (5) years-from the date of acceptance. The OWNER may conduct TV inspections within the warranty period. During the warranty period, any defects that 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. Any defects replaced at that time shall be fully warranted by the CONTRACTOR and manufacturer for one year from the date the defect was repaired. During the non-prorated warranty period, any defects which affect the integrity, strength or water tightness of the installed pipe shall be repaired at the CONTRACTOR's expense.
- B. Wrinkles, blisters, dry spots in resin, or other defects in the finished laterals, which in the OWNER's opinion, negatively affect the lateral's integrity or strength or the pipe's flow capacity or performance of solids passage are unacceptable. CONTRACTOR will be responsible to remove and repair, at CONTRACTOR's expense, all such defects in a manner satisfactory to the OWNER. Defects also include but are not limited to the following:
1. Leakage through the lining or between lining and pipe
 2. More than 10 percent reduction in the lining thickness
 3. Lining separating from the pipe
 4. Excessive wrinkles inhibiting flow (greater than 3% outside of lower 120 degrees of pipe and greater than 2% within lower 120 degrees of pipe or at OWNER's discretion).
 5. Foreign Inclusions
 6. Dry spot (area devoid of resin)
 7. Improperly cut lateral/reinstatement connection
- C. The lining shall be as free as commercially practicable from visual defects such as foreign inclusions, dry spots, pinholes, and delamination. The lining shall have a smooth surface free from leaks, cracks, and crazing. Some minor waviness that, in the OWNER's opinion, will not appreciably decrease the flow cross-section or affect the flow characteristics shall be permissible.

2.7 DELIVERY, STORAGE AND HANDLING

- A. If the flexible tube is impregnated with resin at the factory, it shall be transported, installed, and cured before expiration of the shelf life.
- B. The certified CIPP CONTRACTOR or Subcontractor shall be responsible for the delivery, storage and handling of all materials for CIPP lining in accordance with the written requirements of the manufacturer.
- C. The CONTRACTOR shall exercise adequate care during transportation, handling and installation to ensure the CIPP material is not torn, cut, or otherwise damaged. If any part or parts of the CIPP material becomes torn, cut or otherwise damaged before or during insertion, it shall be repaired or replaced in accordance with the manufacturer's recommendations and approval by the ENGINEER before proceeding.
- D. The CIPP lining shall be maintained at a proper temperature in refrigerated facilities and protected from ultraviolet light at all times prior to installation to prevent premature curing. Any CIPP lining showing evidence of premature curing shall be rejected for use and immediately removed from the site.

PART 2 - PRODUCTS

3.1 CIPP LINER

- A. The CIPP liner for laterals is to be provided per the City of West Palm Beach's Approved Materials List or approved equivalent.
- B. The outside reach of CIPP liner tube shall be labeled by the liner manufacturer with the location of the liner manufacturer, the liner thickness and the liner diameter. The outside of the flexible tube shall be marked along its full length at regular intervals not to exceed five (5) feet.
- C. The service lateral lining shall be a seamless, corrosion-resistant, cured-in- place pipe lining product that seals the service lateral pipe and the junction between the service lateral pipe and main sewer. The portion of the lateral lining system that connects to the main/lateral interface shall be either a full- wrap or brim-seal connection type and should meet the following requirements:
 - 1. The connection between the service lateral and the main sewer shall be lined so a continuous overlap between the service lateral lining and the main sewer extends 3-inches minimum from the lateral along the entire circumference.
 - 2. The seal insert shall be fabricated to a size that when installed will key into the internal surface irregularities of the lateral joint and neatly fit tight to the internal circumference of the main and lateral. The insert shall be of a material that allow for circumferential stretching and angular alignment with the lateral pipe connection geometry during insertion.

3. A secondary epoxy-sealing component shall be used to form a sealing bond between the seal insert product and the host lateral and main pipe walls.
- D. The flexible tube shall be one or more layers of needled felt or equivalent non-woven material manufactured under quality control conditions set by the manufacturer and be capable of holding resin and withstanding installation pressures and curing temperatures. The tube shall be compatible with the resin system used and shall contain no intermediate layers that delaminate after resin curing. The liner tube will be lined on one side with a translucent impermeable chemically resistant waterproof coating that is compatible with the tube/resin material. This coating will be on the inside of the lined pipe after curing is completed. The coating will provide a smooth and seamless inner wall.
- E. Tube material shall be able to stretch to fit irregular pipe sections and negotiate bends. The tube shall be fabricated to a size so that, when installed, it will fit snugly inside the circumference and length of the existing laterals and produce the required thickness after the resin is cured. Allowance should be made for circumferential stretching during installation and shrinkage of resin during curing and aging so that the final cured product is snug against the wall of the host pipe and free of fins and buckles.
- F. The minimum length of the flexible tube shall be as necessary to effectively and fully span the distance between manholes, with allowance for proper stretching or shrinkage due to pressure or expansion.
- G. 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 the layers separate during field sample testing, new samples will be required to be obtained from the installed pipe. Any reoccurrence may cause rejection of the work.
- H. 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.
- I. The felt tubing shall be vacuum impregnated with a thermosetting resin system. The resin used shall be compatible with CIPP system used and designated for use with sewage.
- J. The resin will be a corrosion resistant thermo-set polyester, vinyl ester or epoxy resin designed for use in sewer applications including all required catalysts, initiators that when cured within the tube create a composite that satisfies the requirements of ASTM F1216, ASTM D5813 and ASTM F1743, the physical properties herein, and those which are to be utilized in the submitted and approved design of the CIPP for this project. The resin shall not contain fillers,

except those required for viscosity control or fire retarding. The resin shall be formulated to have a gel (pot) life appropriate for the scope of the work. The resin shall be heat cured by an internal exothermic chemical reaction initiated by steam. The resin shall produce a CIPP that will comply with the structural and chemical resistance requirements of this specification. The resin shall be resistant to abrasion from solids, grit, and sand in wastewater and stormwater. The resin shall have proven resistance to the municipal wastewater environment.

- K. The reinforced / seam stitched / heat welded seam tape / felt liner tube and resin will meet and or exceed prior to and upon installation minimum testing standards as required by ASTM (ASTM F1216 and ASTM D5813) and ANSI/NSF International. All materials must have 3rd party testing provided by an independent laboratory. The materials must be ANSI/NSF Standard- 14 approved.
- L. The wet-out tube shall have a relatively uniform thickness that when compressed at installation pressures will equal or exceed the calculated minimum design CIPP wall thickness.
- M. The CIPP shall be designed as per ASTM F1216, Appendix X.1. The CIPP design shall assume no bonding to the original pipe wall. CONTRACTOR shall submit to the ENGINEER the design calculations for approval prior to procuring materials for the project.
- N. The CONTRACTOR must have performed long-term testing for flexural creep of the CIPP pipe material installed by his/her 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 as defined within the relevant ASTM standard. A percentage of the instantaneous flexural modulus value (as measured by ASTM D790 testing) shall be used in design calculations for external buckling. The percentage, or the long-term creep retention value utilized, shall be verified by this testing. Retention values exceeding 50% of the short-term test results shall not be applied unless substantiated by qualified third-party test data to the OWNER's satisfaction. The materials utilized for the 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 the CIPP design.
- O. The cured pipe material (CIPP) shall conform to the structural properties, as listed below.

Required Cured-In-Place Lateral Lining Standards Minimum

Flexural Strength (ASTM D-790)	4,500 PSI
Flexural Modulus (ASTM D-790)	250,000 PSI Tensile
Strength (ASTM D-638)	3,000 PSI
Compressive Strength (ASTM D-695)	5,400 PSI
Chemical Resistance (ASTM D-543)	< 20% loss
Leakage Test* (NSF Standard 14)	0/gal/in/day

* Leakage test performed by ANSI/NSF International

The required structural CIPP wall thickness shall be based as a minimum, on the physical properties above or greater values if substantiated by independent lab testing and in accordance with the design equations in the ASTM F1216, Appendix X1, and the following design parameters:

- Design Safety Factor (typically used value) = 2.0
- Maximum long-term deflection shall be 5 percent
- All material properties used in design calculations shall be long-term (time-corrected) values.
- The CIPP shall be designed for fully deteriorated conditions.
- Retention Factor for Long-Term Flexural Modulus to be used in Design = 50%
- Ovality = Based on greater of actual ovality found during CCTV inspection and 2% (i.e. 2% minimum)
- Enhancement Factor, K = 7 min.
- Groundwater Depth = Greater of 8 ft. or depth shown on plan
- Soil Depth (above crown of existing pipe) = Greater of 8 ft. or depth shown on plan
- Soil Density = 120 pcf (moist)
- Live Load = H20 Highway
- Designed for 50-year service life
- The design for the CIPP shall recognize any non-uniform cross section and the liner bifurcation present at the spring line of the pipe. Accounting for this condition by the use of an ovality reduction factor alone is unacceptable.
- 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.

P. Chemical Resistance:

1. The liner shall be fabricated from materials which, when complete, are chemically resistant to and will withstand internal exposure to domestic sewage having a pH range of 5 to 10.5 and temperatures up to 125-degrees Fahrenheit.
2. CIPP liners shall meet the minimum chemical resistance requirements in accordance with ASTM D 543 and meet the chemical resistance requirements of ASTM F1216, Appendix X2.1 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.

Q. Hydraulic Capacity - Overall, the hydraulic cross-section shall be maintained to the greatest extent practical. The CIPP shall have a minimum of the full flow capacity of the original pipe before rehabilitation. Calculated capacities may be derived using a commonly accepted roughness coefficient for the existing pipe material taking into consideration its age and condition.

R. The installed product shall be compatible with the lining system utilized for the main lines.

3.2 END SEALS

- A. End seals shall be utilized at manhole connections and at lateral connections if needed. The rubber end seal shall be an extended hydrophilic rubber compounded from chloroprene (Neoprene) rubber and hydrophilic resin that expands on contact with water.
- B. The end seals must be in a tubular form which when installed will form 360-degree seal between the host pipe and the newly installed liner and must be a minimum 3- inches wide. The use of caulking, rope, or band type of an end seal will not be allowed unless approved by the OWNER/ENGINEER.
- C. On contact with water, the rubber shall swell and mold itself to completely fill any gaps and exert pressure evenly to ensure the seal.

PART 3 - EXECUTION

1.1 GENERAL

- A. The CONTRACTOR shall provide appropriate maintenance of traffic to complete the work including securing appropriate right of way and MOT permits from the City of West Palm Beach and other governing agencies as applicable. If water is needed to facilitate the installation, the CONTRACTOR shall secure a hydrant meter from the City of West Palm Beach and pay for the meter deposit, set up and usage fees.
- B. Public Notification - The CONTRACTOR shall make every effort to maintain

sewer service usage throughout the duration of the project. In the event that a connection will be out of service, the longest period of no service shall be 8 hours. 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. Written notice to be delivered to each home or business a minimum of five (5) business days prior to the beginning of work being conducted on the section, and a local telephone number of the CONTRACTOR they can call to discuss the project or any potential problems.
2. Personal contact with any home or business, which cannot be reconnected within the time stated in the written notice.

1.2 BYPASSING

- A. The CONTRACTOR shall notify the ENGINEER and OWNER a minimum of 72 hours prior to commencing any previously approved bypass operations for the sanitary or storm systems. The CONTRACTOR shall be solely responsible for clean-up, repair, property damage costs and claims resulting from failure of the diversion system.
 1. Sanitary System: The CONTRACTOR shall provide for the continuous flow of sewage around the section or sections of pipe designated for repair in accordance with Section 02750 – Wastewater Flow Control. Plugging the line at an existing upstream manhole and pumping the flow into a downstream manhole or adjacent system shall make the bypass.

1.3 PRE-INSTALLATION INSPECTION AND CLEANING

- A. The CONTRACTOR shall carry out his/her operations in a safe manner and in accordance with all applicable state and federal requirements and regulations in accordance with Section 02753 – Preparatory Cleaning and Root Removal and 02752 – Television Survey for Cured In-Place Pipe Lining.
- B. The CONTRACTOR shall take field measurements to verify the existing pipe diameter, ovality and length prior to manufacturing liners. If the pipe is more than 3 percent out of round, immediately notify the ENGINEER. The manufacturer shall incorporate these measurements into the manufacturing process of the liner.
- C. Initial Cleaning of Lateral Lines - The CONTRACTOR shall remove all internal debris out of the laterals that will interfere with the installation of the CIPP liner. The CONTRACTOR shall legally dispose of all debris removed from the pipes during the cleaning operation.
- D. Inspection of Pipelines - Inspection of pipelines shall be performed by

experienced personnel trained in locating breaks, obstacles and service connections using close circuit television (CCTV) inspection techniques. The pipeline interior shall be carefully inspected to determine the location of any conditions that may prevent proper installation of CIPP in the laterals. The CCTV video inspection must be done on the mainline pipe and laterals, in accordance with Section 02760 – Service Lateral Television Survey to confirm the proposed repair falls within the limitation parameters set by the manufacturer on the following aspects:

1. The location and clock reference of the lateral junctions to be lined
 2. Any offsets, any intrusions from the lateral into the main
 3. Angle at which the connection comes in
 4. Any changes in the lateral's approach angle for the repair length
 5. Potential flows coming throughout the lateral pipe
 6. Potential flows going through the main pipe
 7. Diametric connection size for the lining length
 8. Main pipe's size at the service lateral point
 9. Service lateral's condition including the presence of debris, turns, bends, changes in diameter, or other observations
 10. Active infiltration present within the work area vicinity
 11. Any defects noted in the mainline pipe or lateral should be documented using NASSCO PACP/LACP Standards.
- E. Inform the OWNER about service laterals in which a service lateral lining cannot be installed from the main sewer to the cleanout established at the property line or easement line. The CONTRACTOR shall identify these service laterals and provide the OWNER with documentation about the conditions encountered including the CCTV inspection. If a full-length lateral lining cannot be installed or a point repair on the service cannot be performed, the OWNER may direct the CONTRACTOR to install a short lateral lining with no cleanout required extending up the lateral from the main. The length is to be field determined to the maximum length possible but should extend 3 feet minimum up the lateral from the main.
- F. Inform the OWNER about service laterals in which a short length service lateral product cannot be installed. The CONTRACTOR shall identify, document, and video record these services and inform the OWNER about the conditions encountered. If a short length lateral lining cannot be installed, the service connection will be "cut and buffed" to restore a 95% minimum service opening.
- G. Line Obstructions - It shall be the responsibility of the CONTRACTOR to clear the line of obstructions such as solids and roots that will prevent the insertion of CIPP.

1. All point repairs and clean out replacements/additions must be completed prior to CIPP lining.
 - a. If pre-installation inspection reveals an obstruction such as a dropped joint, or a collapse that will prevent the installation process, that was not evident on the pre-bid video and it cannot be removed by conventional cleaning equipment, then the CONTRACTOR shall make a point repair excavation to uncover and remove or repair the obstruction. Such excavation shall be approved in writing by the OWNER's representative prior to the commencement of the work.
 - b. If the CONTRACTOR needs to add a new or replace an existing clean out to perform the CIPP lining and this was not evident from the plans, then the Contractor shall perform this work upon written approval from the OWNER's representative prior to the commencement of the work.
2. Prior to installing the service lateral product, the area around the lateral sealing surface in the main and lateral shall be inspected.
 - a. All protruding taps should be cut even/flush or replaced with factory fitting.
 - b. Waste product build-up, hard scale, roots, lateral cutting debris, or resin slugs must be removed using high-pressure water jetting or in-line cutters. All laterals to be lined shall be cleaned as required prior to lining. The term "cleaned" shall mean removing all sand, dirt, roots, grease, and other solids or semisolid materials from the interior face of the sewer mainlines and the service laterals. Built-up deposits on the main and lateral pipe walls shall be removed. The removal shall reach at least 1 foot beyond the scheduled service lateral installation length to allow the bladder to inflate tightly against the pipe walls ensuring a smooth transition from service lateral product to the existing pipe wall.
3. Have a copy of the pre-lining inspections in the field. Immediately prior to lining insertion, the camera shall traverse the lateral to inspect for debris which may have entered the line after the existing condition inspection.
4. Where active infiltration is present and when it is recommended by the service lateral lining manufacturer, the infiltration must be stopped in advance by chemical grouting in accordance with ASTM F2454. Additional precautions need to be taken when applying the sleeve to a main pipe lined with a CIPP lining with a polyolefin coating. The coating is to be lightly scarified, scraping off the coating in the main CIPP in the service lateral lining's vicinity, and verified by the OWNER. This scuffing is mandated for service lateral linings required to adhere to the pipe wall.
5. The Contractor shall be responsible, if needed, for bypassing sewage

while installing the service lateral lining product. In cases where the temporary sewage backup is accepted as a replacement for bypassing, the CONTRACTOR shall be responsible for all damage caused by sewage backing up into properties or sanitary sewer overflows.

1.4 INSTALLATION PROCEDURES

- A. The service lateral lining shall be vacuum-impregnated with resin (wet-out) under controlled conditions. The resin volume used shall be sufficient to fill all voids in the textile lining material at nominal thickness and diameter. The volume shall be adjusted by adding 5% to 10% excess resin for the change in resin volume due to polymerization and to allow for any resin migration into the cracks and joints in the original pipe. All resin shall be contained within the translucent bladder during vacuum impregnations. No dry or unsaturated area in the lateral tube shall be acceptable upon visual inspection.
- B. The pressure apparatus shall include a bladder with sufficient length in the main and lateral lines so the inflated bladder extends beyond the ends of the service lateral product's lateral tube and main line tube, pressing the end edges flat against the internal pipe wall, thus forming a smooth transition from service lateral product to pipe diameters without a step, ridge, or gap between the service lateral product and the lateral and mainline pipes' inner diameters.
- C. For service lateral linings with hydrophilic materials, the main bladder shall be inflated causing the main sheet to unwrap and expand, embedding the hydrophilic material between the main lining and the main pipe as the main lining is pressed tight against the main pipe.
- D. After insertion is completed, recommended pressure must be maintained on the impregnated service lateral product pressing the lining firmly against the inner pipe wall during the entire curing process.
- E. The lining shall be cured at ambient temperatures or by a suitable heat source. In no instance will sewage be used to invert or cure linings or calibration tubes. The finished service lateral lining shall be free from dry spots, lifts, and delamination. The installed service lateral lining should not inhibit the CCTV post installation video inspection for the mainline and service lateral pipes or future pipe cleaning operations. For service lateral linings with compression gaskets, the CIPP shall taper at each end providing a smooth transition to accommodate video equipment and maintain proper flow in the mainline. In all cases, the finished product must provide an airtight/watertight verifiable non-leaking connection between the main sewer and sewer service lateral. During the warranty period, any defects with the service lateral that affect the lateral connection's performance, cleaning, or water tightness shall be repaired at the CONTRACTOR's expense in a manner acceptable to OWNER.
- F. Following the lining installation, provide the OWNER with an electronic picture and recorded data identifying the location and showing the completed work and

restored condition for all the rehabilitated service laterals from the sewer main to the service reconnection point. The CONTRACTOR shall televise the rehabilitated lateral to provide a detailed record of finished conditions using NASCCO PACP/LACP guidelines. When complete, the CONTRACTOR shall submit the rehabilitated lateral inspections

- G. Installation procedures shall be in accordance with the manufacturer's recommendations.
- H. The curing of the CIPP must take into account the existing pipe material, the resin system, and ground conditions (temperature, moisture level, and thermal conductivity of soil). The post-cure temperature should be held for a period as recommended by the resin manufacturer, during which time the recirculation of the water and cycling of the head source to maintain the temperature continues.
- I. The bond between all CIPP layers shall be uniform. All layers, after cure, shall be completely saturated with resin.
- J. The CIPP shall be cooled to a temperature below 100-degrees F before relieving the hydrostatic head. Care should be taken in release of the static head so that a vacuum will not be developed that could damage the newly installed liner. Provide piping, valves and other equipment to discharge curing water. The temperature of water discharged to the sewer system from processing liners shall not exceed 125-degrees F maximum, or the level allowed by State or local standards if less than 125-degrees F. Temperature gauges shall be placed as needed to monitor the temperatures during the cure cycle.
- K. The CONTRACTOR shall furnish on-site on a continuous basis at least one (1) additional operational robotic cutter assembly train and key spare components as a "stand-by" unit in the event of primary equipment breakdowns.

1.5 FINISHED CIPP LINER PRODUCT

- A. The finished CIPP shall be continuous over the entire length of service pipe and be free from visual defects such as foreign inclusions, dry spots, pinholes, delamination, fins and wrinkles larger than 2 percent of the pipe diameter.
- B. The liner shall conform to the shape of the pipe existing prior to liner insertion and not be out of round by more than 3 percent.
- C. Defects beyond the specification allowances, determined by the ENGINEER as affecting the integrity or strength of the CIPP, or as adversely affecting the hydraulic capacity of the pipe, shall be repaired or replaced at the CONTRACTOR's expense. Method of repair shall be proposed by the CONTRACTOR and submitted to the ENGINEER for review and approval. The repairs shall be smooth and sealed with an epoxy resin compatible with the CIPP liner system.

- D. Fins and wrinkles in the finished CIPP beyond the specification allowances are unacceptable and shall be ground, removed or otherwise repaired and sealed by the CONTRACTOR at no additional cost to the OWNER.
 - 1. Methods of repair shall be proposed by the CONTRACTOR and submitted to the ENGINEER for review and approval.
- E. Separations of liner seams in the finished liner pipe are unacceptable and shall be removed or repaired by the CONTRACTOR at no additional cost to the OWNER.
 - 1. If a separation of a liner seam exists, the CONTRACTOR shall repair or replace that section of the pipe at no additional cost to the OWNER.
 - 2. Methods of repair shall be proposed by the CONTRACTOR and submitted to the ENGINEER for approval.
- F. There shall be no visible infiltration through the liner at the service connection, or around the liner at manhole connections. The CONTRACTOR shall repair all visible leaks in a manner approved by the ENGINEER.

1.6 POST INSTALLATION

- A. The lining's field acceptance shall be based on the OWNER's evaluation of the installation including post-lined digital CCTV inspection and reviewing certified test data for the installed pipe samples. A post-liner inspection of the rehabilitated line shall be completed in accordance with Section 02760 – Service Lateral Television Survey.
- B. Portions of any piece of liner material removed during installation shall be available for inspection and retention by the ENGINEER.
- C. The CONTRACTOR shall take photographs of Hydrophilic Rubber End Seals when used at manhole connections.

1.7 FIELD SAMPLING AND TESTING

- A. The lining's field acceptance shall be based on the OWNER's evaluation of the installation including post-lined digital CCTV inspection and reviewing certified test data for the installed pipe samples. The CCTV inspection for each lateral shall extend 10 feet minimum past the end of the rehabilitation work on the service lateral. For laterals where a cleanout was installed, the CCTV inspection shall include the cleanout and the connection to the existing, undisturbed service lateral.
- B. All service connections shall be open, clear, and watertight.
- C. A flat plate sample shall be collected for every 50 lateral installations, and the sample shall be submitted to a third-party testing laboratory to confirm and thickness measured as described in ASTM F1743 and strength properties

(flexural strength and flexural modulus) in accordance with ASTM F1216. The test results must meet or exceed the strengths in the design, or the CONTRACTOR shall provide acceptable remediation measures to repair defects.

- D. The lining shall have no evidence of defects including splits, cracks, breaks, lifts, kinks, delamination's, or crazing.
- E. If any defective lining is discovered after it has been installed, it shall be removed and replaced by the CONTRACTOR with a new lining, a new pipe, or other measures with the OWNER's approval at no additional cost to OWNER. Any lining installation not meeting specified strengths or thickness shall provide other acceptable remediation measures as approved by the OWNER. Credit will only be accepted if remediation measures cannot be agreed upon. The re-inspection requirements as listed above shall apply to this re- installed section of line.
- F. The OWNER reserves the right to take five (5) random core samples of the installed CIPP liner at no additional cost in accordance with the procedures in ASTM D5813, as is applicable. The method of repair will be as recommended by the Manufacturer.
- G. The CONTRACTOR shall be responsible for all costs associated with the testing of the liner physical properties.
- H. The CONTRACTOR shall refrain from removing the sewer bypass pumping system until both the ENGINEER and OWNER have formally notified the CONTRACTOR that the work and finished product is accepted.

1.8 CLEANUP

- A. After the liner installation has been completed and accepted, the CONTRACTOR shall cleanup the entire project area. The CONTRACTOR shall dispose of all excess material and debris not incorporated into the permanent installation.

END OF SECTION

SECTION 02771

MANHOLE REHABILITATION

PART 1 - GENERAL

2.1 WORK INCLUDED

- A. The work specified in this section includes all labor, materials, accessories, equipment, and tools for performing operations required to rehabilitate sanitary sewer and stormwater manholes to reduce infiltration and inflow (I&I), provide corrosion protection, repair cracks and voids, and restore/increase structural integrity as a result of application of lining materials to the structure walls, bench, and all other surfaces of concrete, brick or any other masonry construction material. The materials shall be chemically resistant to withstand internal exposure to the typical fluid within the host structure (domestic sewage or stormwater) and designed to handle all design pressures.
- B. Where indicated on the plans, recommended by liner manufacturer or as needed to perform the manhole rehabilitation, work may require, patching manhole interior; stopping infiltration with chemical grout; rebuilding invert and benching; resetting or replacing manhole ring and cover assemblies; installing chimney seals, adjusting elevation of manhole frame and cover.
- C. Eliminate active infiltration observed in the frame seal, chimney (corbel for brick manholes), cone, wall, bench, invert, holes, or pipe connections prior to applying the manhole lining system.
- D. Reinstall existing manhole rings and covers removed to allow the completion of the rehabilitation work and restore the site to its pre- maintenance condition.
- E. The CONTRACTOR shall provide a written report including photographs for each completed manhole. This report should include the general masonry condition before and after preparation, the amount of infiltration, how infiltration was rectified, and what type and how much product was used.
- F. CIPP installation of the primary main will take place prior to all manhole coating work. Lined-through manholes shall be opened prior to manhole coating work.

2.2 RELATED REQUIREMENTS SPECIFIED ELSEWHERE

- A. Drawings and general provisions of the Contract, including the General Conditions and Terms and Division 1 Specification sections, apply to this section.
- B. The following sections are referenced in this specification:
 - 1. 01340 – Submittals
 - 2. 02750 – Wastewater Flow Control

2.3 QUALITY ASSURANCE

- A. Furnish materials of quality required by the American Society for Testing and Materials (ASTM) standards or other approved standards and specifications.
- B. Provide guarantee against defective materials and workmanship in accordance with the requirements of these specifications.
- C. All workers must be confined space certified prior to starting all work. All workers shall abide by OSHA 1910.146.
- D. Applicator shall initiate and enforce quality control procedures consistent with applicable ASTM, NACE and SSPC standards and the protective coating manufacturer's recommendations.
- E. The CONTRACTOR installing the finished protective liner shall meet the following requirements and provide the following documentation as part of their qualifications:
 - 1. Be a certified trained applicator of the specified process. Provide documentation supporting applicator's qualifications including applicator's certificate from the manufacturer.
 - 2. Have a minimum of five (5) years of work experience with successfully performing reconstruction of sanitary sewer and stormwater manholes on projects of similar size and scope within the State of Florida and have successfully installed the proposed lining system in a minimum of 500 manholes. Provide a list of all municipal installations performed by the manufacturer and CONTRACTOR over the past five (5) years along with the client reference contact name, telephone number, and brief description of work performed.
 - 3. Be fully qualified, experienced, and equipped to complete the work in a timely and satisfactory manner and capable of providing crews as needed to complete this work without undue delay.
- F. The OWNER reserves the right to disapprove the use of the CONTRACTOR based on the submitted qualifications.

2.4 REFERENCES

- A. ASTM – Applicable published standards of the American Society for Testing and Materials, West Conshohocken, PA.
- B. SSPWC 210-2.3.3 - Chemical resistance testing published in the Standard Specifications for Public Works Construction, 1997 edition (otherwise known as "The Greenbook").

- C. NACE - The published standards of National Association of Corrosion Engineers (NACE International), Houston, TX.
- D. ICRI Technical Guideline No. 03730 - Surface Preparation Guidelines for the Repair of Deteriorated Concrete Resulting from Reinforcing Steel Corrosion
- E. City of West Palm Beach Approved Materials List

2.5 SUBMITTALS

- A. the structure to be rehabilitated, the rehabilitation products, surface preparation and installation to the ENGINEER for approval in accordance with Section 01340 – Submittals and the following supplemental requirements. The submission should include manufacturer recommendations for each of the products and structures.
 - 1. The submission of these data shall be made in a timely manner to prevent project delay. At the request of the ENGINEER, test for adverse chemical conditions that may hinder overall product performance. The wall thickness of the liner shall be structurally designed to withstand the hydraulic load generated by the groundwater table and restore structural integrity. CONTRACTOR shall submit calculations for approval and/or certifications by the liner manufacturer that demonstrate the required minimum thickness for the field conditions.
 - 2. In addition to liner/coating materials, the submission shall include information on all patching and repair materials, epoxies, chemical grout and additives, cementitious compound, waterproofing, and corrosion control materials that will be used, the installation method, curing times and temperatures, recommended surface preparations, and description of sealing method for each manhole and equipment.
- B. Reports: Submit manufacturer's test reports of physical/chemical properties of the product.
- C. A certificate of "Compliance with Specifications" shall be furnished for all materials supplied.
- D. Documentation showing compliance with OSHA VOC emissions regulations.
- E. A work plan including by-pass pumping for stormwater and sewer.
- F. A safety plan: Comply with OSHA standards and all regulations pertaining to the work including confined space entry.
- G. Applicator Qualifications: Submit qualifications of applicator. Certification by the manufacturer stating that the applicator is trained and approved in the application of the specified products. Certification that the equipment to be used for applying

the products has been manufactured or approved by the protective coating manufacturer and Applicator personnel have been trained and certified for proper use of the equipment. Certification letter shall be dated within six months of bid date.

- H. Material Safety Data Sheet (MSDS) for each product used (applies to coatings / linings and chemical grouts).
- I. Final installation report on completed manholes including thickness measurements (applies to linings only) and testing reports.

2.6 DELIVERY, STORAGE, AND HANDLING

- A. Care shall be taken in shipping, handling and placing to avoid damaging the chemical grouts, cementitious materials, and other manhole rehabilitation products. Extra care may be necessary during cold weather construction. Any lining product or material damaged in shipment shall be replaced as directed by the ENGINEER or OWNER.
- B. Any materials showing deterioration, or which has been exposed to any other adverse storage condition that may have caused damage, even though no such damage can be seen, shall be marked as rejected and removed at once from the work.
- C. While stored, the materials shall be adequately packaged and protected. The materials shall be stored in a manner as recommended by the manufacturer.
- D. Protective coating materials are to be handled according to their material safety data sheets.
- E. Storage and handling shall be in accordance with the City of West Palm Beach.

2.7 SITE CONDITIONS

- A. Applicator shall conform with all local, state and federal regulations including those set forth by OSHA and the EPA and any other applicable authorities.
- B. Method statements and design procedures are to be provided by CONTRACTOR when confined space entry, flow diversion or bypass is necessary in order for Applicator to perform the specified work.

2.8 WARRANTY

- A. Applicator shall warrant all work against defects in materials and workmanship for a period of five (5) years, unless otherwise noted, from the date of final acceptance of the project. The warranty shall be for all labor and materials cost necessary to repair or replace the failed application, including related work

(permits, bypass piping, pumps, flow monitoring, restoration, and record information) Applicator shall, within a reasonable time after receipt of written notice thereof, repair defects in materials or workmanship which may develop during said five (5) year period, and any damage to other work caused by such defects or the repairing of same, at his own expense and without cost to the OWNER.

PART 2 - PRODUCTS

3.1 GENERAL

- A. The materials to be utilized in the lining of manholes shall be designed for to withstand internal exposure to the typical fluid within the host structure (domestic sewage or stormwater).
- B. Sewer manholes shall be designed and manufactured to withstand the severe effects of hydrogen sulfide in a wastewater environment. Manufacturer of corrosion protection products shall have long proven experience in the production of the lining products utilized and shall have satisfactory installation record.
 - 1. The finished sewer structure shall be corrosion resistant to: Hydrogen sulfide, 20% sulfuric acid, 17% nitric acid, 5% sodium hydroxide, as well as other common ingredients of the sanitary sewage environment.
- C. Equipment for installation of repair and lining materials shall be high quality grade and be as recommended by the manufacturer.

3.2 REPAIR MATERIALS

- A. reinforce and/or rebuild surfaces, etc. as determined necessary by the ENGINEER, liner manufacturer and protective coating applicator. Repair materials must be compatible with the specified coating/liner and shall be applied in accordance with the manufacturer's recommendations. Shop drawings shall be submitted for all proposed repair materials and should include application, minimum thickness, cure time, compressive strength and surface preparation procedures which permit optimum bond strength with the approved coating.
- B. The following products may be accepted and approved as compatible repair basecoat materials for approved top coating for use within the specifications.
 - 1. 100% solids, solvent-free grout specifically formulated for approved top coating compatibility. The grout manufacturer shall provide instructions for trowel or spray application and for approved top coating procedures.
 - 2. In the case of excessive infiltration, a rapid-setting hydraulic cement or plug may be used to stop the flow of the infiltration. Approved manufacturers include Strong, or approved equal. The hydraulic cement

shall not contain chlorides, gypsums, plasters, iron particles, aluminum powder or gas-forming agents, or promote the corrosion of steel it may come in contact; the plug shall also be compatible with the coating/lining products to be used and shall comply with the following minimum requirements:

Minimum Requirements		
Compressive Strength	ASTM C 109	>1000 psi, 1hr. >2500 psi, 24 hrs.
Tensile Strength	ASTM C 190	>290 psi, 1 day >575 psi, 28 days
Sulfate Resistance	ASTM C 267	No weight loss after 15 cycles @ 2000 ppm
Freeze/Thaw	ASTM C 666 "Method A"	100 cycles
Pull Out Strength	ASTM C 234	14,000 lbs.
Set Time		< 5.0 minutes

3. Factory blended, rapid setting, high early strength, non-shrink cementitious or epoxy repair mortar that can be troweled or pneumatically spray applied may be approved if specifically formulated to be suitable for approved top coating. Such repair mortars should not be used unless their manufacturer provides information as to its suitability for top coating with the approved top coating.
4. Restoration mortar - Low shrinkage, high strength, sprayable cementitious mortar when recommended by the liner manufacturer to restore surface profile.
5. The water used to mix product shall be clean and potable. No material (other than water) shall be used with or added to the patching product.

3.3 LINER MATERIALS

- A. The liner material shall be used to form the sprayed on/structural enhanced monolithic liner covering all interior surfaces of the structure including benches and inverts of manholes. The coating/liner system shall be a structural liner from the City of West Palm Beach's Approved Materials List or approved equal and should be appropriate for the existing condition, material and use of the manhole structures to be rehabilitated.
- B. Other Materials: All components of the lining system recommended by the product manufacturer for a complete and functional system shall be applied as

part of the complete coating system for each manhole. This includes applying primers and additional topcoats as recommended by the liner manufacturer.

3.4 PROTECTIVE COATING APPLICATION EQUIPMENT

- A. Manufacturer approved spray equipment shall be used in the application of all layers of the protective coating.

PART 3 - EXECUTION

3.1 INSTALLATION RESPONSIBILITIES

- A. The CONTRACTOR shall provide appropriate maintenance of traffic to complete the work including securing appropriate right of way and MOT permits from the City of West Palm Beach and other governing agencies as applicable. If water is needed to facilitate the installation, the CONTRACTOR shall secure a hydrant meter from the City of West Palm Beach and pay for the meter deposit, set up and usage fees.
- B. Cleaning of Manholes - The CONTRACTOR shall remove all internal debris out of the adjacent mains that will interfere with the installation of the liner/coating system. The CONTRACTOR shall legally dispose of all debris removed from the adjacent gravity mains during the cleaning operation.
 - 1. Each manhole to be rehabilitated shall be thoroughly cleaned and then inspected for loose or missing bricks, loose mortar, or holes. Remove any protrusions or obstructions into the manhole. Observed leaks shall be eliminated prior to applying the manhole lining system.
 - 2. Damage incurred to the manhole or pipe segments due to methods and equipment employed by the CONTRACTOR is the responsibility of the CONTRACTOR. Damage to public and private property from sewer surcharging/blocked drainage pipes that results from material or equipment left in the manhole or mains or from any flow blockage is the responsibility of the CONTRACTOR. The cost to repair the manhole or pipe segments and expenses incurred by the OWNER as a result of the damage shall be the responsibility of the CONTRACTOR.
- C. Bypassing Flows - The CONTRACTOR shall notify the ENGINEER and OWNER a minimum of 72 hours prior to commencing any previously approved bypass operations for the sanitary or storm systems. The CONTRACTOR shall be solely responsible for clean-up, repair, property damage costs and claims resulting from failure of the diversion system.
 - 1. Sanitary System: The CONTRACTOR shall provide for the flow of sewage around the manholes designated for repair in accordance with Section 02750 – Flow Bypass Pumping System (Sanitary Sewer). Plugging the

line at an existing upstream manhole and pumping the flow into a downstream manhole or adjacent system shall make the bypass. The pump(s) and bypass line(s) shall be of adequate capacity to accommodate the sewage flow.

2. Storm System: The CONTRACTOR shall provide a plan to divert stormwater flow during the manhole rehabilitation work in accordance with 02734 – Flow Bypass Pumping System (Drainage). The plan should include the stormwater flow diversion pumping locations and methods with sufficient detail to assure that the work can be performed without incident. The stormwater flow diversion plan shall include an emergency response plan in the event of a failure of the pumping system.
 3. The CONTRACTOR shall coordinate with OWNER's Operations and Maintenance Staff a minimum of two (2) weeks prior to performing any work that would require any lift stations to be temporarily shut down.
- D. Evaluation of Atmosphere: Prior to entering structures, an evaluation of the atmosphere will be conducted to determine the presence of toxic, flammable vapors or possible lack of oxygen. The evaluation shall be in accordance with local, state or federal safety regulations.
- E. Before application of each material, surfaces to be sprayed or coated will be inspected by the ENGINEER and by the OWNER. Correct defects or deficiencies before application of subsequent material.
- F. Public Notification - The CONTRACTOR shall make every effort to maintain sewer service usage throughout the duration of the project. In the event that a connection will be out of service, the longest period of no service shall be 8 hours. 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. Written notice to be delivered to each home or business a minimum of five (5) business days prior to the beginning of work being conducted on the section, and a local telephone number of the CONTRACTOR they can call to discuss the project or any potential problems.
 2. Personal contact with any home or business, which cannot be reconnected within the time stated in the written notice.
- 3.2 PREPARATION
- A. Place covers over all pipe openings to prevent extraneous material from entering the adjacent piping system. Place tape to protect equipment not intended for spraying/coating. All foreign material shall be removed from the structures' wall

and bench/floor using a pressure water spray (minimum 3000 psi). CONTRACTOR is responsible for any damage caused during cleaning and is responsible for notifying ENGINEER if there is a concern that using high velocity water will cause damage to the structure. All contaminants including oils, grease, incompatible existing coatings, waxes, form release, curing compounds, efflorescence, sealers, salts, or other contaminants shall be removed. The use of acid for cleaning purposes, no matter how dilute, will not be allowed. Loose or protruding brick, mortar and concrete shall be removed by using a mason's hammer and chisel. The surface to be repaired must be clean and free of any loose materials.

- B. Inspect cleaned surfaces to identify and mark corroded reinforcing steel, and to locate cracks, leaks, and joints. Remove all loose mortar and rubble of existing chimney (corbelling), cone, walls, benches, and inverts. Prepare manhole to receive lining as necessary by reshaping and repairing benches, inverts, cone, walls, and corbelling where required. All interior surfaces shall be prepared as recommended by the lining manufacturer. Minimum requirements are as listed below:
1. Replace or treat corroded reinforcing steel, repair cracks and leaks, and treat joints in accordance with manufacturer's instructions and as approved by the ENGINEER. Refer to ICRI Technical Guideline No. 03730 - Surface Preparation Guidelines for the Repair of Deteriorated Concrete Resulting from Reinforcing Steel Corrosion. Apply approved epoxy putty promptly after cleaning reinforcing steel to protect the steel from contamination and re- rusting.
 2. Infiltration shall be stopped by using a material which is compatible with the specified repair mortar and is suitable for top coating with the specified protective coating. Repair cracks and other voids and fill with suitable non-shrinking cements, sealants, or grouts, including all voids between the existing connecting pipes and manhole walls. Patches shall be smooth and even with the manhole wall. All excess or spilled material shall be cleaned and removed prior to application of the liner/coating.
 3. The area between the manhole and the manhole ring and any other area that might exhibit movement or cracking due to expansion and contraction, shall be grouted with a flexible grout or gel.
 4. Surfaces to receive protective coating shall be cleaned and abraded to produce a sound surface with profile to meet as a minimum ICRI CSP4 – CSP6 profile and porosity to provide a strong bond between the protective coating and the substrate. Detergent water cleaning and hot water blasting may be necessary to remove oils, grease or other hydrocarbon residues from the concrete. Whichever method(s) are used, they shall be performed in a manner that provides a uniform, sound clean neutralized surface that is not excessively damaged.

5. Prepare surfaces in accordance with manufacturer's recommendations. This includes adding a restoration mortar as needed to rebuild surface profile within the structure as recommended by the liner manufacturer. When installing restoration mortar:
 - a. Do not trap air in corners, behind exposed reinforcing steel, or between lifts.
 - b. Mortar Thickness: Apply in layers of a minimum thickness of 1/2" and no more than 4" above peaks of existing profile after surface preparation. If material sags or slumps, remove it and replace with new material.
 - c. Manhole chimneys constructed with bricks or precast concrete rings shall be completely lined with the mortar mix but not overlap the bottom inside edge of the manhole frame.
 - d. Finishing: Finish surface with wood float, sponge float, broom, or brush to produce a textured surface to apply corrosion barrier topcoat.
 6. Install coating/liner in accordance with manufacturer's recommendations within 24-hours of surface preparation.
- C. Drop Connections: Remove any interior drop connections anchored to manhole walls prior to installing the lining system. After installation and proper curing of the liner, reinstall interior drop connections to their original condition prior to removal. If the existing drop connection is already damaged and cannot be reused, CONTRACTOR shall request from the ENGINEER on the best course of action.

3.3 INSTALLATION/APPLICATION

- A. Application Temperatures: Temperature of the surface to be coated should be maintained as recommended by the product manufacturer during application. Prior to and during application, care should be taken to avoid exposure of direct sunlight or other intense heat source to the structure being coated.
- B. Surfaces to receive protective coating shall be dry to the touch and or with no visible dampness unless otherwise required by the product manufacturer. This is to insure maximum adhesion to the substrate. If required, drying may be accomplished by a minimum of 20 minutes of a heated, forced air blower. The drying shall be to the specification dictated by the resin manufacturer and its trained applicator.
- C. Application of Protective Lining System:
 1. The liner shall be manually sprayed on to all surfaces by a trained technician who is experienced and certified in the application of a spray

applied resin and has been certified by the manufacturer. Appropriate personal protection equipment shall be utilized but, in every case, when applying the liner, the sprayer and personnel in direct contact with the spray atmosphere, will always be protected by supplied air.

2. Application procedures shall conform to the recommendations of the protective coating manufacturer, including material handling, mixing, environmental controls during application, safety, and spray equipment. This includes apply all recommended layers of the lining system.
 3. The spray equipment shall be specifically designed to accurately ratio and apply the specified protective coating materials and shall be regularly maintained and in proper working order.
 4. If necessary, subsequent top coating or additional coats of the protective coating should occur within the time frame specified by the product manufacturer. Additional surface preparation procedures will be required if this recoat window is exceeded.
 5. The minimum thickness of the material applied is to be no less than recommended by the product manufacturer to provide structural integrity. No other products such as cement or grouts may be used as part of the structural reinstatement, however, said products may be used as part of the repair process prior to sprayed application of the structure as specified.
 6. Application of the spray applied material must be completed in one (1) mobilization in order to minimize the disruption and cost of excessive bypassing, pipeline plugging, traffic control and all other support services.
 7. The finished manhole must be returned to full service immediately after the spray application is complete.
- D. Bench/Invert Repair: The manhole bench must be sprayed but depending on availability and future plans, some judgment consideration will have to be made regarding the invert. Important issue here is the necessity to insure a monolithic system is achieved. The spray shall be applied such that the entire structure receives a structurally enhanced monolithic liner.
- E. The finished invert surfaces shall be smooth, free of ridges and will be sloped in the direction of flow. Special care shall be used to insure a smooth transition between the new manhole invert and intersecting pipeline inverts such that flow will not be impaired.
- F. Curing: The structure should be allowed to cure per manufacturer recommendations and return to ambient temperature prior to any physical testing, including vacuum testing.
- G. Reset or replace manhole ring and cover assemblies and adjust elevation of manhole frame and cover as needed for a complete and functional manhole. The following procedures should be followed for resetting and/or replacing the

manhole:

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 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, where so indicated by the OWNER, 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 the manhole ring and cover is damaged is required to be replaced, 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 above entitled "Realign, Grout, and Seal Manhole Casting (Frame)" above. A minimum of 7 days after the manhole casting has been realigned and grouted, where so indicated by the OWNER, the CONTRACTOR shall install an aromatic urethane internal manhole sealing system through the frame-joint area.
3. 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.

3.4 TESTING AND INSPECTION

- A. The following test/inspection will be performed by the OWNER's Representative.
 1. Visually verify the absence of leaks from infiltration.
 2. At no cost to the OWNER, the CONTRACTOR shall hire an independent material- testing firm to perform appropriate testing and certify that the thickness of the liner is in accordance with these specifications and the submitted shop drawings. Minimum 1 (one) test shall be performed for each manhole. Each passing thickness test shall have a minimum of 90% of the design thickness for each product. The average of all tests performed for each structure shall be the minimum thickness specified. The testing firm shall issue a written statement to the Department confirming the compliance of each manhole.
 3. **High Voltage Spark Test:** After the protective coating has set hard to the touch it shall be inspected with high-voltage holiday detection equipment.

Surface shall first be dried, an induced holiday shall then be made on to the coated concrete or metal surface and shall serve to determine the minimum/maximum voltage to be used to test the coating for holidays at that particular area. The spark tester shall be initially set at 100 volts per 1 mil (25 microns) of film thickness applied but may be adjusted as necessary to detect the induced holiday (refer to NACE RPO188-99). All detected holidays shall be marked and repaired by abrading the coating surface with grit disk paper or other hand tooling method. After abrading and cleaning, additional protective coating material can be hand applied to the repair area. All touch- up/repair procedures shall follow the protective coating manufacturer's recommendations.

B. Coated Surfaces will be rejected by the Department if they fail:

1. To meet the minimum thickness requirements, or
2. To stop inflow, infiltration, exfiltration, or
3. To restore the structural integrity of the reconstructed structure (if applicable), or
4. To pass the Department's inspections and testing, or
5. To provide uniform and solid mechanical bonding between the structure's original surface/rehabilitated surface and the cementitious sub-coat and/or the epoxy top coat

C. Rejected Coated Surfaces: Coated and rejected areas must be identified and marked.

1. 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.
2. To repair and recoat: sand or grind down to substrate, clean, spray with approved primer sealer, and recoat with specified corrosion barrier topcoat. Re-inspection will be required.
3. The Department may require that additional testing of the liner be performed at the manufacturer's expense any time during the five- year warranty period. Any deficiencies in performance shall be corrected without delay by the manufacturer's CONTRACTOR at no cost to the Department.

D. A final visual inspection shall be made by the Inspector and manufacturer's representative. Any deficiencies in the finished coating shall be marked and repaired according to the procedures set forth herein by Applicator.

- E. The municipal sewer or storm system may be put back into non-severe operational service as soon as the final inspection has taken place. However, for severe corrosion duty such as high concentrations of acids, bases or solvents, 4 to 8 hours may be necessary prior to returning to service. Consult coating manufacturer for further details.

END OF SECTION

SECTION 02775
CONCRETE SIDEWALK

PART 1 - GENERAL

1.01 RELATED DOCUMENTS

- A. All applicable provisions of the Bidding and Contract Requirements, and Division 1 - General Requirements shall govern the work under this section.

1.02 WORK INCLUDED

- A. The work specified in this Section consists of the construction of concrete sidewalk damaged during construction, in accordance with these Specifications and the requirements of the owner in conformity with the lines, grades and dimensions of the existing sidewalk.

1.03 RELATED WORK

- A. Section 02300 - Earthwork.
- B. Section 02230 - Site Clearing.
- C. Section 02751 - Portland Cement Concrete Paving.

PART 2 - PRODUCTS

2.01 CONCRETE

- A. Concrete shall be Class I Concrete, with a minimum compressive strength of 3,000 psi in accordance with Section 345, Florida Department of Transportation Standard Specifications for Road and Bridge Construction. Minimum concrete sidewalk thickness within residential areas shall be 4" thick. Minimum concrete sidewalk thickness shall be 6" thick within 10' of cross streets/intersections, at driveways, within Florida Department of Transportation (FDOT) rights-of-ways, and within all areas subject to vehicular traffic.

2.02 FORMS

- A. Forms for this work shall be made of either wood or metal and shall have a depth equal to the plan dimensions for the depth of concrete being deposited against them. They shall be straight, free from warp or bends, and of sufficient strength when staked, to resist the lateral pressure of the concrete without displacement from lines and grade. Forms shall be cleaned each time they are used and shall be oiled prior to placing the concrete.

2.03 SUBGRADE AND GRADING

- A. Excavation shall be made to the required depth, and the foundation material upon which the sidewalk is to be set shall be compacted to a firm, even surface, true to grade and cross-section, and shall be moist at the time that the concrete is placed.

2.04 JOINTS

- A. Expansion joints between the sidewalk and the curb, and at all other locations indicated on the plans, shall be 1/4-inch wide, formed with a preformed joint filler. Preformed joint filler shall meet the requirements of AASHTO M153 or AASHTO M213.
- B. Contraction joints may be of the open type or may be sawed. Open type contraction joints shall be formed by staking a metal bulkhead in place and depositing the 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 edged with a tool having a 1/2-inch radius.

If the CONTRACTOR elects to saw the contraction joints, a slot approximately 1/8 inch wide and not less than 1-1/2 inches deep shall be cut with a concrete saw after the concrete has set, and within the following periods of time:

Contraction joints shall be constructed at not more than 20-foot intervals, and shall be in place within 12 hours after finishing.

2.05 ADA DETECTABLE WARNINGS

- A. Detectable warnings shall be installed at all locations where required, compliant with ADA guidelines.

PART 3 - EXECUTION

3.01 PLACING

- A. The concrete shall be placed in the forms to the required depth and shall be vibrated and spaded until mortar entirely covers its surface.

3.02 FINISHING

- A. Screeding: The concrete shall be struck-off by means of a wood or metal screed, used perpendicular to the forms, and floated in order to obtain the required grade and remove surplus water and laitance.
- B. Surface requirements: The concrete shall be given a broom finish. The surface variations shall not be more than 1/4 inch under a ten-foot straightedge, nor more

than 1/8 inch on a five-foot transverse section. The exposed edge of the slab shall be carefully finished with an edging tool having a radius of 1-1/2 inch.

3.03 CURING

- A. The concrete shall be continuously cured for a period of at least 72 hours. Curing shall be commenced after finishing has been completed and as soon as the concrete has hardened sufficiently, to permit application of the curing material without marring the surface.
- B. Wet burlap, white-pigmented curing compound, waterproof paper or polyethylene sheets may be used for the curing.
- C. CONTRACTOR shall protect against graffiti and other damages to the finish, prior to curing and acceptance.
- D. No sidewalk installed by the CONTRACTOR with visible cracks will be accepted by the OWNER. Cracked sidewalk shall be removed, disposed of and replaced by the CONTRACTOR at no cost to the OWNER. Cracked sidewalk replacement shall consist of a minimum of one flag (5') of sidewalk.

END OF SECTION 02775

SECTION 02810

UNDERGROUND IRRIGATION

PART 1 - GENERAL

1.01 RELATED DOCUMENTS

- A. All applicable provisions of the Bidding and Contract Requirements, and Division 1 - General Requirements shall govern the work under this Section.

1.02 SUMMARY

- A. This Section includes the following:
 - 1. Pipe and fittings, valves, sprinkler heads and accessories; and,
 - 2. Irrigation control system.

1.03 WORK INCLUDED

- A. The work is to include the furnishing of all labor, supplies, equipment and materials necessary to complete the installation of the pipe and fittings, valves, and sprinkler heads, controller, etc as shown on the Drawings as well as all other related responsibilities described in these Specifications and accompanying Plans.
- B. The system is a fully automatic system comprised of zones operated by the controller. This system has been designed to provide 100% coverage. It is the responsibility of the CONTRACTOR to ensure the entire system is installed according to applicable laws, rules, regulations and conventions.

1.04 RELATED WORK

- A. Section 02230 - Site Clearing
- B. Section 02300 - Earthwork
- C. Section 02305 - Excavation and Backfilling for Utilities
- D. Section 02502 - Valves General
- E. Section 02900 - Landscape Work

1.05 REFERENCE STANDARDS

- A. American Society of Testing and Materials
 - 1. ANSI/ASTM D2282 - Acrylonitrile-Butadiene-Styrene (ABS) Plastic pipe (SDR-PR);

2. ANSI/ASTM D2564 - Solvent Cement for Poly (Vinyl Chloride) (PVC) Plastic Pipe and Fittings;
 3. ASTM B32 - Solder Metal;
 4. ASTM B42 - Seamless Copper Pipe, Standard Sizes;
 5. ASTM B88 - Seamless Copper Water Tube;
 6. ASTM D1784 - Rigid and Chlorinated Polyvinyl Compounds
 7. ATSM D2235 - Solvent Cement for Acrylonitrile - Butadiene - Styrene (ABS) Plastic Pipe and Fittings;
 8. ASTM D2466 - Polyvinyl Plastic Pipe Fittings, Schedule 40; and,
 9. ASTM D2467 - Polyvinyl Plastic Pipe Fittings, Schedule 80.
- B. FS O-F-506 - Flux, Soldering; Paste and Liquid.
- C. NEMA 250 - Enclosures for Electrical Equipment (1000 Volts Maximum).

1.06 QUALITY ASSURANCE

- A. Responsibility for Assuring Quality Work:
1. The CONTRACTOR's Superintendent shall be well versed in standard plumbing procedures, PVC assembly procedures, blueprint reading and coordination with other contracts or services in the project area.
 2. All employees shall be competent and highly skilled in their particular job in order to properly perform the work assigned to them. The CONTRACTOR shall be responsible for maintaining the quality of material on the job throughout the duration of his responsibility.
- B. Requirements of Regulatory Agencies:
1. All work and materials shall be in full accordance with the latest rules and regulations of safety order of Division of Industrial Safety; the Florida Building Code, the Uniform Building Code and other applicable laws and regulations, including any regulatory authorities having jurisdiction, and Plumbing Codes; and,
 2. Should the contract documents be at variance with the aforementioned rules and regulations, notify the OWNER for instructions before proceeding with work affected.

C. Testing:

1. Preliminary inspection of completed installation will be made prior to backfilling of trenches and during hydrostatic testing; and,
2. Final inspection shall be made in conjunction with the final inspection of lawn, shrub and tree planting.

D. Permits and Inspections:

1. Any permits for the installation or construction of any work included under this contract, which are required by any of the legally constituted authorities having jurisdiction, shall be obtained and paid for by the CONTRACTOR, each at the proper time; and,
2. The CONTRACTOR shall also arrange for and pay all costs in connection with any inspection and examination required by these authorities.

1.07 SUBMITTALS

- A. Shop drawing or irrigation system design, including but not limited to piping, sprinkler heads, valves, wiring, and controls, if not provided in drawings.
- B. CONTRACTOR shall furnish 2 manufacturer's service manuals to the OWNER. Manuals may be loose-leaf and shall contain complete drawings of all equipment installed showing components and catalog numbers together with the manufacturer's name and address.
- C. Loose equipment to furnish: Loose irrigation equipment, operating keys and spare parts if shown on the drawings.
 1. 3 quick coupler keys and matching swivel hose cells;
 2. 2 valve keys for gate valves;
 3. 2 keys for each controller;
 4. 2 sets of special tools required for removing, disassembling and adjusting each type of sprinkler and valve supplied on this project; and,
 5. 2 cover lifting tools for valve boxes.

D. Record Drawings:

The CONTRACTOR shall maintain one record set of blue-line prints of the irrigation system in good condition at the site and mark on them the exact 'record'. The CONTRACTOR shall make a daily record of all work installed during each day. Drawings shall indicate the exact location of check valves, gate valves, wire locations, head layout, automatic valves, quick couplers, irrigation, drainage piping,

etc. Locations should be shown by the triangular system of measurements from easily identified permanent features, such as buildings, curbs, fences, walks, and by GPS, etc. Drawings shall show approved substitutions if any, of material including manufacturer's name and catalogue number. Drawings shall be to scale and all information shall be recorded in a neat, orderly way.

1. At the time of the irrigation mainline test, the CONTRACTOR shall provide a preliminary set of 'Record' drawings to the OWNER; and,
2. On or before the date of substantial inspection, the CONTRACTOR shall deliver 2 sets of As-Built drawings to the OWNER. The delivery of the prints shall not relieve the CONTRACTOR of the responsibility of furnishing required information that may have been omitted.
3. Immediately upon installation of any work which deviates from what is shown on the prints, the CONTRACTOR shall clearly indicate such changes in red pencil on the prints. Such changes shall include, but not be limited to, changes in (1) material, (2) sizes of material, (3) location, and (4) quantities. Dimensions shall be used where required such as, but not limited to underground utilities.

E. Substitutions:

1. The CONTRACTOR shall use materials as specified herein. Material other than that specified will be permitted only after written application by CONTRACTOR and written approval by the OWNER;
2. Substitutions will only be allowed when in the best interest of the OWNER; and,
3. The installation of any approved substitution is the CONTRACTOR's responsibility. Any changes required for installation of any approved substitution must be made to the satisfaction of the OWNER and without additional cost to the OWNER.

1.08 LOCATION

- A. Bidders shall personally examine the sites and fully acquaint themselves with all of the existing conditions in order that no misunderstanding may afterwards arise as to the character or as to the extent of the work to be done; and, likewise, in order to advise and acquaint themselves with all precautions to be taken in order to avoid injury to persons or property of another. No additional compensation will be granted because of any unusual difficulties which may be encountered in the execution or maintenance of any portion of the work.

PART 2 - MATERIALS

2.00 All materials to be as specified below or approved equal.

2.01 PIPE

- A. Pipe locations shown on the plan are schematic and shall be adjusted in field.
- B. All PVC pipe shall be new and free from defects and shall be continuously marked indicating size, schedule, type and Department of Commerce Standard Reference. Pipe shall be furnished in standard length of 20 feet.
- C. Main: Main line shall be solvent weld schedule 40 PVC pipe sized as noted on plans.
- D. Laterals: All lateral pipes shall be Polyvinyl Chloride (PVC) 1120-1120, Class 200. Threaded connections shall be schedule 80 unless noted otherwise on the Plans or Specifications.
- E. Galvanized Steel Pipe: All pressure mains which are exposed to possible damage, such as above ground, shall be threaded end, standard weight, Schedule 40 galvanized or coated steel.
- F. Sleeves: All sleeves to be Polyvinyl Chloride (PVC) Schedule 40 and sized as twice the size of the pipe it is carrying.
- G. Chaseways: All chaseways shall be PVC Schedule 40 and sized as needed for present and future use.

2.02 PIPE FITTINGS AND JOINTS

- A. All PVC lateral pipe shall have PVC solvent weld Schedule 40 fittings and joints. The primer and solvent glue shall be compatible with the pipe and fittings. No male threaded PVC fittings are to be used, with the exception of street ells and riser adapters.
- B. Galvanized steel pipe shall have threaded standard, 150-pound galvanized malleable fittings. All sprinkler heads shall be connected to the supply line with flexible pipe and ells, (Rainbird flex pipe and barbed ells O.A.F.) or Schedule 80 swing joints as shown on the details.
- C. Main line pipe joints shall be "belled" solvent-weld type.

2.03 SPRINKLER HEADS

- A. Shrub heads and bubblers shall be installed on 1/2" schedule 40 PVC risers. Paint all risers with black paint. Shrub heads shall be installed to a standard height of 6" above plants, and shall be installed within planted masses to be less visible. Bubblers shall be installed at the base of trees for low level watering.

- B. All pop-up heads shall be mounted on flexible type swing joints.
- C. All pop up and shrub heads shall be pressure compensating.
- D. Use screens in all heads.

2.04 IRRIGATION CONTROL WIRE

- A. If necessary, all irrigation control wire from the controller to the electric valve shall be UL approved PE irrigation control wire, single conductor insulated utilizing low density high molecular weight polyethylene insulation suitable for operating at 600 volts and conductor temperatures up to 60° C. The conductor shall be soft drawn bare copper meeting the requirements of ASTM Specification B-3 or B-8. Temperature rating shall be from -55° to +60° C. Thickness of insulation for conductor size 14 AWG through 12 AWG solid shall be 3/64 inches. Wire size, number and color as follows: #12 White for Common; #14 Red for Hotwires; #14 Yellow for Spares.

2.05 WIRE CONNECTORS

- A. All splices in irrigation control wire shall be accomplished by using 3M Dry Direct Bury Splice Kit or approved equal.

2.06 SLEEVING AND CONDUIT

- A. Sleeving and conduit shall be PVC, Schedule 40 for pipe sizes through 3 inches, and Class 160 for sizes 4 inches diameter or greater. Size as required by code or as shown on the Plan, whichever is larger in size. Electric conduit shall be gray PVC with Underwriters' Laboratories label.

2.07 RISERS

- A. Risers to be Schedule 40 NPT riser threshold, height to be determined by use.

2.08 AUTOMATIC CONTROL VALVES

- A. Utilize the automatic valves that are noted on the plans or if not noted use Rainbird ESP series or approved equal.

2.09 GATE VALVES & ISOLATION VALVES

- A. Gate valves 3 inches and smaller shall be NIBCO T-113 (screwed end) with all bronze body, wedge disc and non-rising stem, or approved equal.
- B. Isolation valves shall be iron body resilient seat gate valves with modified wedge disc NRS type, with slip on joint ends installed with thrust blocks.

2.10 VALVE BOXES

- A. Valve boxes shall be made of molded plastic as manufactured by Carson Industries or approved equal. Boxes shall be 9 in. x 9 in. x 6 in. and green with a green cover marked "Irrigation" on top.

2.11 PAINT FOR RISERS

- A. All risers to be painted black.

2.12 CONTROLLER

- A. Controller shall be Solatrol Inc.- LEIT 8000 or approved equal with stainless steel enclosure as specified on Contract Documents.

2.13 VACUUM BREAKER

- A. Vacuum breaker shall be FEBCO 765Y or approved equal.

PART 3 - EXECUTION

3.01 GENERAL

- A. The Irrigation Contractor shall carefully schedule his work with the Landscape Contractor and all other site developments.
- B. Sleeves are required wherever piping or electrical wires are placed under paved surfaces. Install sleeves prior to commencement of paving.
- C. No consideration will be given to any design changes. Should any changes be deemed necessary after award of contract, for proper installation and operation of the system, the OWNER shall negotiate such changes.
- D. Lay out work as accurately as possible to the submitted shop drawings.
- E. Full and complete coverage is required. CONTRACTOR shall make any necessary minor adjustments to layout as required to achieve full coverage of irrigated areas at no additional cost to the OWNER.
- F. Where piping is shown on drawings to be under paved areas but running parallel and adjacent to planted areas, the intent is to install piping in planted areas. Do not install directly over another line in same trench.
- G. It shall be the CONTRACTOR's responsibility to establish the location of all sprinkler heads in order to assure proper coverage of all areas. In no case shall spacing of sprinkler head exceed distances shown on the drawings and/or those specified. Pipe sizes shall conform to those shown on the drawings. No substitutions of smaller pipe sizes will be permitted, but substitutions of larger sizes may be

approved. All pipe damaged or rejected because of defects shall be removed from the site at the time of said rejection, at not additional cost to the OWNER.

- H. Install irrigation system after completion of site grading. The irrigation system shall be installed and completely operational three days prior to the installation of any planting operations.

3.02 PREPARATION

- A. Layout of Main and Laterals: The sprinkler main lines and all laterals shall be laid out by the CONTRACTOR and approved by the OWNER or ENGINEER, prior to excavation. The sprinkler lines, as shown on the Plans, are drawn for clarity and are schematic in nature. No sprinkler lines shall be under paved areas unless in sleeves or specifically noted on the Plans. Any adjustment or site modification shall be done prior to the excavation operation.
- B. Layout of Sprinkler Heads: All sprinkler head locations shall be staked by the CONTRACTOR and approved by the OWNER or ENGINEER, prior to installation to ensure uniformity and correctness to both pattern and coverage.
- C. Valve Locations: The location of all valves shall be in landscape areas. The location of all valves shall be staked by the CONTRACTOR and approved by the OWNER or ENGINEER, prior to installation to ensure ease of access for maintenance and to ensure that they do not conflict with other elements on the project. Each valve shall be installed in a separate valve box. The valve locations shown on the plan are drawn for clarity and are schematic in nature. Sequence all valves so that the farthest valve from the P.O.C. operates first and the closest to the P.O.C. operates last.
- D. Valve boxes must be placed a minimum of 12 inches and a maximum of 15 inches from the edge of pavement and the top of the box shall be 2 inches above finish grade. Valve boxes to be installed in shrub beds only. Using 3 inches high number stencils, paint the valve number in white on the lid of each valve box.
- E. Irrigation Plans: The irrigation system indicated on the drawings is drawn for clarity and is essentially diagrammatic. Spacing of the heads shown on the Plans shall not be modified unless approved in writing by the OWNER and ENGINEER.

3.03 TRENCHING

- A. Perform all excavations as required for installation of work included under this Section, including shoring of earth banks, if necessary. Restore all surfaces, existing underground installation, etc., damaged or cut as a result of the excavations, to their original condition.
- B. Should utilities not shown on the drawings be found during excavations, CONTRACTOR shall promptly notify the OWNER for instructions as to further action. Failure to do so will make the CONTRACTOR liable for any and all damage

thereto arising from his operations subsequent to discovery of such utilities. Indicate such utility crossings on the record drawings promptly.

- C. Trenches shall be open, vertical sided construction wide enough to provide free working space around work installed and to provide ample space for backfilling and compacting.
- D. When 2 pipes are to be placed in the same trench, a 6-inch space is to be maintained between pipes. The CONTRACTOR shall not install 2 pipes with one directly above the other.
- E. Backfill and compaction shall be in accordance with Section 02305, Excavation and Backfilling for Utilities. Depth of trenches shall be sufficient or provide a minimum cover above the top of the pipe as follows or as showing drawing if greater:

12 inches over non-pressure lateral lines

18 inches over non-pressure lateral lines under paving

18 inches over control wires

18 inches over sprinkler main line

24 inches over sprinkler main line under paving

- F. The CONTRACTOR shall cut trenches for pipe to required grade lines and compact trench bottom to provide accurate grade and uniform bearing for the full length of the line.
- G. All laterals and mainline shall be sufficiently sloped to provide positive drainage through drain valves.
- H. The CONTRACTOR shall be held responsible for any damages caused by these operations and shall immediately repair or replace damaged parts.

3.04 INSTALLATION

- A. Ground Level Areas: The CONTRACTOR shall do all necessary excavating and backfilling required for the proper installation of the work. Minimum depth of cover over lateral lines shall be 12 inches, over main line shall be 18 inches, over sleeves it shall be 24 inches. Backfill material shall be clean fill. If existing material has rock, then clean sand must be used. In rocky areas, the trenching depth shall be two inches below normal trench depth to allow for a 2-inch bed of sand below the pipe. There shall be no rock in contact with PVC pipe. The CONTRACTOR shall use backfilling equipment that will tamp backfill to its original density. He shall barricade or light the excavation to prevent hazards to the public. Objectionable materials such as coral rock, asphalt, limerock and bricks that are encountered during working operations shall be removed from the project by the CONTRACTOR.

- B. Modifications Due to Field Conditions: Conditions that occur on the site that causes the system to be modified, shall be presented as shop drawings by the CONTRACTOR and approved by the ENGINEER, prior to construction.
- C. The existence and location of utilities (overhead, above ground and underground) shall be thoroughly investigated and verified by the CONTRACTOR before the work begins in the area of said utilities. The CONTRACTOR shall exercise care in digging and working so as not to damage utilities or endanger the safety and lives of people. Should overhead, above ground or underground obstructions be encountered which interfere with the work, the ENGINEER shall be consulted in order for a decision to be made on the relocation of the work to clear such obstruction. The CONTRACTOR shall be responsible for the immediate repair of any damage to utilities caused by his work.
- D. PVC Sleeves and Electrical Conduit
 - 1. All PVC sleeves shall be a minimum of twice (2x) the diameter of the pipe to be sleeved; and,
 - 2. All PVC control wire conduit shall be of sufficient size to hold the required quantity of control and common wires. Electrical wires are not to be placed in the same sleeve with water pipes.

3.05 PVC PIPE ASSEMBLY

- A. All PVC pipe shall be cut to the proper length prior to assembly. The cut shall be neat and square, 90 degrees to the axis of the pipe. Prior to assembly, the cut end shall be de-burred. The fitting and pipe end shall both be cleaned with a PVC High Etch Primer. This primer shall have a purple tint to aid in visual inspection.
- B. A thin even flow coat of slow drying, heavy duty PVC solvent/glue shall be applied to both the inside of the fitting and the pipe mating surface.
- C. The pipe shall be inserted into the fitting until it bottoms, then given a quarter turn to ensure proper sealing. The pipe and fittings shall be out of service during the curing time as recommended by the manufacturer or 24 hours, whichever is longer. The finished joint shall be water-tight and shall have a strength equal to or greater than that of the pipe being joined. The direct tapping of PVC pipe or fittings shall not be permitted.
- D. Threaded Joints for PVC Pipes
 - 1. Use Teflon tape on all threaded PVC fittings;
 - 2. Use strap-type friction wrench only. Do not use metal-jawed wrench; and,

3. At threaded joints between PVC and metal pipes, the metal shall contain the socket end and the PVC end shall contain the spigot. A metal spigot shall not, under any circumstances, be screwed into a PVC socket.

3.06 IRRIGATION CONTROL VALVES

- A. Valves shall be carefully inspected during installation; they shall be opened wide and then tightly closed and tested for tightness. Special care shall be taken to prevent any foreign matter from becoming lodged in the valve seat. Valves shall be set plump at the locations indicated and in accordance with the details shown on the drawings.
- B. Install control valves in valve boxes grouping together where practical. Place no closer than 12 inches to walk edges, buildings and walls.
- C. Pressure regulating remote control valves shall be adjusted so that the most remote sprinkler heads operate at the pressure specified.
- D. Valves shall be installed as shown in details and in accordance with manufacturer's instructions and the specifications.

3.07 QUICK COUPLING VALVES

- A. Shall be set a minimum of 12 inches from walks, curbs or paved areas where applicable or as otherwise noted. Quick coupling valves shall be housed in valve boxes.
- B. Valves shall be installed on 3 elbow PVC Schedule 80 swing joint assembly.

3.08 VALVE BOXES

- A. Valve boxes shall be set flush with finish grade in lawn areas and ½ inch above finish grade in ground cover and shrub bed areas.

3.09 SPRINKLER HEADS

- A. Sprinkler Heads: All sprinkler heads shall be installed as shown on the Drawings. Backfill around the sprinkler shall be free of rocks, roots, or debris. If finished grade has not been established, the line shall be temporarily capped at the head and a stake marker placed. After grading has been completed, the sprinkler head shall be set. The CONTRACTOR shall coordinate his operations with the various phases of the work. Adjust heads for proper coverage avoiding excess water on walks, walls and paving.
- B. All sprinkler heads within a zone shall have matched precipitation rates.
- C. All heads operating on one valve (zone) shall do so at the same pressure.
- D. All heads shall be pop-up type heads. Permanent shrub risers are not permitted.

- E. Do not mix different types of heads within zone.
- F. Shrub beds and lawn areas are to be on separate valves (zones).
- G. Place part-circle pop-up sprinkler heads 6 inches from edge of adjacent walks, curbs and mowing bands, or paved areas at time of installation.
- H. All sprinkler nozzles shall be adjusted for the proper radius and direction of spray pattern. Make adjustments where possible to prevent over-spraying into walks, pavement or buildings.
- I. Sprinkler heads and quick coupling valves shall be set perpendicular to finished grade unless otherwise designated on the drawings.

3.10 DRAIN VALVES

- A. All laterals shall be provided with manual drain valves.
- B. The mainline shall be drained with manual drain valves.
- C. Drain valves are to be provided at sufficient intervals to provide complete drainage of all piping.

3.11 AUTOMATIC CONTROLLER

- A. The automatic controller shall be installed at the approximate location shown on the irrigation drawings. Controller shall be wall mounted in a locking box. Suitable power supply will be supplied by the Electrical Subcontractor.
- B. All regulatory authorities having jurisdiction and other applicable codes shall take precedence in connecting the 110-volt electrical service to the controller.
- C. Install per regulatory authority having jurisdiction code, manufacturer's latest printed instructions, and as detailed.
- D. Connect remote control valves to controller in sequence to correspond with station setting beginning with 1, 2, 3, etc.
- E. Affix controller name (i.e., 'Controller A') on inside of controller cabinet door with letters minimum of 1 inch high. Affix a non-fading copy of irrigation diagram to cabinet door below controller name. Irrigation diagram is to be sealed between two sheets of 20 mil (minimum) plastic. Irrigation diagram shall be a reduced copy of the as-built drawing and shall show clearly all valves operated by the Controller, showing station number, valve size and type of planting irrigated.

3.12 CONTROL WIRING

- A. Control Lines: All electric control lines shall be installed in the same trench with the pipe lines in a neat and orderly fashion. They shall be installed in the main and

lateral trenching or in their own trenches, and where necessary, bundled together and taped every 5 feet.

- B. Connections: any connections to existing pipe systems shall be made after consultation and approval of regulatory agencies.
- C. All electrical equipment and wiring shall comply with regulatory authorities having jurisdiction and be installed by those skilled and licensed in the trade.
- D. Wiring shall occupy the same trench and shall be installed along the same route as pressure supply or lateral lines wherever possible, and shall have a minimum of an 18-inch cover.
- E. Control wires shall be installed to the side of the main line whenever possible. Placement over pipes is not permitted.
- F. Where more than 1 wire is placed in a trench, the wiring shall be taped together at intervals of 10 feet.
- G. An expansion curl shall be provided within 3 feet of each wire connection and at least every 100 feet of wire length on runs of more than 100 feet in length. Expansion curls shall be formed by wrapping at least 5 turns of wire around a 1-inch diameter pipe, then withdrawing pipe.
- H. Control wire splices at remote control valves to be crimped and sealed with specified splicing materials. Line splices will be allowed only on runs of more than 500 feet and they must be located in 10-inch round splice boxes, which are green in color. The connector shall be 3MD BY splice kit by 3M Corporation, or 'Snip-Snap' connector by Imperial, or equal. Use one splice per connector sealing packs.
- I. Wire: Tape and bundle control wires every 10 feet and run alongside mainline. At all turns in direction make a 2-foot coil or wire. At all valve boxes coil wire around a $\frac{3}{4}$ inch piece of PVC to make a coil using 30 inches of wire. Provide 1 spare for every 10 hot wires – a minimum of 2 extra. Number all wires, using an electrical book of numbers, according to the plans. Number wires in all valve boxes, junction boxes and at the controller.

3.13 SHUT-OFF VALVES

- A. Shall be located in the following locations:
 - 1. After backflow preventer and prior to main supply loop;
 - 2. Between mainline and each remote-control valves; and,
 - 3. To be located within planting and lawn areas.
- B. All shut-off valves shall be located in valve boxes.

3.14 CLOSING OF PIPE AND FLUSHING OF LINES

- A. All testing shall be done under the supervision of the OWNER or ENGINEER. Submit written requests for inspections to the OWNER at least 3 days prior to the anticipated inspection date.
1. Flushing: All lines shall be flushed prior to any installation of automatic sprinkler valves or sprinkler heads to remove all sand and other foreign matter with velocity of the flushing water not less than 4 feet per second. Flushing shall be terminated at the direction of the ENGINEER. The CONTRACTOR shall dispose of the flushing water without causing a nuisance or property damage.
 2. Thoroughly flush out all water lines under a full head of water before installing heads, valves, quick couplers assemblies, etc. Maintain flushing for a minimum of three minutes at the valve located furthest from water supply;
 3. After flushing, cap or plug all openings to prevent entrance of materials that would obstruct the pipe or clog heads. Leave in place until removal is necessary for completion of installation;
 4. Test as specified below;
 5. Upon completion of testing, complete assembly and adjust sprinkler heads for proper distribution; and,
 6. All sprinkler heads and quick coupling valves shall be set perpendicular to finished grades unless otherwise designated on the drawings, or otherwise specified. Sprinkler heads adjacent to existing walls, curbs and other paved areas, shall be set to grade. Sprinkler heads, which are to be installed in lawn areas where the turf has not yet been established, shall be set 1 inch above the proposed finish grade. Heads installed in this manner will be lowered to grade when the turf is sufficiently established to allow walking on it without appreciable destruction. Such lowering of heads shall be done by this CONTRACTOR as part of the original contract with no additional cost to the OWNER.

3.15 TESTING

- A. Pressure and Leakage Testing:
1. General: All pumps, gauges, and measuring devices shall be furnished, installed and operated by the CONTRACTOR and all such equipment and devices and their installation shall be approved by the ENGINEER.
 2. Pressure Tests for Lines: Pressure piping installed under this contract shall be subjected to a pressure test after the pipe has been installed and partially backfilled for underground installations. Each pressure test shall be

maintained for at least one hour at 150 psi during which time all joints shall be examined for leaks.

3. Before application of test pressure, all air shall be expelled from the pipe. If permanent air vents are not located at all high points, the CONTRACTOR shall install corporation cocks or fittings and valves at such points so the air can be expelled as the pipe system is slowly filled with water. After expulsion of air, the corporation cocks, or other blow-off devices shall be closed and the test pressure applied.
4. All exposed pipe, fittings, valves, and joints shall be carefully examined for leaks. All cracked, broken, or defective pipe, fittings, or valves discovered as a consequence of this pressure test shall be removed and replaced with sound material. All leaking, or defective joints shall be repaired, replaced, or corrected. After all necessary replacements and corrections, the test shall be repeated until satisfactory to the ENGINEER.
5. Leakage Testing for Pressure Piping: After completion of satisfactory pressure tests of piping, the lines shall be subjected to leakage tests. The duration of each leakage test shall be at least two hours and the pressures maintained during each leakage test shall be as specified above for the pressure tests.
6. Leakage is defined as the quantity of water that must be supplied into the newly laid pipe or any valved section thereof to maintain the specified test pressure after the air in the pipeline has been expelled and the pipe has been filled with water. The allowable limits for leakage of underground piping shall be determined by the following formula.
7. Allowable Limits for Leakage of Pressure Piping: The hydrostatic pressure tests shall be performed as hereinabove specified and no installation, or section thereof, will be acceptable until the leakage is less than the number of gallons per hour as determined by the formula:

$$L = \frac{SD(P)^{1/2}}{148,000}$$

in which,

L = Allowable leakage, in gallons per hour

S = Length of pipe being tested in feet

D = Nominal pipe diameter; in inches

P = Average test pressure during the test, in psi gauge

8. Water shall be supplied to the line during the test period as required to

maintain the test pressure as specified. The quantity used, which shall be compared to the above allowable quantity, shall be measured by pumping from the calibrated container.

9. Where leakage exceeds the allowable limit, the defective pipe or joints shall be located and repaired. If the defective portions cannot be located, the CONTRACTOR shall remove and reconstruct as much of the work as is necessary in order to conform to the specified limits. No additional payment will be made for the correction of defective work, or to damage to other parts of the work resulting from such corrective work.

- B. Balancing and Adjustment: The CONTRACTOR shall balance and adjust the various components of the sprinkler system so the overall operation of the system is most efficient. This includes a synchronization of the controllers, part circle sprinkler heads, and individual station adjustments on the controllers.

3.16 INSPECTION

- A. The CONTRACTOR shall maintain proper facilities and provide safe access for inspection to all parts of the work.
- B. Irrigation inspection shall consist of a minimum of:
 1. Mainline pressure test;
 2. Coverage test; and,
 3. Final irrigation inspection.
- C. If the laws, ordinances or any public authority require any work to be specifically tested or approved, the CONTRACTOR shall give the OWNER 3 days notice of its readiness for inspection.
- D. The CONTRACTOR shall be solely responsible for notifying the OWNER where and when such work is in readiness for testing.
- E. If any work should be covered up without approval of the OWNER it must be uncovered, if required, for examination at CONTRACTOR's expense.
- F. No inspection will commence without 'Record' drawings and without completing previously noted corrections, or without preparing the system for inspection.

3.17 BACKFILL AND COMPACTING

- A. After system is operating and required tests and inspections have been made, backfill excavations and trenches.
- B. Backfill for all trenches, regardless of the type of pipe covered, shall be compacted to the requirements of Section 02305, Excavation and Backfilling for Utilities.

- C. Within all planting and lawn areas the existing 4-inch layer of topsoil shall be restored to its original condition and finish grade. After backfilling, the CONTRACTOR shall dispose of surplus earth offsite.

3.18 RESPONSIBILITY PRIOR TO FINAL ACCEPTANCE

The CONTRACTOR shall be responsible for maintenance until the inspection for completion and final acceptance. The responsibilities include the following:

- A. Repair of all damage to installed material and equipment as needed.
- B. Adjustment of all sprinkler heads with regard to proper height after landscape installation, arc coverage, radius and operation at least once a week.
- C. The system shall be operational at least one month prior to Substantial Completion. Once a week after Substantial Completion, the CONTRACTOR shall clean, repair and adjust all valves and other controls. Also, check to ensure that they are opening and closing properly.
- D. Once a week the controllers shall be checked to ensure that the clocks have the right time, the program is properly set and that it is properly operating all of the valves correctly. Following inspections, the pump enclosure is to be locked.

END OF SECTION 02810

SECTION 02900
LANDSCAPE WORK

PART 1 - GENERAL

1.01 RELATED DOCUMENTS

- A. All applicable provisions of the Bidding and Contract Requirements, and Division 1 - General Requirements shall govern the work under this Section.

1.02 WORK INCLUDED

- A. The work included in this section consists of furnishing all labor, supplies, equipment and materials necessary to complete the installation and maintenance of all landscaping as shown on the Plans as base bid including the installation of sod, seeding, shrubbery, ground cover, trees, irrigation, etc. as shown, as well as all other related responsibilities as described in these Specifications and accompanying plans.
- B. Installation: All plant materials included shall be of the specific size and quality indicated on the plans and in these specifications and shall be installed in strict accordance with sound nursery practices and shall include maintenance and watering for all work outlined on the plans and specifications until final acceptance. CONTRACTOR shall maintain and weed landscaped median and entry sign areas when they become unsightly.
- C. Quantities and Locations: The ENGINEER reserves the right to adjust the number and locations of the designated types and species to be used at any of the locations shown in order to provide for any modifications which might become necessary.

1.03 RELATED WORK

- A. Section 02919 - Topsoil.
- B. Section 02922 - Sodding.

1.04 QUALITY ASSURANCE

- A. Responsibility for Assuring Quality Work: The CONTRACTOR's Superintendent shall be well versed in Florida plant material, planting operations, reading design plans, and coordination with other performing contracts or services in the job area.

All employees shall be competent and highly skilled in their particular job in order to properly perform the work assigned to them. The CONTRACTOR shall be

responsible for maintaining the quality of the material on the job throughout the duration of his responsibility.

- B. Correct Grade of Plants: In the event that it becomes apparent that any nursery supplying plants for this work has knowingly and consistently represented the grade of plants as being higher than their actual grades as determined under these provisions, all plants already delivered from such sources shall be removed from the job at the CONTRACTOR's expense, and no further plants will be accepted from such nursery until written evidence is submitted and confirmed that all material for delivery has been inspected and approved by inspectors of the State Plant Board as being of the grade as represented.
- C. Authority for Nomenclature, Species, etc.: All plant material shall conform to the names given in Hortus Third, 1976 edition. Names of varieties not included therein conform generally with names accepted in the nursery trade.
- D. Grade Standards: All plant materials shall be nursery grown except where specified as collected material, and shall comply with all required inspections, grading standards and plant regulations as set forth by the Florida Department of Agriculture's "Grades and Standards for Nursery Plants" revised 1973, or with any superseding specifications that may be called for on the Plans or in the Specifications. All plants not listed in the grades and standards for nursery plants, shall conform to a Florida No. 1 as to: (1) Health and Vitality, (2) Condition of Foliage, (3) Root System, (4) Freedom from Pest or Mechanical Damage, (5) Heavily Branched and Densely Foliated according to the accepted normal shape of the species, or sport, (6) Form and branching habit.
- E. Balled and Burlapped (B&B) and Wire Balled and Burlapped (WB&B) Plants: These plants shall be properly protected until they are planted. The plant shall be handled only by the earth ball and not be the plant itself.

Any B&B or WB&B plant which shows evidence of having been handled by a method other than the method outlined above, and resulting in a cracked or broken ball or of the roots being loosened within the ball shall be rejected.

For plants grown in soil of loose texture, which does not readily adhere to the root system, (especially in the case of large plant material), WB&B plants may be specified. For WB&B plants, before plant is removed from the hole, sound hog wire shall be placed around the burlapped ball and looped and tensioned until the burlapped ball is substantially packaged by the tightened wire netting to prevent disturbing the loose soil around the roots during handling. Any wire, synthetic material or chemically treated material will be removed from the rootball at planting time, and all ties shall be removed from the rootball and around the trunk at planting.

- F. Container Grown Plants (CG): Any Container Grown (CG) plants, which have become "pot bound" or for which the top system is out of proportion (larger) to the size of the container, will not be acceptable.

With metal containers, unless the root-ball system slips easily and unbroken from the can, a nursery can-cutter shall be used to slit the can in such a way that the can may be opened fully.

CG plants shall not be removed from the can until immediately before planting, and with all due care to prevent damage to the root system.

- G. Submit to the ENGINEER the names and locations of nurseries proposed as sources of acceptable plant material. The ENGINEER reserves the right to visit the nursery to inspect and/or select the specified material.
- H. The ENGINEER will be included in the hand selecting of any Live Oaks for the project.

1.05 DELIVERY, STORAGE AND HANDLING

- A. Inspection and Transporting: Movement of nursery stock shall comply with all Federal, State, and local laws and regulations. Therefore, required inspection certificates shall accompany each shipment, and shall be filed with the ENGINEER.

Wrap root balls with burlap. Wire wrap burlap if root ball is not sufficiently compacted. Palms will not require burlap wrapping if the following requirements are met:

1. Dug from marl or heavy soil that adheres to roots and retains shape without shattering.
 2. Moistened material used to cover ball and roots not exposed to wind and sun.
 3. Transport material on vehicles large enough to allow plants not to be crowded. Plants shall be covered to prevent wind damage during transit and shall be kept moist, fresh and protected at all times. Such protection shall encompass the entire period which the plants are in transit, being handled, or are in temporary storage.
- B. All plant material shall not remain on the work site longer than two (2) days prior to being installed.

1.06 SUBSTITUTIONS

- A. Substitutions of plant types or change in the size of plant material will only be permitted upon submission of documented proof that the particular plant type and size specified is not obtainable. The CONTRACTOR must submit substitutions that meet City of West Palm Beach requirements for canopy, trunk diameter, species, height, clear trunk, setbacks, etc.
- B. Where B&B or WB&B plants are specified, CG plants of the same species, etc., will not be accepted. Where a B&B or WB&B is not specified on a particular plant material, B&B, WB&B or CG plants may be used provided they meet all specifications.

1.07 GUARANTEE

- A. All plant material shall be guaranteed for a minimum of one (1) calendar year from the time of final acceptance, which will normally coincide with the Final Completion Certification at project completion.

1.08 REPLACEMENT

- A. The guaranteeing of plant material shall be construed to mean the complete and immediate replacement of plant material if it is:
 - 1. Not in a healthy growing condition.
 - 2. There is a question to its survival ability at the end of the guarantee period.
 - 3. It is dead.

1.09 SIZE, QUALITY AND GRADE OF REPLACEMENT

- A. Replacement plant material shall be of the same species, quality and grade as that of the plant to be replaced. The size of the replacement shall not necessarily be the same size as the original specified plant at its initial planting but shall closely match specimens of the same species. Replacements shall be guaranteed for a period equal to the originally specified guarantee. This guarantee period shall begin at time of plant replacement.

1.10 GUARANTEE NULL AND VOID

- A. The guarantee shall be null and void for plant material which is damaged or dies as a result of "Act of God" limited to hail, freeze, lightening, winds which exceed hurricane force, and lethal yellowing, providing the plant was in a healthy growing condition prior to these "Acts of God".

PART 2 - MATERIALS

2.01 PLANT MATERIAL

- A. Florida No. 1: Except where another grade is specifically called for in the Plans, all plant material shall be no less than Florida No. 1 at the time of final inspection immediately prior to the acceptance by the OWNER.
- B. Habit of Growth: All plant material shall have a habit of growth that is normal for that species and shall be sound, healthy, vigorous and free from insects, plant diseases, injuries, and dead limbs.
- C. Branching, Leafing, Measurements and Ball Sizes:
 - 1. Trees and Shrubs: Requirements for the measurement, branching character, ball diameter, depth and other standards shall follow the Code of Standards recommended by the American Association of Nursery Stock, Bulletin Z-60.1-1973 and as revised.
 - 2. Palms: Requirements for the measurement of clear trunk, clear wood and graywood ball diameter and depth shall comply with requirements as set forth by the Florida Department of Agriculture's "Grades and Standards for Nursery Plants, Part II for Palms and Trees".
- D. Die-Back and Leaf-Drop: Plant material showing signs of die-back or leaf-drop will not be accepted and must be removed from the job immediately if so, directed by the ENGINEER. Therefore, any plant material with tendencies toward leaf-drop or die-back must be root pruned early enough to provide a sound network of hair roots prior to relocation to the job site.
- E. Mechanical Destruction of Foliage: Mechanical destruction of foliage resulting from root pruning shall not affect more than 10% of the total foliage prior to planting on the job site. Loss of foliage caused by seasonal change will be accepted.
- F. Spanish Moss: If Spanish Moss (*Tillandsia usneoides*) exists on plant material, it shall be completely removed prior to planting on the job site.
- G. Palms: Before transporting, see Delivery, Storage and Handling; for requirements related to wrapping of root balls:
 - 1. Remove a minimum of fronds from the crown of the palms to facilitate transporting and handling.
 - 2. Palms with burn marks, nail holes, and frond boots on trunk shall not be accepted.

3. Using untreated burlap strip or untreated cotton twine, tie Sabal Palmetto buds and leave in place until Palmetto is established. Tying shall be as set forth in Florida Department of Agriculture's "Grades and Standards for Nursery Plants". Tying of other palms shall be at the option of the CONTRACTOR.
 4. To reduce head volume, Palm fronds may be taper trimmed by not more than one-third (1/3).
 5. Palm trees showing cable or chain marks and equipment scars shall be rejected.
- H. Chlorosis: The allowable level of Chlorosis in foliage shall be as set forth in the Florida Department of Agriculture's "Grades and Standards for Nursery Plants".

2.02 PLANTING SOILS

- A. General Type: All plant material with the exception of Sabal Palmetto shall be planted with planting soil mixed with 50% original soil, if the soil is of good quality, as determined by the ENGINEER. The planting soils shall be sandy loam (50% sand, and 50% muck) typical of the locality. The soil must be taken from ground that has never been stripped, with a slight acid reaction (5.5 to 6.5 ph) and without an excess of calcium or carbonate. Soil shall be delivered in a loose friable condition.
- B. Special Type: Planting soil for palms shall be a good grade of salt free sand, which is free of all weeds.

2.03 WATER

- A. Water shall be potable, from municipal water supplies or other sources which are approved by a public health department.

2.04 MULCH

- A. Mulch shall be Eucalyptus mulch or other approved non native tree bark mulch. It must be uniformly shredded and be free from large pieces of bark, foreign matter, weed seeds and any other organic or inorganic material. Submit sample for approval. CONTRACTOR shall apply one application at initial installation and a second application prior to final acceptance.

2.05 FERTILIZER

- A. Fertilizer to be used shall contain 0% phosphorus content.
- B. New Plant Material: Trees, palms and shrubs, fertilize with Agriform planting tablets, 20-0-5 formula, 21 grams.

- C. New Ground Covers: Fertilize with an approved fertilizer 50% or greater organic 6-0-6 or 8-0-8 with minor elements including, but not limited to, iron zinc and manganese.
- D. Composition of Quality: All fertilizer shall be uniform in composition and dry. Granular fertilizer shall be free flowing and delivered in manufacturer's standard container with name of material, weight and guaranteed analysis printed on container. Tabletized fertilizer shall be delivered in unopened containers or boxes. All bags, containers or boxes shall be fully labeled with the manufacturer's analysis. Submit labels to ENGINEER for approval prior to placement of fertilizer.
- E. All fertilizer shall comply with the State of Florida fertilizer laws.

2.06 PRUNING PAINT

- A. Pruning Paint shall be commercial tree paint, which is waterproof, antiseptic, adhesive, elastic and free of kerosene, water, cresol and any other substances harmful to plant material.

2.07 VEGETATIVE ROOT INHIBITOR

- A. A vegetative root inhibitor shall consist of a polypropylene fabric with root control time release modules of Trifluralin with an effective life of 100 years.
- B. Vegetative root inhibitor shall be Bio-Barrier as manufactured by Reemay, Inc. or approved equal.

PART 3 - EXECUTION

3.01 INSPECTION

- A. Utilities: The location and existence of utilities (overhead and underground) shall be thoroughly investigated and verified by the CONTRACTOR before the work begins in the area of said utilities. The CONTRACTOR shall exercise care in digging and work so as not to damage existing utilities in said areas, such as underground pipes, cables, wires, etc. Should such overhead or underground obstructions be encountered which interfere with planting, the ENGINEER shall be consulted immediately in order for a decision to be made on the relocations of plant material to clear such obstruction. The CONTRACTOR shall be responsible for the immediate repair of any damage to utilities caused by their work.

3.02 PREPARATION

- A. Staking Plant Locations: Plant locations must be staked or marked prior to plant hole excavation or placing on deck, by scaling the plants from existing features found on-site and shown on the plans, and utilizing Sunshine State One Call locations. Stakes shall be removed prior to Final Completion.
- B. Spacing of Shrubs: Shrub beds located next to another bed, walkway, structure, etc., shall have the plants along the perimeter spaced so that the plants can mature properly without growing into the other bed, walkway, structure, etc.
- C. Excavation of Plant Holes: Excavation of plant holes shall be roughly cylindrical in shape with the sides approximately vertical. The ENGINEER reserves the right to adjust the size and shape of the plant hole and the location of the plant in the hole to compensate for unanticipated structures or unanticipated factors. All plant holes shall be sufficiently deep to allow the rootball to set on existing soil and have root collar at grade level. Plants shall be centered in the holes with the tree trunk locations scaled from existing permanent structures as shown on the drawings. Plants shall be set straight or plumb in locations. All plant holes to accommodate plants with ball sizes less than 24 inches in diameter shall be at least 18 inches greater than the diameter of the ball. All plant holes to accommodate plants with ball sizes 2 feet and larger in diameter shall be at least twice the diameter of the ball. The excavated material from the plant holes may not be used to back-fill around the plant material. Such material shall be disposed of either on the project site or off the site as directed by the ENGINEER. Plant holes for shrub material planted in mass shall meet all requirements listed above for plant holes. However, they shall not be individual holes but one continuous hole or excavation. Plant holes for hedge material shall also meet all requirements listed above for plant holes, however, a continuous trench shall be used in lieu of individual holes.

3.03 INSTALLATION

- A. Setting of Plants:
 - 1. When lowered into the hole the plant shall rest on the prepared hole bottom such that the roots after settlement are level, or slightly above the level of its previous growth condition and the final level of the ground around the plant shall conform to the surrounding grade. The plants shall be set straight or plumb or normal to the relationship of their growth prior to transplanting. The ENGINEER reserves the right to realign any plant material after it has been set.
 - 2. Palms of the Sabal species may be set deeper than the depth of their original growth condition in order to lessen the necessity for support or bracing. For such deeper planting however, it will be required that the underlying soil be friable and that the clear trunk requirements set forth in

the plant list be maintained from the finished grade and NOT from the previous grade of the palm trees before it was transplanted.

3. Plant material of the shrub category and smaller must be handled by the ball only. Plant material too large for hand handling, if moved by winch or crane, must be thoroughly protected from chain, rope or cable marks, girdling, bark slippage, limb breakage and any other damage that might occur by improper handling or negligence.
4. All palm trees handled by the trunks must be wrapped with burlap and wood battens, held in place by banding strips as called for in the details.

B. Backfilling:

1. Use planting soils specified in Article 2.02, Planting Soil. Backfill to the bottom two thirds of the planting hole and firmly tamp and settle by watering as backfilling progresses. After having tamped and settled the bottom two thirds (2/3) of the hole, thoroughly puddle with water and fill remaining one third (1/3) of the hole with planting soil, tamping and watering to eliminate air pockets.

C. Application of Fertilizer:

1. Fertilize New Planting (Trees, Palms and Shrubs) as follows:

(a)	Specified Container Size	Application Rate
	1 gallon container	1 tablet
	3-gallon container	2 tablets
	5-gallon container	3 tablets
	7-gallon container	5 tablets

- (b) Large tubs or boxes and B&B material shall receive one (1) tablet for each ½ inch of trunk diameter (measured 3 feet from ground). For large shrubs, one (1) tablet for each 1 foot of height or spread.

- D. Mulch: Within 24 hours after planting, planting areas must be mulched as called for in these specifications. The mulch shall be uniformly applied to a depth of 3 inches over all shrub, tree and groundcover areas and any areas indicated on the plans.
- E. Staking and Guying shall be installed within 24 hours; in accordance with details.

- F. Initial Watering: Initially, water the plant material to develop uniform coverage and deep-water penetration of at least 6 inches. Avoid erosion, puddling, and washing soil away from plant roots.
- G. Hand Watering: Provide hand watering of plant material as necessary subject to weather conditions, to maintain healthy growing conditions until final acceptance. This shall be in addition to water received from irrigation system, if any.
- H. Pruning:
 - 1. The amount of general pruning shall be limited to the minimum necessary to remove dead or injured twigs and branches and to compensate for the loss of roots as a result of transplanting operations. Pruning shall be done in such a manner as not to change the natural habit of shape of a plant, and in accordance with National Arborist Association standards for pruning.
 - 2. All broken or damaged roots shall be cut off smoothly. The tops of all trees shall be pruned in a manner complying with standard horticultural practices. All cut surfaces of ½ inch or more in diameter above ground level shall be treated with an approved commercial tree paint.
- I. Weeding: In the event that weeds or undesirable vegetation becomes prevalent to such an extent that they threaten plant material or become unsightly, they shall be removed as directed by the ENGINEER. If necessary, the plant material and/or planting soil shall be replaced as needed to eliminate the weeds at the expense of the CONTRACTOR.

3.04 CLEANING AND PROTECTION

- A. Disposal of Trash: All debris and other objectionable material created through planting operations and landscape construction shall be removed completely on a daily basis from the job or as directed by the ENGINEER. Excess soil shall be disposed of as directed by the ENGINEER.
- B. Responsibility for Protection and Restoration of Property: The CONTRACTOR shall be responsible for all damage to property whether it is accidental or necessary for the completion of their contract.
- C. Protection Against Mechanical Damage: The CONTRACTOR's responsibility for protection against mechanical damage shall include providing protection from vehicles and providing warning signs and barricades as might be necessary and they shall repair, restore and replace any planting areas which become damaged as a result of any negligence of the CONTRACTOR or their employees in complying with these requirements. Coordination shall be with the OWNER and the ENGINEER.

D. Responsibility Prior to Final Acceptance:

1. Maintenance shall begin immediately after each plant is planted and continue until final acceptance, which shall coincide with the Contractual Final Completion Certification.
2. Plants shall be watered by hose, soaking thoroughly each day for the first two weeks (14 calendar days) and every other day for the following two-week period. Soaking then shall continue on a twice weekly basis for another period of three (3) weeks for material over 5 feet height, amounting to a total of 28 days after installation of planting under 5 feet and a total of 49 days for plants over 5 feet. All watering is required without regard to an irrigation system.
3. Plant maintenance shall include watering, pruning, weeding, cultivating, mulching, tightening and repairing of guys, stakes, braces, etc., replacement of sick or dead plants, resetting plants to proper grades or upright position and maintenance of the watering saucer, and all other care needed for proper growth of the plants. Plant material rejected during the course of the construction shall be removed within five working days and replaced before the inspection for completion will be scheduled. Weeding shall occur whenever planted areas become unsightly.
4. During the maintenance period and up to the issuance of Certificate of Final Completion, the CONTRACTOR shall do all seasonal spraying and/or dusting of all planting. Stakes shall be removed prior to Final Completion after tree is stable. The materials and methods shall be in accordance with the highest standard nursery practices and as recommended by the County Agent, or Horticultural engineer and approved by the ENGINEER, prior to implementation.
5. Planting areas and plants shall be protected against trespassing and damage. If any plants become damaged or injured, they shall be treated or replaced, as directed and in compliance with this specification. No work shall be done within or over planting areas or adjacent to plants without proper safeguards and protection.

END OF SECTION 02900

SECTION 02919

TOPSOIL

PART 1 - GENERAL

1.01 RELATED DOCUMENTS

- A. All applicable provisions of the Bidding and Contract Requirements, and Division 1 - General Requirements shall govern the work under this Section.

1.02 WORK INCLUDED

- A. Provide all labor, materials, necessary equipment and services to restore the landscape disturbed by construction, as indicated on the drawings, as specified herein or both.
- B. Including but not necessarily limited to the following:
 - 1. Topsoil Stripping.
 - 2. Topsoil Mixing and Spreading.
- C. There shall be no classification of excavation for measurement of payment regardless of materials encountered.

1.03 RELATED WORK

- A. Section 02230 - Site Clearing.
- B. Section 02300 - Earthwork.
- C. Section 02922 - Sodding

PART 2 - PRODUCTS

2.01 TOPSOIL

- A. Topsoil shall be obtained from any previously established stockpile on site, to the extent that suitable material is available.
- B. Additional topsoil, if required, shall be obtained by mixing existing on-site sandy fill with imported muck or compost.
- C. Topsoil, whether obtained from stockpile, or mixed as described in "B" above, shall be sandy loam, and shall have the following characteristics:
 - 1. 95% of topsoil shall pass a ¼ inch sieve.

2. Topsoil shall be free of stones 1 inch in longest dimensions, earth clods, plant parts, and debris.
 3. Organic matter content shall be 4% to 12% of total dry weight.
 4. pH and nutrient content shall be adjusted as necessary to conform with recommendations made by testing laboratory. (See 2.01 (D))
- D. Samples shall be submitted to OWNER for testing. Test shall indicate compliance with the specifications and recommendations as to the type and quantity of soil additives required to bring the nutrient content and pH to satisfactory levels for planting specified plant material. Tests shall be required at a rate of one per 500 cubic yards of material placed, for the first 5,000 cubic yards of material, and may be reduced at the ENGINEER's discretion thereafter. Sampling shall be done in the presence of the ENGINEER. The CONTRACTOR shall be responsible for the cost of testing.

PART 3 - EXECUTION

3.01 JOB CONDITIONS

- A. Protection: Use all means necessary to protect existing objects and vegetation. In the event of damage, immediately make all repairs and replacements necessary to the acceptance of the ENGINEER.

3.02 FILLING AND GRADING:

- A. Topsoil shall be spread in a uniform 2 inches layer after compaction, over all sodded and pervious areas, and finished to existing grades shown on the plans, making allowance, where necessary, for sod. Grades shown include 2 inches for thickness of sod in all sodded areas.

END OF SECTION 02919

SECTION 02922

SODDING

PART 1 - GENERAL

1.01 RELATED DOCUMENTS

- A. All applicable provisions of the Bidding and Contract Requirements, and Division 1 - General Requirements shall govern the work under this Section.

1.02 WORK INCLUDED

- A. The work included in this section consists of furnishing all labor, supplies, equipment and materials necessary to complete the installation of sod and associated materials hereinafter listed and as shown on the plans.

1.03 RELATED WORK

- A. Section 02300 - Earthwork.
- B. Section 02919 - Top Soil.

1.04 QUALITY ASSURANCE

- A. Sodding work shall be performed by a firm specializing in sodding.
- B. Substitutions: Do not make substitutions. If specified sod is not obtainable, submit proof of non-availability to ENGINEER, together with proposal for use of equivalent material.
- C. Analysis and Standards: Package standard products with supplier's certified analysis. For other materials, provide analysis by recognized laboratory made in accordance with methods established by the Association of Official Agriculture Chemists, wherever applicable.

1.05 SUBMITTALS

- A. Submit the following in accordance with Conditions of Contract and Division 1 Specification Sections.
- B. Plant and Material Certifications:
 - 1. Certificate of inspection as required by governmental authorities.
 - 2. Manufacturer's or vendor's certified analysis for soil amendments or fertilizer materials.

1.06 DELIVERY, STORAGE AND HANDLING

- A. Packaged Materials: Deliver packaged materials in containers showing weight, analysis, and name of manufacturer. Protect materials from deterioration during delivery, and while stored at site.
- B. Sod: Time delivery so that sod will be placed within 24 hours after stripping. Protect sod against drying.
- C. Transporting:
 - 1. Sod transported to the project in open vehicles shall be covered with tarpaulin or other suitable covers securely fastened to the body of the vehicle to prevent injury to the sod material. Closed vehicles shall be adequately ventilated to prevent overheating of the sod. Evidence of inadequate protection against drying out in transit shall be cause for rejection.
 - 2. Sod shall be kept moist, fresh and protected at all times. Such protection shall encompass the entire period during which the sod is in transit, being handled, or in temporary storage.
 - 3. Upon arrival at the temporary storage location or the site of work, sod shall be inspected for proper shipping procedures. Should the roots be dried out, the ENGINEER will reject the sod. When sod has been rejected, the CONTRACTOR shall remove it at once from the area of the work and replace it.
 - 4. Unless otherwise authorized by the ENGINEER, the CONTRACTOR shall notify the ENGINEER at least 48 hours in advance of the anticipated delivery date of sod material. A legible copy of the invoice, showing species and variety of sod included for each shipment shall be submitted to the ENGINEER. Certificate of Inspection must accompany each sod shipment.

1.07 JOB CONDITIONS

- A. Begin installation of sod after preceding related work is accepted.
- B. Environmental Requirements:
 - 1. Install sod during months acceptable to the ENGINEER.
 - 2. Do not install sod on saturated soil.
- C. Protection: Erect signs and barriers to control vehicular traffic.

- D. Utilities: Determine location of underground utilities and perform work in a manner which will avoid possible damage. Hand excavate, as required. Maintain grade stakes set by others until removal is mutually agreed upon by parties concerned.

1.08 SEQUENCING AND SCHEDULING

- A. Correlate planting with specified maintenance periods to provide maintenance from date of Substantial Completion.
- B. Coordination with sodding: Plant trees, palms and shrubs after final grades are established and prior to planting of sod, unless otherwise acceptable to ENGINEER. If planting of trees, palms and shrubs occurs after sod work, protect sod areas and promptly repair damage to lawns resulting from planting operations.

1.09 SPECIAL PROJECT WARRANTY

- A. Warranty sod through specified lawn maintenance period, and until Final Certification.

PART 2 - PRODUCTS

2.01 PLANTING SOIL

- A. Provide new planting soil that is fertile, friable, natural loam, surface soil, reasonably free of subsoil, clay lumps, brush, weeds and other litter, and free of roots, stumps, stones larger than 1 inch in any dimension, and other extraneous or toxic matter harmful to plant growth.
- B. Obtain planting soil from local sources or from areas having similar soil characteristics to that found at project site.
- C. Refer to Section 162 of the "FDOT Standard Specifications for Road and Bridge Construction" FY 2024-25 for Topsoil Specifications.

2.02 COMMERCIAL FERTILIZER

- A. For sod, provide fertilizer with percentage of nitrogen required to provide not less than 1 pound of actual nitrogen per 1,000 sq. ft. of lawn area and not less than 4% phosphoric acid and 2% potassium. Provide nitrogen in a form that will be available to sod during initial period of growth; at least 50% of nitrogen to be organic form.

2.03 SOD

- A. Provide strongly rooted sod, not less than 2 years old, free of weeds and undesirable native grasses, and machine cut to pad thickness of 1-1/2 inch (plus

or minus 1/4 inch), excluding top growth and thatch. Provide only sod capable of vigorous growth and development when planted (viable, not dormant).

- B. Provide sod uniform pad sizes with maximum 5% deviation in either length or width. Broken pads with uneven ends will not be acceptable. Sod pads incapable of supporting their own weight when suspended vertically with a firm grasp on upper 10% of pad will be rejected.
 - C. Provide sod to match the existing sod and composed of the following:
 - 1. St. Augustine Floritam
 - 2. Argentine Bahia Grass
 - D. Sod shall be nursery grown on cultivated mineral agricultural soils. Sod shall have been mowed regularly and carefully maintained from planting to harvest.
 - E. American Sod Producers Association (ASPA) Grade: Nursery Grown or Approved. Field grown sod is not acceptable.
 - F. Furnished in pads:
 - 1. Size:
 - a. Length: 24 inches plus or minus 5%.
 - b. Width: 18 inches plus or minus 5%
 - c. Thickness: 1-1/2 inches excluding top growth and thatch.
 - 2. Not stretched, broken or torn.
 - G. Uniformly mowed height when harvested: 2 inches.
 - H. Thatch: Maximum 1/2 inch uncompressed.
 - I. Inspected and found free of disease, nematodes, pests, and pest larvae, by entomologist of State Department of Agriculture.
 - J. Weeds:
 - 1. Free of Bermuda grass, nut grass or other objectionable weeds.
 - K. Uniform in color, leaf texture, and density.
- 2.04 WATER
- A. Water shall be potable, from municipal water supplies or other sources which are approved by a public health department.

2.05 FERTILIZER

- A. Apply fertilizer uniformly at a rate as specified by the manufacturer.
- B. Apply fertilizer no more than 48 hour before laying sod and not before a storm

2.06 HERBICIDES

- A. As recommended by the State Department of Agriculture.

2.07 STAKES

- A. Softwood, 3/4-inch diameter, 8-inch length.

PART 3 - EXECUTION

3.01 PREPARATION OF GROUND SURFACE

- A. Before mixing, clean planting soil of roots, plants, sods, stones, clay lumps, and other extraneous material harmful or toxic to plant growth.
- B. Mix specified fertilizers with planting soil as necessary at rates specified. Delay mixing fertilizer if planting will not allow placing of planting soil within a few days.
- C. For sod, mix planting soil either prior to planting or apply on surface of topsoil and mix thoroughly before planting.

3.02 PREPARATION OF PLANTING BEDS

- A. Loosen subgrade of lawn areas to a minimum depth of 4 inches. Remove stones measuring over 1 1/2 inches in any dimension. Remove sticks, stones, rubbish, and other extraneous matter. Limit preparation to areas which will be planted promptly after preparation.
- B. Spread planting soil to minimum depth of 2 inches or as required to meet lines, grades, and elevations shown, after light rolling and natural settlement. Add specified fertilizer and mix thoroughly into upper 4 inches of topsoil.
- C. Place approximately 1/2 of total amount of top soil required. Work into top of loosened subgrade to create a transition layer and then place remainder of planting soil. Add specified soil amendments and mix thoroughly into upper 4 inches.
- D. Where sod is to be planted in areas that have not been altered or disturbed by excavating, grading, or stripping operations, prepare soil for lawn planting as follows: Till to a depth of not less than 6 inches. Apply fertilizers as specified. Remove high areas and fill in depressions. Till soil to a homogenous mixture of fine texture, free of lumps, clods, stones, roots and other extraneous matter.

- E. Prior to preparation of unchanged areas, remove existing grass, vegetation and turf. Dispose of such material outside of OWNER's property. Do not turn existing vegetation over into soil being prepared for lawns.
- F. Allow for sod thickness in areas to be sodded.
- G. Apply specified commercial fertilizer at rates specified and thoroughly mix into upper 2 inches of topsoil. Delay application of fertilizer if lawn planting will not follow within a few days.
- H. Fine grade sod areas to smooth, even surface with loose, uniformly fine texture. Roll, rake, and drag lawn areas, remove ridges and fill depressions, as required to meet finish grades. Limit fine grading to areas which can be planted immediately after grading.
- I. Moisten prepared sod areas before planting if soil is dry. Water thoroughly and allow surface to dry before planting lawns. Do not create a muddy soil condition.
- J. Restore sod areas to specified condition, if eroded or otherwise disturbed, after fine grading and prior to planting.

3.03 SODDING NEW LAWNS

- A. Lay sod within 24 hours from time of stripping.
- B. Lay sod to form solid mass with tightly fitted joints. Butt ends and sides of sod strips; do not overlap. Stagger strips to offset joints in adjacent courses. Work from boards to avoid damage to subgrade or sod. Tamp or roll lightly to ensure contact with subgrade. Work sifted soil into minor cracks between pieces of sod; remove excess to avoid smothering of adjacent grass.
- C. Anchor sod on slopes with wood pegs to prevent slippage.
- D. Water sod thoroughly with a fine spray immediately after planting.

3.04 MAINTENANCE

- A. Begin maintenance immediately after planting.
- B. Maintain lawns for not less than 30 days after Substantial Completion Certification, and longer as required to establish an acceptable lawn.
- C. Maintain sod by watering, fertilizing, weeding, mowing, trimming, and other operations such as rolling, regrading and replanting as required to establish a smooth, acceptable lawn, free of eroded or bare areas.

D. Mowing:

1. Whenever grass reaches a height of 3 inches, it shall be cut back to 2 inches with all clippings removed.
2. After two mowings, CONTRACTOR shall topdress the sod with an application of fertilizer at the rate of 1 pound of actual nitrogen per 1,000 square feet.

3.05 CLEANUP AND PROTECTION

- A. During sodding work, keep pavements clean and work area in an orderly condition.
- B. Protect sodding work and materials from damage due to landscape operations, operations by other contractors and trades, and trespassers. Maintain protection during installation and maintenance periods. Treat, repair, or replace damaged sod work as directed.

3.06 INSPECTION AND ACCEPTANCE

- A. Sod areas will be accepted when in compliance with all the following conditions:
 1. The roots are thoroughly attached to the soil.
 2. Absence of visible joints.
 3. All areas show a uniform stand of specified grass in healthy condition.
 4. At least 30 days have elapsed since the completion of the work in this section.
- B. When inspected sod work does not comply with requirements, replace rejected work and continue specified maintenance until reinspected by ENGINEER and found to be acceptable. Remove rejected plants and materials promptly from project site.
- C. Procedure:
 1. The CONTRACTOR shall submit a request for acceptance in writing to the ENGINEER. Request must be received not less than 10 days before the anticipated date for final inspection.
 2. Upon completion of all repairs and/or renewals required by ENGINEER at the inspection, the ENGINEER will verify the completeness of the work and then notify the OWNER in writing that the work is accepted.
 3. Upon Final Completion, the OWNER will assume maintenance of all sod areas.

END OF SECTION 02922

APPENDIX A – TEST HOLES

AMG Underground Inc.
Utility Locating & Mapping Services

PN# 23018

Test Hole No: 1

Project Name: Pilgrim Rd & Plymouth Rd

Job #

Work Order #

Requested By: Brown & Phillips

Utility Requested

Project Location: West Palm Beach, FL

☒ Water Gas Elec Catv San FM
Storm Fiber Tel Other

Sheet of Proposed: Water Main
Form by: DL Assisted by: EB # of Holes 1
Soil Coditions: ☒ Good Fair Poor Date: 10/10/23

Utility Found

Size: 8"

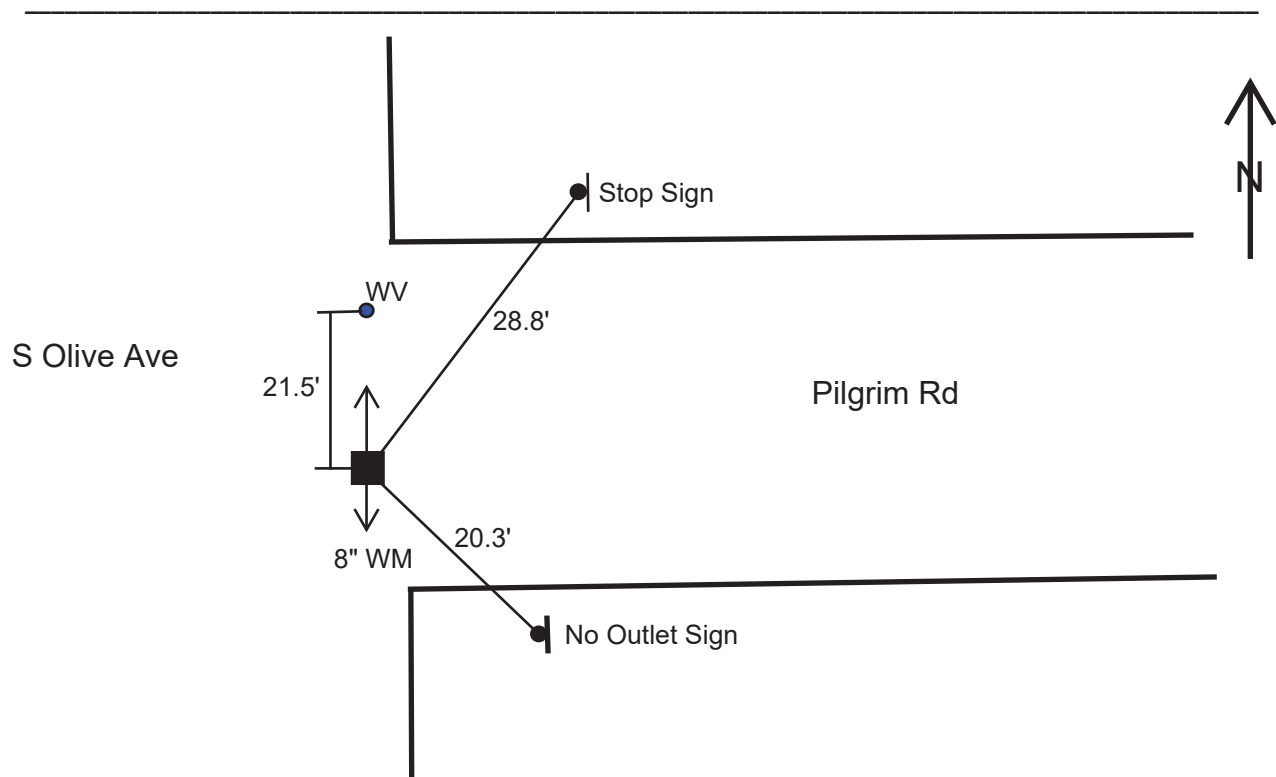
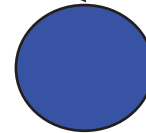
Installed: ☒ PK Hub&Tack Stl Pin ChisX

☒ Water Gas Elec Catv San FM
Storm Fiber Tel Other

Cover: 3.93'

Material

☒ CI DI PVC AC Copper STL
W/STL Clay RCP Hdpe PE



AMG Underground Inc.
Utility Locating & Mapping Services

PN# 23018

Test Hole No: 2

Project Name: Pilgrim Rd & Plymouth Rd

Job #

Work Order #

Requested By: Brown & Phillips

Utility Requested

Water Gas **Elec** Catv San FM
Storm Fiber Tel Other

Project Location: West Palm Beach, FL

Sheet of Proposed: Water Main
Form by: DL Assisted by: EB # of Holes 1
Soil Coditions: **Good** Fair Poor Date: 10/10/23

Utility Found

Size: (2) 4"

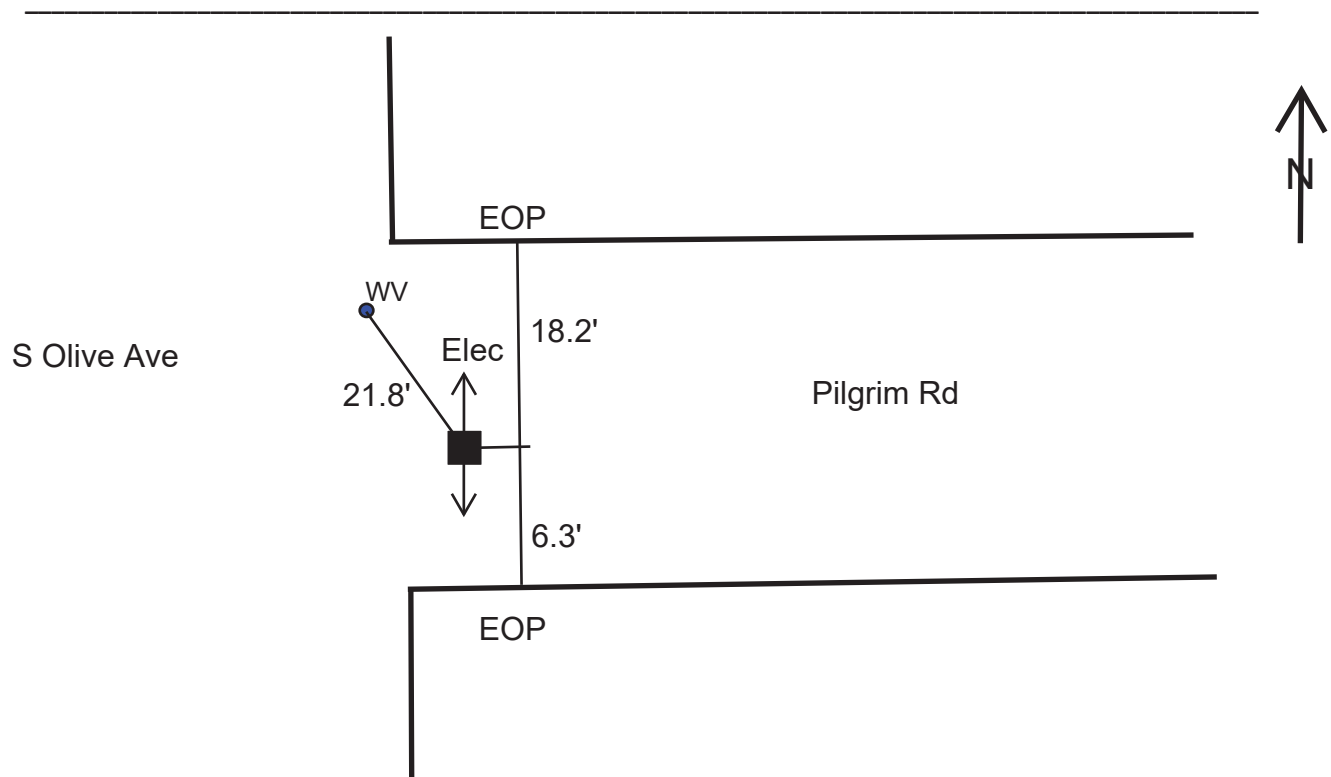
Installed: **PK** Hub&Tack Stl Pin ChisX

Water Gas **Elec** Catv San FM
Storm Fiber Tel Other

Cover: 1.95'

Material

CI DI **PVC** AC Copper STL
W/STL Clay RCP Hdpe PE



AMG Underground Inc.
Utility Locating & Mapping Services

PN# 23018

Test Hole No: 3

Project Name: Pilgrim Rd & Plymouth Rd

Job #

Work Order #

Requested By: Brown & Phillips

Utility Requested

Project Location: West Palm Beach, FL

Water ☒ Gas ☐ Elec Catv San FM
Storm Fiber Tel Other

Sheet of Proposed: Water Main
Form by: DL Assisted by: EB # of Holes 1
Soil Coditions: ☒ Good ☐ Fair ☐ Poor Date: 10/10/23

Utility Found

Size: 4"

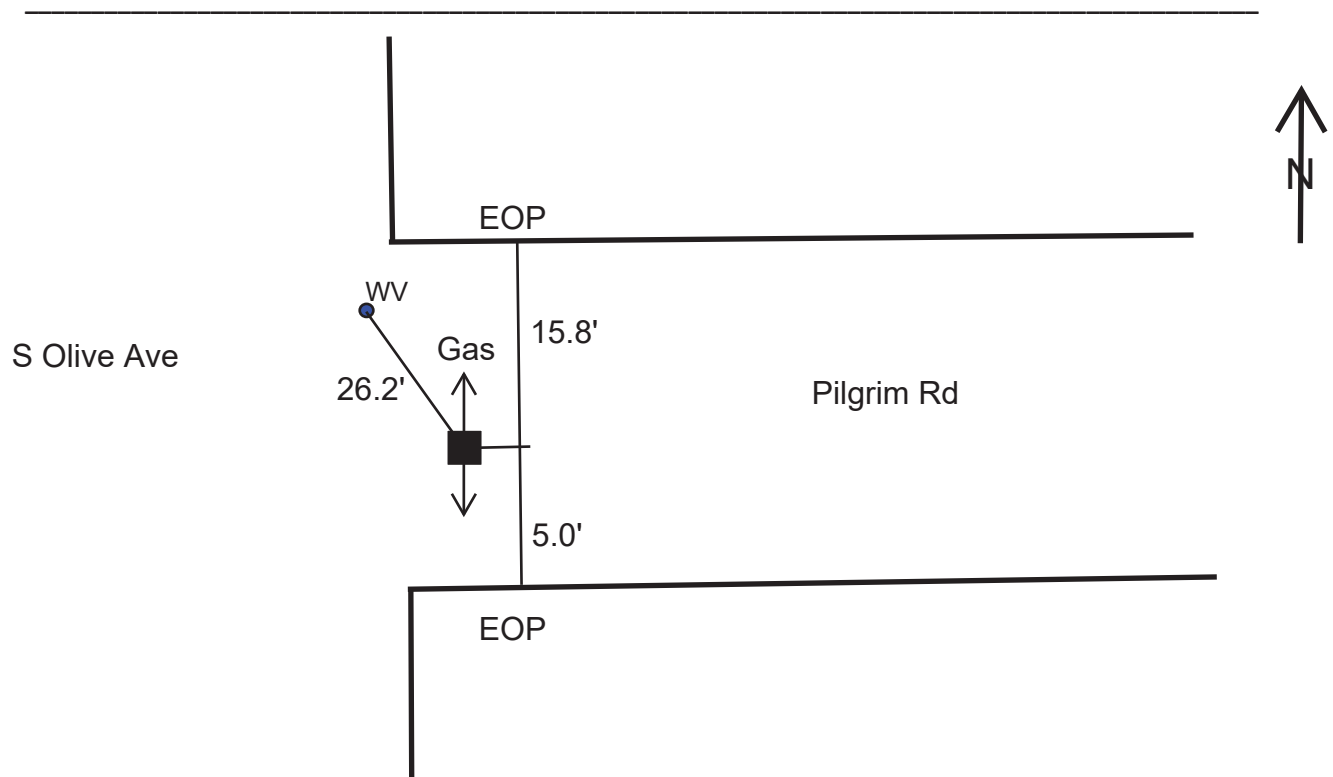
Installed: ☒ PK ☐ Hub&Tack ☐ Stl Pin ☐ ChisX

Water ☒ Gas ☐ Elec Catv San FM
Storm Fiber Tel Other

Cover: 4.05'

Material

CI DI PVC AC Copper STL
☒ W/STL ☐ Clay ☐ RCP ☐ Hdpe ☐ PE



AMG Underground Inc.
Utility Locating & Mapping Services

PN# 23018

Test Hole No: 4

Project Name: Pilgrim Rd & Plymouth Rd

Job #

Work Order #

Requested By: Brown & Phillips

Utility Requested

Project Location: West Palm Beach, FL

Water Gas Elec Catv San FM
Storm Fiber Tel Other

Sheet of Proposed: Water Main
Form by: DL Assisted by: EB # of Holes 1
Soil Coditions: **Good** Fair Poor Date: 10/10/23

Utility Found

Size: See Note

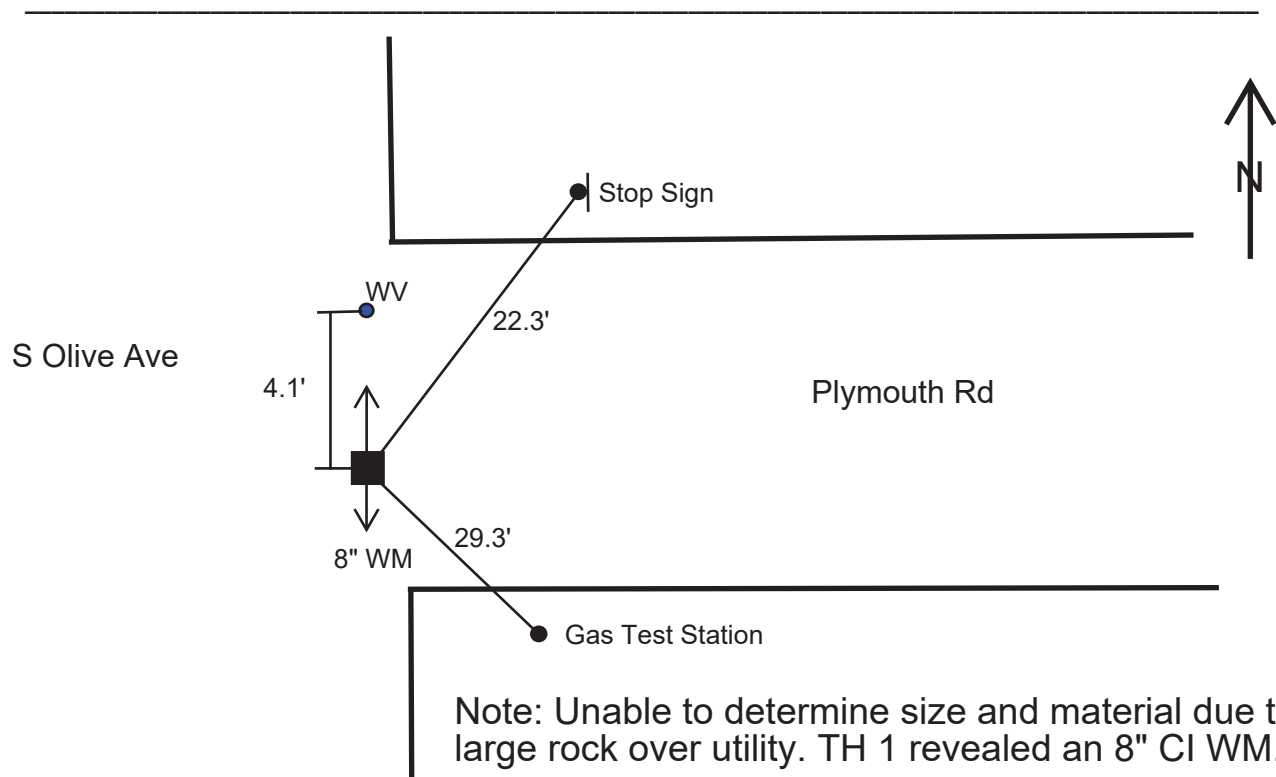
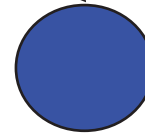
Installed: **PK** Hub&Tack Stl Pin ChisX

Water Gas Elec Catv San FM
Storm Fiber Tel Other

Cover: 3.55'

Material

CI DI PVC AC Copper STL
W/STL Clay RCP Hdpe PE



AMG Underground Inc.
Utility Locating & Mapping Services

PN# 23018

Test Hole No: 5

Project Name: Pilgrim Rd & Plymouth Rd

Job #

Work Order #

Requested By: Brown & Phillips

Utility Requested

Water ☒ Gas ☐ Elec Catv San FM
Storm Fiber Tel Other

Project Location: West Palm Beach, FL

Sheet of Proposed: Water Main
Form by: DL Assisted by: EB # of Holes 1
Soil Coditions: ☒ Good ☐ Fair ☐ Poor Date: 10/10/23

Utility Found

Size: 4"

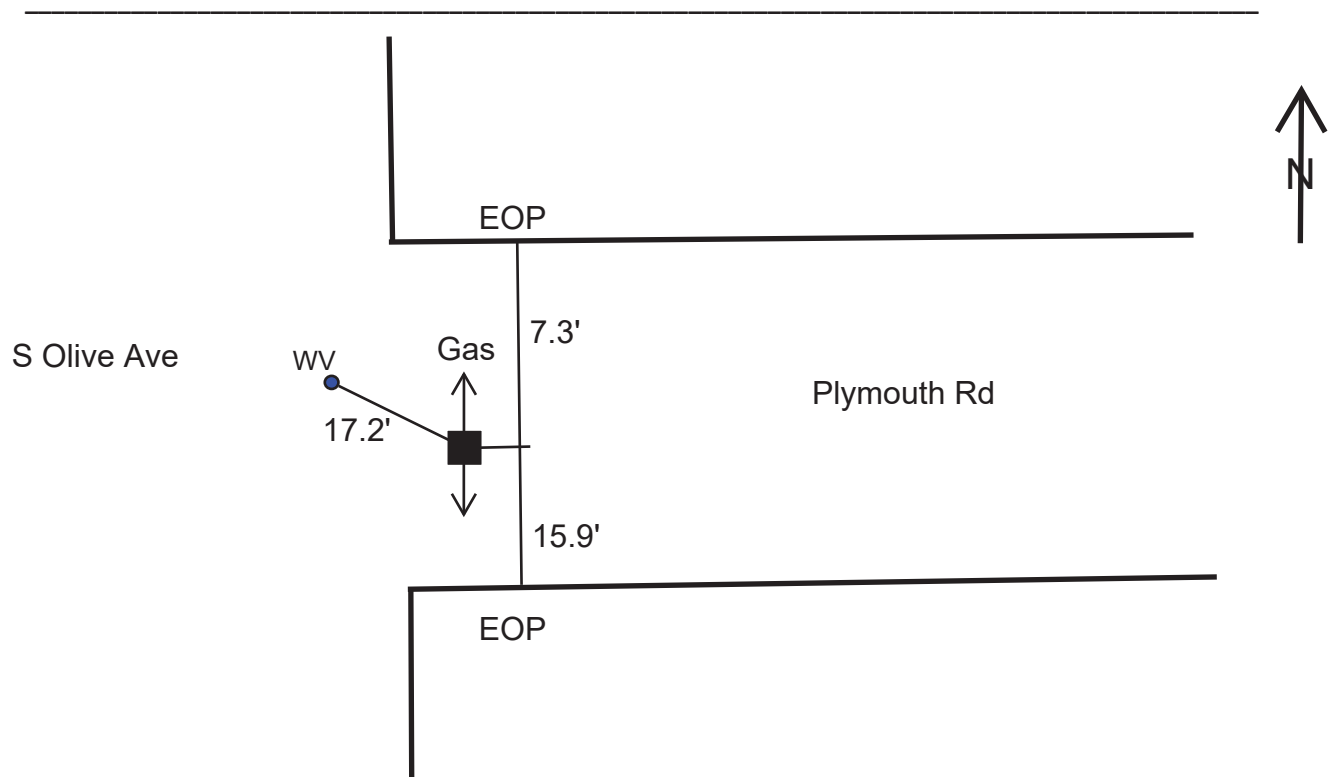
Installed: ☒ PK ☐ Hub&Tack ☐ Stl Pin ☐ ChisX

Water ☒ Gas ☐ Elec Catv San FM
Storm Fiber Tel Other

Cover: 4.00'

Material

CI DI PVC AC Copper STL
☒ W/STL ☐ Clay ☐ RCP ☐ Hdpe ☐ PE



AMG Underground Inc.
Utility Locating & Mapping Services

PN# 23018

Test Hole No: 6

Project Name: Pilgrim Rd & Plymouth Rd

Job #

Work Order #

Requested By: Brown & Phillips

Utility Requested

Project Location: West Palm Beach, FL

☒ Water Gas Elec Catv San FM
Storm Fiber Tel Other

Sheet of Proposed: Water Main
Form by: DL Assisted by: EB # of Holes 1
Soil Coditions: ☒ Good Fair Poor Date: 10/10/23

Utility Found

Size: 6"

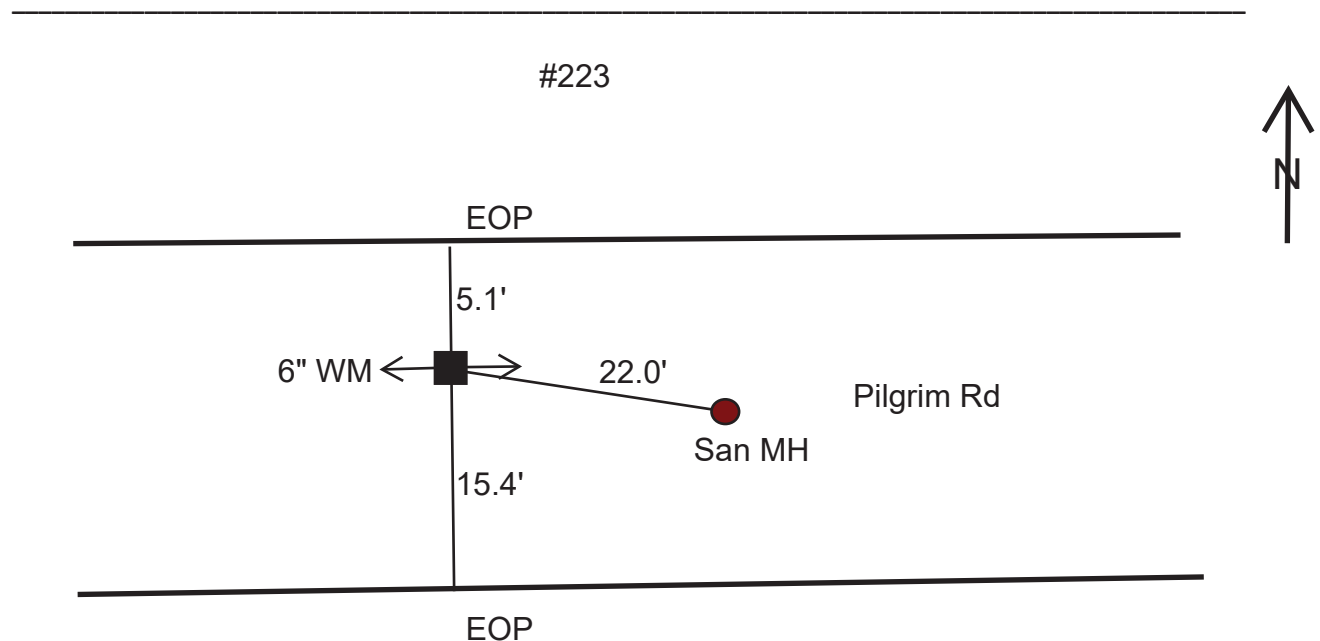
Installed: ☒ PK Hub&Tack Stl Pin ChisX

☒ Water Gas Elec Catv San FM
Storm Fiber Tel Other

Cover: 2.05'

Material

☒ CI DI PVC AC Copper STL
W/STL Clay RCP Hdpe PE



AMG Underground Inc.
Utility Locating & Mapping Services

PN# 23018

Test Hole No: 7

Project Name: Pilgrim Rd & Plymouth Rd

Job #

Work Order #

Requested By: Brown & Phillips

Utility Requested

Project Location: West Palm Beach, FL

☒ Water Gas Elec Catv San FM
Storm Fiber Tel Other

Sheet of Proposed: Water Main
Form by: DL Assisted by: EB # of Holes 1
Soil Coditions: ☒ Good Fair Poor Date: 10/10/23

Utility Found

Size: 6"

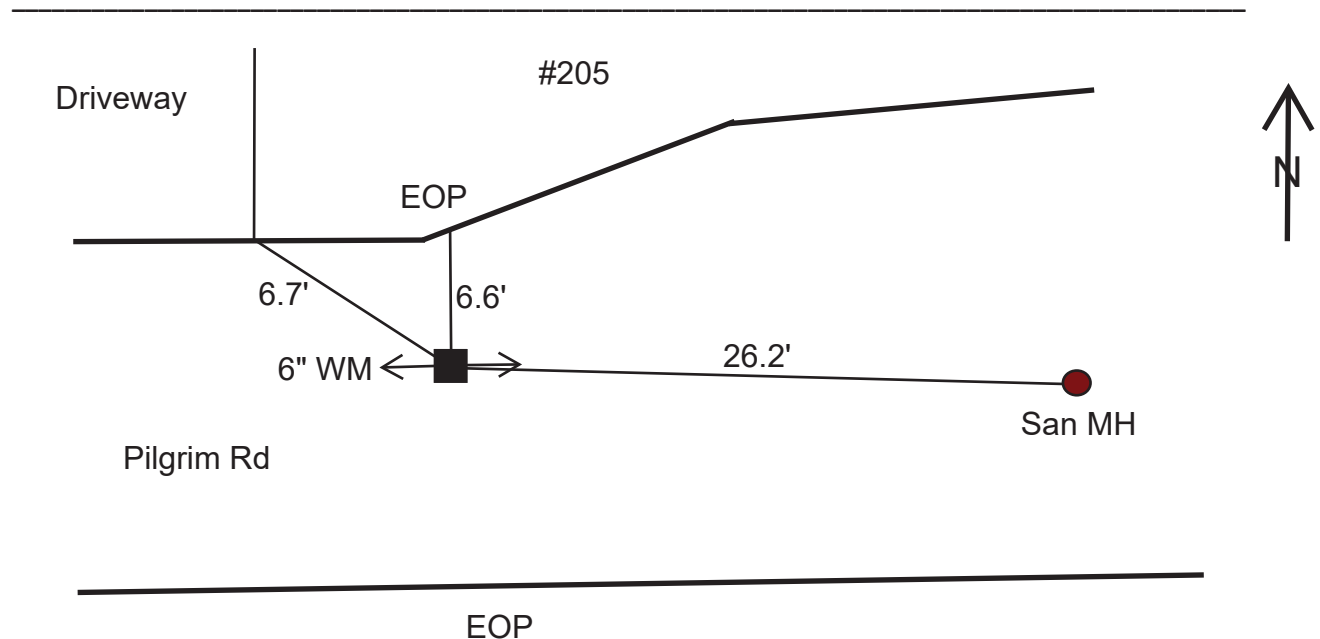
Installed: ☒ PK Hub&Tack Stl Pin ChisX

☒ Water Gas Elec Catv San FM
Storm Fiber Tel Other

Cover: 2.35'

Material

☒ CI DI PVC AC Copper STL
W/STL Clay RCP Hdpe PE



AMG Underground Inc.
Utility Locating & Mapping Services

PN# 23018

Test Hole No: 8

Project Name: Pilgrim Rd & Plymouth Rd

Job #

Work Order #

Requested By: Brown & Phillips

Utility Requested

Project Location: West Palm Beach, FL

Water ☒ Gas Elec Catv San FM
Storm Fiber Tel Other

Sheet of Proposed: Water Main
Form by: DL Assisted by: EB # of Holes 1
Soil Conditions: ☒ Good Fair Poor Date: 10/10/23

Utility Found

Size: 2" / 1" WM Svc

Installed: PK ☒ Hub&Tack Stl Pin ChisX

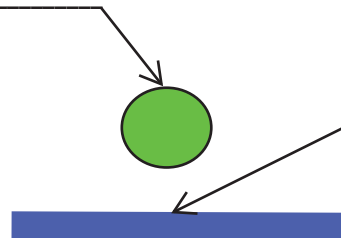
Water ☒ Gas Elec Catv San FM
Storm Fiber Tel Other

Cover: 0.90'

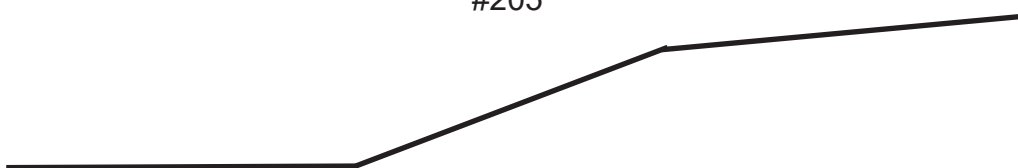
Material

CI DI PVC AC Copper STL
☒ W/STL Clay RCP Hdpe PE

Cover: 1.25'

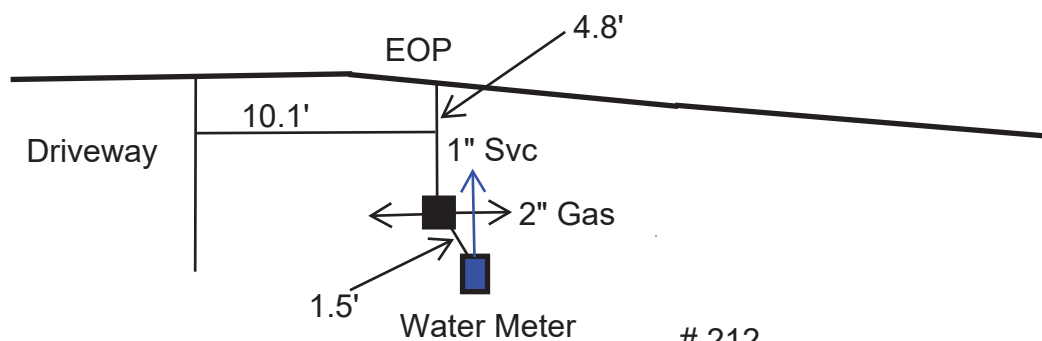


#205



Pilgrim Rd

Note: Test hole also revealed 1" water service. Depth = 1.25' +/-
O/S = 1' +/- east of hub & tack



212

**APPENDIX B – CITY OF WEST PALM BEACH TRASH
PICK-UP SCHEDULE**

**APPENDIX C – CITY OF WEST PALM BEACH APPROVED
MATERIALS LIST**



**401 Clematis Street
West Palm Beach, FL 33401
Phone: 561-822-1200
Fax: 561-494-1116**

APPROVED MATERIALS LIST (AML)

REVISED: October 17, 2018

PLEASE REFER TO THE GENERAL NOTES AND SUBMITTAL GUIDELINES SECTION STARTING ON PAGE 6 PRIOR TO FILLING OUT ANY OF THE SUBMITTAL SHEETS.

OFFICIAL USE ONLY - THIS SECTION

Contractor: _____ Engineer: _____

Project Name: _____ Project No.: _____

APPROVED: _____
SIGNATURE DATE

APPROVED AS NOTED: _____
SIGNATURE DATE

NOT APPROVED: _____
SIGNATURE DATE

OFFICIAL USE ONLY - THIS SECTION

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INSTRUCTIONS AND GENERAL NOTES:

Sections 1 through 4 are listed materials for specific uses in City-owned and maintained water and wastewater systems. Sections 5 through 8 are listed material for specific use in the construction and maintenance of infrastructure to be owned and maintained by the City. Materials are listed by type of material, group, short specification listed with each approved item, approved manufacturer, and manufacturer's part number.

When applicable, standard detail sheet number(s) will be identified on the Approved materials List (AML) page for the purpose of cross referencing the material to the drawing.

SUBMITTAL GUIDELINES:

1. Submit two (2) complete original AML packages with a transmittal letter. One (1) original to be retained in the project file and one (1) original provided to staff for use.
 - A. Submit with the original AML package any additional copies, as needed, to be approved and returned for the Engineer/Contractor/Supplier' use.
 - B. Submit with the original AML package a Concurrency form executed by the Engineer and Contractor.
 - C. Submittals shall be complete AML packages. Complete AML's by indicating the following:
 - i. Check each type of material item to be used.
 - ii. Check each corresponding manufacturer and model number to be used.
 - iii. Initial any written changes or corrections to an AML.
 - D. Any proposed non-standard material submittals shall include two (2) original copies for City retention and a Shop Drawing material Approval for each separate material item. Submit with the original AML package any additional shop drawing copies, as needed, to be approved and returned for the Engineer/Contractor/Supplier's use.
2. The City of West Palm Beach approves materials to be utilized in the water distribution system within the rights of ways, easements and on private property up to the downstream side of the backflow preventers in the following Municipalities in our utility service coverage area:
 - A. City of West Palm Beach
 - B. Town of Palm Beach
 - C. Town of South Palm Beach
 - D. Parts of Palm Beach County (Served by City of West Palm Beach)

The City of West Palm Beach approves materials to be utilized in the sanitary collection system, wastewater lift stations, force mains, and services within the rights of ways and easements of:

- A. City of West Palm Beach
3. Material cut sheets from a supply house catalog will not be considered a suitable shop drawing submittal.
 4. Foreign and domestic materials manufacturers shall meet the same criteria for quality and craftsmanship.
 5. All materials, fittings, pipe and equipment shall be new, unused, and warranted for a minimum period of one (1) year after acceptance.
 6. The City of West Palm Beach undertakes a continual effort to maintain an AML that reflects the latest technological advances and industry capabilities. The AML is updated as often as it is practical.

7. The AML does not supersede the policies and procedures of the City of West Palm Beach Purchasing Department. Any direct and specifically identifiable conflicts between the AML and City technical specifications shall be arbitrated by the Department Director responsible for the related material (e.g. any conflict with water distribution pipe would be decided by the Director of Public Utilities).
8. The most current edition of the AML is maintained on the City of West Palm Beach Engineering Services web page and is available via email or paper copy, upon request. AML's associated with City capital construction projects will utilize the edition stipulated by the contract execution date, all other shall utilize the latest edition at the time of initial submission.
9. City may implement new and additional materials and/or manufacturers to a project-specific AML or in general. Project-specific material shall be added to a shop drawing amendment with Engineer of Record (EOR)'s approval. In general material may added to the next edition of the AML with City's approval.
10. By signing the Concurrency form, the Engineer and Contractor agree to adhere to the material specifications of the AML. It shall be acknowledged that the City has right to reject construction materials not in accordance with the AML.
11. All material parts utilized in the City's water distribution system, except hydrants, shall meet the provisions of Chapter 62-555.335, Florida Administrative Code.
12. Product/Material can be removed from the AML at any time after if City does not satisfied with the quality and performance.

- End of Section -



**ENGINEERING SERVICES
DEPARTMENT**

P.O. Box 3366,
West Palm Beach, FL 33402
TEL (561) 494-1040
FAX (561) 494-1116

CERTIFICATION AND CONCURRENCY FORM

Project Name: _____

Concurrence of Contractor: _____
Signature Date

Firm

Concurrence from the
Engineer of Record (EOR): _____
Signature Date

Firm

The execution of this document acknowledges that I (We), the above signed, have reviewed this Approved Materials List (AML) in its entirety, initialed all error corrections to the AML, and concur that the materials listed are acceptable and appropriate for the project noted above. As the engineer-of-record and/or contractor, I (We), the above signed, shall provide written notification to the City for any material listed in the AML to which I object being utilized for the project noted above.

Individual material shop drawings will be required for all non-standard items. Materials not listed in the AML, or AML listed material that defers in specification, shall be considered non-standard material.



**APPROVED MATERIALS LIST
SECTION ONE
PRESSURE PIPE**

PRESSURE PIPE STANDARDS ARE TO BE USED FOR:

1. Potable water distribution system, water distribution transmission mains, large meter services and private fire lines. Distribution System Utility Service Area includes:
 - A. City of West Palm Beach
 - B. Town of Palm Beach
 - C. Town of South Palm Beach.
2. Sanitary Collection Force Mains. Sanitary Collection System Utility Service Area includes:
 - A. City of West Palm Beach.

Submittal: FIRE HYDRANTS**FIRE HYDRANTS APPROVED FOR USE:**

Hydrants shall conform to requirements of AWWA Standard C502-94 for Dry Barrel Hydrants or the latest revision, as to the design, component materials, construction and manufacture except as modified or noted in the City technical specifications (a copy of those specifications can be supplied on request). Approved hydrants will be used in the construction of systems to be owned and operated by the City of West Palm Beach Public Utilities Department. Approved hydrants shall be used in the construction of private systems within the corporate boundaries of the City of West Palm Beach.

☐ Clow
Medallion

☐ American
B-84-B

☐ Mueller
Super Centurion 250

☐ Kennedy
Guardian

HYDRANT COATINGS:

When constructed to the City of West Palm Beach technical specifications, hydrants shall have a shop coat of silver paint applied at the manufacturer. Contractors shall paint the hydrant bonnets with the following coating after installation and prior to acceptance. Contractors shall clean, prep, and paint all damaged factory paint.

Paint for Fire Hydrant Bonnet (REQUIRED)

☐ HENTZEN COATING, INC.: Alert Series Light Reflective Coating

Paint for the Barrel Section and Nozzle Caps (TOUCH-UP PAINT)

☐ SHERWIN-WILLIAMS: Silver-Brite Aluminum paint. Sale identification No. B59S11

MISCELLANEOUS COLORS:

Hydrants installed outside the City of West Palm Beach corporate boundaries, may be painted alternate colors. A letterhead correspondence from the Fire Chief or Fire Marshal of the corresponding service area (Town of Palm Beach, Town of South Palm Beach, and Unincorporated Palm Beach County), may request permission to paint the barrel section any alternate color. An original copy of the request shall accompany the AML submittal. The reflective bonnet paint color cannot be changed.

☐ Proposed Color: _____

Manufacturer: _____

Paint Color No.: _____

AUTOMATIC FLUSHING DEVICE:

☐ Kupferle Foundry Co., 9800-WC Eclipse

☐ Kupferle Foundry Co., 9400-WC Eclipse

Submittal: DUCTILE IRON PIPE

Pipe shall comply with ANSI/AWWA Standard or latest revision. 3", 10", 14" and 16" pipe are considered "odd" sizes and can only be used to tie into existing lines. The minimum standards for 3 to 12" pressure pipe Class 52. The minimum standard for 14" to 64" pressure pipe is Class 51. The minimum standard for all F.J. (Flanged) pipes, for any usage, shall be Class 53. The minimum standard for all size diameter sanitary collection system gravity mains shall be Class 50 or Pressure Class 350.

MANUFACTURER:☐

American

☐

U.S. Pipe

☐

McWane

CLASS:☐

Class 52, sizes to be used on water mains: _____

☐

Class 51, sizes to be used on water mains: _____

☐

Class 52, sizes to be used on force mains: _____

☐

Class 51, sizes to be used on force mains: _____

☐

Class 50, sizes to be used on gravity mains: _____

☐

Pressure Class 350, sizes to be used on gravity mains: _____

☐

Class 53, sizes to be used for FJ pipe: _____

BELL TYPE:☐**FLANGE JOINTS:**

Flanges shall be ANSI Standard Class 125, plain faced and drilled, in accordance with ANSI B16.1. Flanges shall be solid with a uniform thickness as shown on Table 15.3 and Figure 15.1 of the ANSI/AWWA C115/A21.15 standard or latest revision. Submit a letterhead correspondence from the manufacturer/vendor certifying that the flanged pipe complies with ANSI/AWWA Flange standard, the ANSI/AWWA pipe standard and the ANSI/AWWA lining standard (if for water) or the lining for gravity or force mains.

☐**MECHANICAL JOINT:**

All mechanical joints shall conform to ANSI/AWWA C111/A21.11 standard or latest revision.

☐**SLIP OR PUSH-ON JOINTS:**

All push-on type joints shall conform to ANSI/AWWA C111/A21.11 standard or latest revision. The gasket material shall be SBR type or equal.

☐**RESTRAINED JOINT:**

All restrained joints shall conform to the latest edition of ANSI/AWWA C151 standard.

Submittal: DUCTILE IRON LININGS AND COATINGS

DISTRIBUTION SYSTEM WATER MAINS:

INTERIOR:

☐ Cement mortar lining required, per ANSI/AWWA C104/A21.4 standard or the latest revision.

EXTERIOR:

☐ In ground placement, bituminous asphalt coating required, per ANSI/AWWA C104/A21.4 standard or latest revision.

☐ Fusion-Bonded Epoxy Coating, per ANSI/AWWA C116/A.21.16

ENCASEMENT:

☐ Polyethylene Encasement, per ANSI/AWWA C105/A21.5 standard or latest revision. Encasement shall be 4 mil CL/HDPE.

☐ American Ductile Iron Pipe Company

☐ U. S. Pipe Company

SANITARY SEWER COLLECTION GRAVITY MAINS, FORCE MAINS, AND LATERALS (DIP):

NOTE: When DIP is used in wetwells and air release valve vault applications, the interior coating shall be applied to the inside and outside of the pipe.

INTERIOR:

☐ PERMITE
Permax PCS-9043, Glass Flake Epoxy

☐ VULCAN PAINTERS, INC.
Protecto 401, Ceramic Epoxy Lining.

EXTERIOR:

☐ In ground placement, bituminous asphalt coating required, per ANSI/AWWA C104/A21.4 standard or latest revision.

ENCASEMENT:

☐ Polyethylene Encasement, per ANSI/AWWA C105/A21.5 Standard or latest revision. for in-ground placement. Encasement shall be a minimum of 4 mils thick, CL/HDPE.

☐ American Ductile Iron Pipe Company

☐ U. S. Pipe Company

COATING CERTIFICATIONS:

Certification letter must state the pipe and or fitting manufacturer to be used, the applicable ANSI/AWWA standard, the coating to be used and the thickness of the coating.

☐ Shop for pipe (attach certification letter after this page)

☐ Shop for fittings (attach certification letter after this page)

Submittal: DUCTILE IRON FITTINGS

DUCTILE IRON FITTINGS:

Cast ductile iron fittings 3" through 24" shall be pressure rated at 350 psi minimum. Flange -joint fittings shall be rated at 250 psi minimum. All 30" and 36" fittings shall be pressure rated to 250 psi minimum. All fittings shall conform to the latest edition of either ANSI/AWWA C110/A21.10 or ANSI/AWWA C153/A21.53, and C111/A21.11 standards.

- | | |
|--|---|
| <input type="checkbox"/> TYLER/UNION | <input type="checkbox"/> SIGMA PRODUCTS |
| <input type="checkbox"/> GRIFFIN PIPE PRODUCTS | <input type="checkbox"/> STAR PIPE PRODUCTS |

List sizes to be used: _____

RESTRAINED JOINT TYPE (by pipe manufacturer):

- | | |
|--------------------------|--|
| <input type="checkbox"/> | American Cast Iron Pipe, 4" - 12" Field Lock Gaskets |
| <input type="checkbox"/> | American Cast Iron Pipe, Fast-Grip gaskets 4 thru 16" |
| <input type="checkbox"/> | American Cast Iron Pipe, Lok-Ring 42" - 64" |
| <input type="checkbox"/> | American Cast Iron Pipe, Flex Ring 4" - 36" |
| <input type="checkbox"/> | American Cast Iron Pipe, 14" - 36"; 4"-16" Fast-Grip gaskets |
| <input type="checkbox"/> | US PIPE/Griffin Pipe Products, Snap-Lok 6"-48" |
| <input type="checkbox"/> | U.S. Pipe, T.R. Flex 4" - 64" |
| <input type="checkbox"/> | U. S. Pipe, Field LOK Gaskets 4" -24". |

MECHANICAL JOINT RESTRAINT:

Mechanical type joint shall be furnished with high strength corten T-head bolts and hex nuts with composition, dimensions, and threading in accordance with C-111 Standard. For all joint restraint products, apply corrosion resistant coating Mega-bond (or approved equal). Polyester based powder electro-statically applied in two coats and heat cured after each coating for cast body. Xylan Fluoropolymer coating will be used for wedge assemblies. Applicable for all restraint devices through 24". Clow Field Lok Gaskets will use a normal cast or ductile iron mechanical joint gland or the Clow Field Lok gland.

- DIP:
- | | | |
|--|---|--|
| <input type="checkbox"/> EBAA IRON
Megalug
Series 1100 | <input type="checkbox"/> STAR PIPE
Stargrip
Series 3000 | <input type="checkbox"/> FORD
Uniflange
Series 1300, 1390, 1400, & 1450 |
| <input type="checkbox"/> SIGMA PRODUCTS
Series SLD | | <input type="checkbox"/> CLOW
MJ Field Lok Gasket
Series DI, 4 to 24" only |

NOTE: All restrained joint systems shall be pressure rated to the same as Ductile Iron pipe and fittings. All components of the restrained system shall meet or exceed the requirements of the latest edition of ANSI/AWWA C-111/A21.21.11 standard. Restraints shall provide a non-point loading type of restraint contact on the pipe with sufficient positive gripping action to secure the gland to the pipe and be designed so that the restraint action is increased as a result of increases in the line pressure.

Submittal: DUCTILE IRON FITTINGS (CONTINUED)

FLANGED JOINT RESTRAINT:

Flange Bolts and nuts shall be carbon steel, hex head, ASTM A183, with a Zinc electroplated finish. The flange type gasket material shall be 1/8-inch thick rubber type conforming to ANSI B16.21 and AWWA C-207, unless otherwise specified. For all joint restraint products, apply corrosion resistant coating Mega-bond (or approved equal). Polyester based powder electro-statically applied in two coats and heat cured after each coating for cast body. Xylan Fluoropolymer coating will be used for wedge assemblies. Applicable for all restraint devices through 24".

- ☐ EBAA IRON
Megalug
Series 2100

APPROVED JOINT RESTRAINT FITTINGS:

- ☐ UNION FOUNDRY
Swivel joint fittings

APPROVED JOINT RESTRAINT FOR PVC:

In some cases there are existing PVC mains that need to be cut or tied into and restrained back due to the addition of elbows, tees and valves. This section covers the types and approved joint restraint allowed. For all joint restraint products, apply corrosion resistant coating Mega-bond (or approved equal). Polyester based powder electro-statically applied in two coats and heat cured after each coating for cast body. Xylan fluoropolymer coating will be used for wedge assemblies. Applicable for all restraint devices through 24".

BELL RESTRAINTS:

- ☐ EBAA IRON
Series 1600 (4 thru 12")
Series 2800 (14 thru 36")

TIE RODS AND ACCESSORIES:

- ☐ SIGMA PRODUCTS:
Duc Lugs (bent eye bolts not allowed):
Socket Clamps (with cast iron washers)
All thread rod, zinc plated (3/4" only)

Submittal: PVC FOR FORCE MAIN

Polyvinyl Chloride (PVC):

PVC pressure pipe (4-inch through 12-inch) shall conform to the applicable requirements of ANSI/AWWA C900 and subject to additional requirements specified herein. PVC pressure pipe (14-inch through 36-inch) shall conform to the applicable requirements of ANSI/AWWA C905 and subject to additional requirements specified herein. Pipe shall be colored green for force main application.

MANUFACTURER:

☐
☐
☐
☐

JM Manufacturing Company*
CertainTeed*
IPEX, Inc.
Sanderson Pipe

☐
☐
☐

Diamond Plastic Corporation*
North American Pipe Corporation
National Pipe and Plastic

NOTE: *No Pipe deflection at joint allowed

LOCATING / TRACER WIRE:

Trace wire system must be installed as a continuous single wire. No looping or coiling of wire is allowed. Trace wire must be properly grounded at all dead ends/stubs. All trace wire termination points shall utilize a trace wire access box.

Locating wire shall be 14 AWG single strand, soft drawn copper wire; 4/64 – inch polyvinyl chloride insulation, color coated per APWA standard for the specific utility being marked. Locating wire shall be spliced before and after all valve boxes and when connecting at Tee's. All splices should be covered with electrical tape. When splicing wire at Tee's, keep clear of fittings.

All main line trace/locating wires must be interconnected in intersections, at tees, and crosses. At tees, the three wires shall be joined using a single 3-way lockable connector. At Crosses, the four wires shall be joined using a 4-way connector.

All new trace wire installations shall be located using typical low frequency (512 Hz) line tracing equipment, witnessed by City, prior to acceptance.

☐

Manufacturer/Model Num.: _____

Submittal: PVC FOR FORCE MAIN (CONTINUED)

DIP FITTINGS FOR PVC:

Fittings in the pipe shall be ductile iron fittings. All fittings shall conform to the latest edition of either ANSI/AWWA C110/A21.10 or ANSI/AWWA C153/A21.53, and C111/A21.11 standards.

☐ TYLER/UNION
☐ GRIFFIN PIPE PRODUCTS
☐ SIGMA PRODUCTS

☐ UNION FOUNDRY COMPANY
☐ STAR PIPE PRODUCTS

List sizes to be used: _____

JOINTS:

All joints for the buried PVC shall be either an integral bell manufactured on the pipe or a separate coupling both employing a rubber ring joint. Deflection at all joints should not exceed 1.5 degrees or one half the maximum deflection recommended by the manufacturer.

RESTRAINED JOINT TYPE (by pipe manufacturer):

☐ Certain Teed Certalok
☐ JM Eagle Lok

MECHANICAL JOINT RESTRAINT:

Mechanical joint restraint shall be incorporated in the design of the follower gland. Glands shall be manufactured of ductile-iron conforming to ASTM A536-80. The restrained glands shall have a pressure rating equal to that of the PVC pipe which it is used. All mechanical joints shall conform to ANSI/AWWA C111/A21.11 and ANSI/AWWA C1530/A21.53 latest revision.

PVC / C900/C905 PVC:

☐ EBAA IRON
Series 2000
☐ SIGMA PRODUCTS
Series SLC

☐ STAR PIPE
Series 4000
☐ CLOW
MJ Field Lok Gasket and or Gland
Series PV, 4 to 12" only

NOTE: All restrained joint systems shall be pressure rated to the same as Ductile Iron pipe and fittings. All components of the restrained system shall meet or exceed the requirements of the latest edition of ANSI/AWWA C-111/A21.21.11 standard. Restraints shall provide a non-point loading type of restraint contact on the pipe with sufficient positive gripping action to secure the gland to the pipe and be designed so that the restraint action is increased as a result of increases in the line pressure.

Submittal: VALVES

RESILIENT WEDGE GATE VALVES (RWGV):

Distribution Water Mains and Sanitary Sewer Collection Force Mains.

Valves shall conform to the latest edition of ANSI/AWWA C509-87 standard, non-rising stems (NRS) with 2" square operating nuts. Minimum valve size shall be 4". Valves smaller than 4" see curb stop material section. UL/FM required on shut-off RSGV for Double Detector check valves application only. See backflow prevention.

- | | | | |
|--|---|---|--|
| <input type="checkbox"/> AMERICAN
2500 Series | <input type="checkbox"/> CLOW
F-6100 Series | <input type="checkbox"/> KENNEDY
Ken-Seal
2370 (Super Seal) | <input type="checkbox"/> MUELLER
A-2360 |
| <input type="checkbox"/> WATEROUS
Series 500 | <input type="checkbox"/> M & H
Style 3067 or
Style 3068 | | |

RESILIENT SEAT BUTTERFLY VALVES:

For use on 14" and larger water mains only.

2" square operating nuts. Valves shall conform to the latest edition of AWWA 504 standard.

- | | | |
|---|---|---|
| <input type="checkbox"/> CLOW
5300 Series
H Series 450 & 4500 | <input type="checkbox"/> Dresser
14501 | <input type="checkbox"/> DEZURIK
BAW |
| <input type="checkbox"/> KENNEDY | <input type="checkbox"/> MUELLER
Lineaseal III | <input type="checkbox"/> PRATT
Groundhog |

PLUG VALVES (To be used on force mains only):

Valves shall conform to the latest edition of AWWA C517 standard.

- | |
|--|
| <input type="checkbox"/> PRATT
Model Num.: _____ |
| <input type="checkbox"/> Milliken Valve
Model Num.: _____ |
| <input type="checkbox"/> DEZURIK
Model Num.: _____ |

JOINT TYPES (For all Valve Types):

- | | |
|-----------------------------|---|
| <input type="checkbox"/> MJ | <input type="checkbox"/> FJ |
| <input type="checkbox"/> SJ | <input type="checkbox"/> TF / MJ (Tapping Flange to Mechanical Joint) |

Submittal: VALVE BOXES

NOTE: The valve box, valve lid and valve extension shall be utilized for each valve. The UVI tags will be used where the debris cap cannot be used.

VALVE BOXES:

Heavy duty, Cast Iron ASTM-A48 Class 30, 2 piece, 5-1/4" opening, flanged base, 18 to 24" adjustable, screw type, valve box, with Locking lid (in paved areas), embossed with "WATER" on the lid for water mains and services.

<input type="checkbox"/> Tyler/Union 461-S	<input type="checkbox"/> SIGMA 461-S Part # VB261X/60WT (SIGMA and Tyler are interchangeable)	<input type="checkbox"/> Bingham & Taylor Non-Flip Option
---	---	--

VALVE BOX LIDS: (Box Lid Shall Match Box Manufacturer)

Non-Locking Lid: Cast Iron ASTM-A48, Class 30, embossed with "SEWER" on the lid for force mains, embossed with "WATER" on the lid for water mains and meter service connections.

<input type="checkbox"/> Tyler/Union	<input type="checkbox"/> SIGMA	<input type="checkbox"/> Bingham & Taylor
--------------------------------------	--------------------------------	---

Locking Lid (For All Paved Areas): Cast Iron ASTM-A48, Class 30, embossed with "SEWER" on the lid for force mains. To be used on Tyler model 461S, 5-1/4", screw type box.

<input type="checkbox"/> Tyler/Union	<input type="checkbox"/> SIGMA	<input type="checkbox"/> Bingham & Taylor
--------------------------------------	--------------------------------	---

Locking Lid (For All Paved Areas): Cast Iron ASTM-A48 Class 30, embossed with "WATER" on the lid for water mains and services.

<input type="checkbox"/> Tyler/Union	<input type="checkbox"/> SIGMA	<input type="checkbox"/> Bingham & Taylor
--------------------------------------	--------------------------------	---

VALVE STEM EXTENSION:

Utilized on all in-ground valves 36" or more below finished grade. Used in place of the American Trench Adapter (valve box). Valve extension must be secured to the valve stem, not set over the operating key.

<input type="checkbox"/> MUELLER	<input type="checkbox"/> PROSELECT
----------------------------------	------------------------------------

UNDERGROUND VALVE IDENTIFICATION (UVI) TAGS:

To be used when the Tyler style valve box with the Debris Cap are not used, such as with the AMERICAN valve trench adapter. 3" x 1/4", Brass, with 1-1/2" theft proof "J" rod anchor. **Stamped**, 1/4" to 3/8" capital lettering. Each valve will have the following minimum information on the tag, words in parentheses are examples of wording to use, City code (WPB), valve size (6"), type of valve (RV, BV, PV), type of use (WM, FM, RW), and operation instructions (R-21) right 21 turns to open, plus valve number, if applicable. In paved and unpaved areas, the UVI will be placed in the concrete collar around valve boxes.

<input type="checkbox"/> WAGCO MARKER

Submittal: PERMANENT BLOW-OFFS

CORPORATIONS FOR BLOW-OFFS:

Corporations to be screwed into a cast iron plug or cap shall meet these specifications: 2" Male Iron Pipe Thread (for tap side) by 2" Female or Male Iron Pipe Thread for tie-in to blow-off.

(NOTE: It is recommended to utilize a male thread to eliminate the need for a brass nipple between the corporation and the permanent blow-off).

<input type="checkbox"/>	FORD	<input type="checkbox"/>	MUELLER	<input type="checkbox"/>	AY MCDONALD
	FB1700-7, or		B-20046, or		3131B
	3149B, or		H-15015, or		
	FB500-7		H-9969		

BRASS NIPPLES:

All brass shall be of non-lead brass (maximum lead content of 0.10% by weight).

☐ Connections from corporation to blow-off must be 2" iron pipe thread by 6" long brass nipples.

BLOW-OFFS: Prefabricated

☐ Model VB2000B, the Hydrant Plus for meter box installation, as manufactured by Water Plus Corporation. Due to dead-end streets where water mains cannot be looped, the following automatic flush type blow-offs are to be used at all dead-ends:

☐ Hydro-Guard Standard Unit or:
☐ Hydro-Guard Vacuum Breaker DDU (Direct Discharge Unit).

Submittal: TAPPING SLEEVES & SADDLES

TAPPING SLEEVES:

DUCTILE IRON:

Allowed for 4" and larger size taps. May be used on DIP, CIP, ACP and PVC.

Ductile iron with mechanical joints.

<input type="checkbox"/>	AMERICAN	<input type="checkbox"/>	CLOW	<input type="checkbox"/>	MUELLER	<input type="checkbox"/>	U.S. PIPE
	2800		F-5200 Series		H-615 or		Type 9
	1004				H-616		

List sizes to be used: _____

STAINLESS STEEL TAPPING SLEEVE:

NOTE: The following materials shall be used when an existing PVC or Transite water or force main is encountered and a sample point, air release or test tap needs to be installed.

Allowed only when tapped line is more than twice as large as tapping diameter (i.e., 12 x 4 is allowable, a 12 x 6 is not allowed). For use on Water Distribution System and/or Force Main System, all 304 stainless steel (SS) with 304 SS hardware required for water or force main taps. May be used on DIP, CIP, AC, or PVC.

<input type="checkbox"/>	JCM	<input type="checkbox"/>	MUELLER	<input type="checkbox"/>	SMITH BLAIR
	J432		H-304		662, 663, 664, or 665
	J462				
<input type="checkbox"/>	ROMAC	<input type="checkbox"/>	FORD	<input type="checkbox"/>	Total Piping Solutions, Inc. (*)
	SST		FAST		
	SST III		FTSS		Part# _____

List sizes to be used: _____

* Product/Material is in Trial.

Submittal: TAPPING SLEEVES & SADDLES (CONTINUED)

SERVICE SADDLES:

All brass shall be of no-lead brass (maximum lead content of 0.10% by weight).

All straps shall be either double stainless steel or single wide stainless steel strap with two bolts on each side of the strap. Usage, size and tapping thread for the corporation to be attached to the saddle shall be as follows:

- A. Water Services: Only 1" and 1-1/2"x 2" AWWA tapping thread are allowed.
- B. Sample Point/Vent pipe (temporary): 1" AWWA tapping thread
- C. Terminal Blow-offs: 2" Iron pipe tapping thread
- D. Air Releases: 1-1/2"x 2" AWWA tapping thread

List the following with each saddle to be used:

- A. Size of pipe to be tapped _____
- B. Type of pipe to be tapped _____
- C. Size of tap to be made _____
- D. Usage (See A through D above).

☐ FORD
202BS Double Band Brass Saddles

☐ Total Piping Solution, Inc
T3 Service Saddle (*)

* Product/Material is in Trial.

Submittal: CASING MATERIAL

CASING SPACERS:

Install casing spacers 4 feet on both sides of each carrier pipe joints. All bolts, nuts, and washers to be attach to spacer sections shall be cadmium plated or stainless steel. All casing spacers larger than 36" shall be factory designed, taking into consideration the weight of the carrier pipe filled with water. Wooden skids are not acceptable as an alternative.

24" OR LARGER 24" CARRIER PIPE:

- ☐ Pipeline Seal and Insulators, Inc
A8G-2
C8G-2
A12G-2
C12G-2

- ☐ APS - Advance Products Systems

- ☐ Cascade CCS

24" OR SMALLER CARRIER PIPE:

- ☐ Pipeline Seal and Insulators, Inc.
Ranger Model

END SEALS:

Casing ends shall be completely closed at both openings of all Jack and bore crossings. These seals shall be no less than 1/8" thick and made of specially compounded synthetic rubber.

- ☐ Model "C" as manufactured by PSI
- ☐ Model "W" as manufactured by PSI
- ☐ LINK-SEAL, Stainless steel 316 bolts, washers and nuts.
- ☐ Cascade CCES

Submittal: AIR RELEASES

GENERAL:

ARV's should be painted blue (potable water) green (force main) for ease of identification. For force mains, the air release will be placed on the upstream side of a vertical offset. The same practice will be applicable for distribution system main, where the direction of normal flow can be determined. ARV's must be supplied with all back-flush valves, which must use stainless steel nipples and ball valves.

AIR RELEASE VALVE:

ARV's should be painted blue (potable water) green (force main) for ease of identification.

Water:

☐
☐

GA Industries 920 (Short)

Val-Matic 45 Series (Long)

Sewer:

☐
☐

GA Industries 929 (Short)

A.R.I. USA Inc. D-025 (Short)

SIZE:

☐
☐
☐

1" Thread

2" Thread

4" Flanged (For special uses to be called out on the plans)

CORPORATIONS FOR AIR RELEASES:

The 1" or 2" corporation shall be used in conjunction with a brass saddle. AWWA tapping thread by male or female iron pipe thread, otherwise a nipple (SS) will be required between the corporation and the ball valve increasing the height of the top of the air release).

THREAD TYPE:

☐

Female

☐

Male

☐

FORD

☐

MUELLER

☐

AY MCDONALD

Submittal: AIR RELEASES (CONTINUED)**AIR RELEASE MANHOLE RING AND COVER:**

Heavy duty, traffic rated, large manhole rings with double covers. The cover must have the offset inner access lid. Ordering information must include: "WEST PALM BEACH" embossed in the lid. If it is a privately owned sewer system, then omit "WEST PALM BEACH". If the air release is on a force main, then it should come with "SANITARY" embossed on the lid. If the air release is on a water main, then it should come with "WATER" embossed on the lid. Manhole lid style "D" must be used in sidewalk areas (non-skid, pedestrian traffic design). Manhole lid style "D" must be used in traffic areas and grass medians.

- ☐ USF 690-AH-M. 10" high casting with a base of 62", large lid is 50-7/8" wide. 105 lbs.
Access lid weight, 760 lbs. Main lid weight, 700 lbs. Ring weight.

BALL VALVES:

- ☐ NIBCO
☐ Approved Equal:
Manufacturer: _____
Model Number: _____

NIPPLES:

- ☐ 2" NPT stainless steel. 3" or 4" in length.
☐ 1" NPT stainless steel. 3" or 4" in length.

SADDLE CLAMP:

- ☐ SS Saddle
List sizes to be used: _____
- ☐ Total Piping Solution, Inc
T3 Service Saddle (*)

* Product/Material is in Trial.

Submittal: AIR RELEASES (CONTINUED)

WATER AND FORCE MAIN AIR RELEASE MANHOLES COATINGS AND LININGS:

To be applied per manufacturers specifications and by a certified applicator (supply letter of certification).

FORCE MAIN ARV MANHOLES:

INTERIORS:

SPRAY OR BUSH APPLIED (by certified applicator)

☐ MADEWELL: Mainstay ML72 Sprayable micro silica cement mortar base, with DS-5 epoxy lining coat.

☐ LAFARGE ALUMINATES: SewperCoat PG (new and rehabbed manholes)

☐ FLOWRITE FIBERGLASS LINING SYSTEMS (for rehabilitation of manholes)

☐ SPECTRAGUARD by SPECTRUM COATING, INC. (new and rehabbed manholes)

FACTORY APPLIED (joints sealed in the field by a certified applicator)

☐ U. S. PRECAST/AGRU: Studded polypropylene welded liner fabric. Must be applied by a certified pre-caster.

☐ U. S. PRECAST/AGRU: Studded HDPE welded liner fabric. Must be applied by a certified pre-caster.

☐ T-LOCK: Polyethylene or polybutylene welded fabric. Must be applied by a certified pre-caster.

EXTERIOR:

☐ KOPPERS: 300M

☐ Sherwin – Williams (Previously MAB): Ply-Tile Epoxy Tar Coating for exterior coating of manholes.

WATER MAIN ARV MANHOLES:

INTERIOR AND EXTERIOR:

☐ KOPPERS: 300M

☐ Sherwin – Williams (Previously MAB): Ply-Tile Epoxy Tar Coating for exterior coating of manholes.

Submittal: DUCTILE IRON PIPE AND STEEL PIPE PAINTING AND FINISHING

Exposed Ductile Iron Pipe shall be painted as specified in the applicable material list.

NEW AERIAL CROSSINGS

- ☐ TNE MEC (Minimum 7.5 mils)
Prime Coat: 90-97 Tneme-Zinc (2.5-3.5 DFT-Mils)
Intermediate: 1095 EnduraShield (3.5-5.0 DFT-Mils)
2nd Coat: 701 Hydroflon (2.0-3.0 DFT-Mils)

NOTE: Substitute series 700 for a gloss finish

Color Identification

- ☐ Water: 11SF / True Blue (Safety)
☐ Force Main: 09SF / Spearmint Green (Safety)
☐ Reclaimed Water: _____
☐ Sanitary: _____

EXISTING AERIAL CROSSINGS

- ☐ TNE MEC (Minimum 9.5 mils)
Prime Coat: 1 Ominithane (2.5-3.5 DFT-Mils)
Intermediate: 27WB Typoxy (5.0-7.0 DFT-Mils)
2nd Coat: 701 Hydroflon (2.0-3.0 DFT-Mils)

NOTE: Substitute series 700 for a gloss finish

Color Identification

- ☐ Water: 11SF / True Blue (Safety)
☐ Force Main: 09SF / Spearmint Green (Safety)
☐ Reclaimed Water: _____
☐ Sanitary: _____

NOTE: The contractor shall provide at the end of the project at least one (1) gallon of each generic topcoat.

- End of Section -



**APPROVED MATERIALS LIST
SECTION TWO
WATER SERVICES**

WATER SERVICES STANDARDS ARE TO BE USED FOR:

1. Potable water distribution services and private fire lines. Distribution System Utility Service includes:
 - A. City of West Palm Beach
 - B. Town of Palm Beach
 - C. Town of South Palm Beach.
2. If DIP pipe and or fittings are required, review and use the appropriate pages in Section One “Pressure Pipe” submittal package for materials.
3. All brass fittings shall be of no-lead brass (maximum lead content of 0.10% by weight). **NOTE: Some manufacturers in this list may not be able to produce compliant lead content material and subsequently are restricted.**

Submittal: TAPPING SADDLES

NOTE: The following materials are to be used when an existing PVC or Transite water main are encountered and a service, sample point, air release or test tap needs to be installed.

SERVICE SADDLES:

All brass shall be of non-lead brass (maximum lead content of 0.10% by weight). All straps shall be either double strap brass with two bolts on each side of the strap. Usage, size and tapping thread for the corporation to be attached to the saddle shall be as follows:

- A. Water Services: Only 1" and 2" AWWA tapping thread are allowed.
- B. Sample Point/Vent pipe (temporary): 1" AWWA tapping thread
- C. Terminal Blow-offs: 2" Iron pipe tapping thread
- D. Air Releases: 1-1/2"x 2" AWWA tapping thread

List the following with each saddle to be used:

- A. Size(s) of pipe to be tapped: _____
- B. Type(s) of pipe to be tapped: _____
- C. Size(s) of tap to be made: _____
- D. Usage (See A through D above): _____

☐

FORD
202BS Double Band Brass Saddles

☐

Total Piping Solution, Inc.
T3 Service Saddle (*)

* Product/Material is in Trial.

Submittal: 5/8", 3/4", and 1" WATER METER

NOTE: Brass fittings listed in these specifications must meet 85-5-5-5 ASTM B62 Cast Brass Specs. Use NPT by copper tubing compression fittings, such as; Pack Joint, 110, Mac-Pak or "T" compression. If polyethylene pipe is used, then stainless steel stiffeners are required in conjunction with fittings.

METER BOXES:

All box lids will have a non-skid surface, the metal hinged meter readers lid will be self-closing. All boxes and lids will be H-20 traffic rated. All boxes will come with mouse holes and be of the flared design.

		CDR/HUBBELL
Box:	<input type="checkbox"/>	11"X18"X12"
Lid:	<input type="checkbox"/>	11"X18"X1-3/4"

PIPE:

Service line pipe shall be continuous length with no joints or fittings allowed in the service, except at the corporation and angle stop.

1" CTS polyethylene service tubing (Manufactured by Endot Industries)

1" Copper tubing, ASTM B88, and WWT-799, type "K", soft or hard drawn, rolls or 20' straight lengths.

(Copper tubing use requires the approval of the City of West Palm Beach)

<input type="checkbox"/>	Endotrace, CTS, polyethylene, with attached tracing wire
<input type="checkbox"/>	Mueller Industries, Inc.
<input type="checkbox"/>	Cerro Flow Products LLC

ANGLE VALVES (Plug or Ball):

1" compression by 1" meter coupling, locking style, quarter turn.

	FORD		AY MCDONALD
<input type="checkbox"/>	BA43-444W-NL	<input type="checkbox"/>	74602B-22

METER BUSHING:

1" meter size (male IPT) reducer to 3/4" meter size (female IPT) to be used on 1" angle valves to set 5/8 x 3/4 and 3/4" meters.

	FORD
<input type="checkbox"/>	A34-NL
<input type="checkbox"/>	A24-NL

METER COUPLING (Consumer Side): 3/4" or 1"

	FORD		AY MCDONALD
<input type="checkbox"/>	3/4" PART #C38-23-2-5-NL	<input type="checkbox"/>	3/4" PART #74620 (3/4"X3/4"X2.50)
<input type="checkbox"/>	1" PART# C38-44-2-625-NL	<input type="checkbox"/>	1" PART #74620 (1"X1"X2.63")

CORPORATIONS:

1" AWWA tapping thread by 1" compression coupling

	FORD		AY MCDONALD
<input type="checkbox"/>	FB1000-4	<input type="checkbox"/>	4701-22, 4701T, 4701B-22 or 4701BT

Submittal: 5/8", 3/4", and 1" WATER METER (CONTINUED)

Residential Dual Check Valves (Angled):

All brass shall be of non-lead brass (maximum lead content of 0.10% by weight) and ASSE Approved.



Ford 3/4" PART #HHCA31-323-NL

Ford 1" PART #HHCA31-444-NL

Residential Dual Check Valves (Straight):

All brass shall be of non-lead brass (maximum lead content of 0.10% by weight) and ASSE Approved.



Ford 3/4" PART #HHS31-323-NL

Ford 1" PART #HHC31-444-NL

Submittal: 1-1/2" and 2" WATER METER

NOTE: Brass fittings listed in these specifications must meet 85-5-5-5 ASTM B62 Cast Brass Specs. Use NPT by copper tubing compression fittings, such as; Pack Joint, 110, Mac-Pak or "T" compression. If polyethylene pipe is used, then stainless steel stiffeners are required in conjunction with fittings.

METER BOXES:

All box lids will have a non-skid surface, the metal hinged meter readers lid will be self-closing. All boxes and lids will be H-20 traffic rated. All boxes will come with mouse holes and be of the flared design.

		CDR/HUBBELL
Box:	<input type="checkbox"/>	17"X30"X12"
Lid:	<input type="checkbox"/>	17"X30"X2"

PIPE:

Service line pipe shall be continuous length with no joints or fittings allowed in the service, except at the corporation and angle stop. Locating wire shall be 14 AWG single strand, soft drawn copper wire; 4/64 – inch polyvinyl chloride insulation. Locating wire shall be spliced before and after all valve boxes and when connecting at Tee's. All splices should be covered with electrical tape. When splicing wire at Tee's, keep clear of fittings.

2" CTS polyethylene service tubing (Manufactured by Endot Industries)

2" Copper tubing, ASTM B88, and WWT-799, type "K", soft or hard drawn, rolls or 20' straight lengths.

(Copper tubing use requires the approval of the City of West Palm Beach)

☐
☐
☐

Endotrace, CTS, polyethylene, with attached tracing wire

Mueller Industries, Inc.

Cerro Flow Products LLC

ANGLE VALVES (plug or ball style):

2" compression by 1 - 1/2 & 2" meter flange coupling, locking style, quarter turn to open.

☐
☐

FORD

BF43-777W-NL

☐

AY MCDONALD

4602B-22

METER FLANGE (Consumer Side):

Two sizes of couplings are listed. The first size is to come out of the back of a 1-1/2" meter, and the other is to come out the back of a 2" meter. Two types of couplings are specified. The first is a meter flange to compression coupling iron pipe size, the second is meter flange to compression coupling copper tubing size.

☐
☐
☐
☐

1-1/2" x IP Size

1-1/2" x CT Size

2" x IP Size

2" x CT Size

FORD

CF35-66-NL

CF34-66-NL

CF35-77-NL

CF34-77-NL

Submittal: 1-1/2" and 2" WATER METER (CONTINUED)

CORPORATIONS:

2"AWWA tapping thread by 2" compression coupling.

FORD

☐

FB1000-7NL

AY MCDONALD

☐

3128B

Must use:

2" female by compression fitting and

FORD

☐

FC1477NL

AY MCDONALD

☐

4754-22

2" x 2"Brass Bushing

FORD

☐

C18-67

AY MCDONALD

☐

3126-626

Submittal: DUAL WATER SERVICE

NOTE: The following material is required for all dual services. The City of West Palm Beach specifies two sizes for its dual water services, 1" copper tubing for short services, and 2" for longer services. Dual services cannot have more than 2 - 3/4" meters on the one 1" service. Brass fittings listed in these specifications must meet 85-5-5 ASTM B62 Cast Brass Specs. Use NPT by copper tubing compression fittings, such as; Pack Joint, 110, Mac-Pak or "T" compression. If polyethylene pipe is used, then stainless steel stiffeners are required in conjunction with fittings.

METER BOXES:

All box lids will have a non-skid surface, the metal hinged meter reader's lid will be self-closing. All boxes and lids will be H-20 traffic rated. All boxes will come with mouse holes and be of the flared design.

Box:	<input type="checkbox"/>	CDR/HUBBELL
Lid:	<input type="checkbox"/>	15"X17"X12"
		15"X17"X1-1/2"

PIPE:

Service line pipe shall be continuous length with no joints or fittings allowed in the service, except at the corporation and angle stop.

1" CTS polyethylene service tubing (Manufactured by Endot Industries)

1" Copper tubing, ASTM B88, and WWT-799, type "K", soft or hard drawn, rolls or 20' straight lengths.

(Copper tubing use requires the approval of the City of West Palm Beach)

<input type="checkbox"/>	Endotrace, CTS, polyethylene, with attached tracing wire
<input type="checkbox"/>	Mueller Industries, Inc.
<input type="checkbox"/>	Cerro Flow Products LLC

ANGLE VALVES (Plug or Ball):

1" female by 1" meter coupling, locking style, quarter turn (for dual services only).

<input type="checkbox"/>	FORD, FBA13444WNL (Ford "U" branch comes with angle valves)
<input type="checkbox"/>	AY MCDONALD, # 4604, or 4644B, to be used with the "U" branches listed below

"U" BRANCHES:

2" female iron pipe thread by 2 - 1" male iron pipe threads by 7.5" separation between angle valves.

<input type="checkbox"/>	FORD, # UV43-62W (1-1/2" by 3/4" for the long side)
<input type="checkbox"/>	FORD, # UV43-42W (1" by 3/4" for the short side)
<input type="checkbox"/>	AY MCDONALD, _____

Need to supply angle valves with "U" branch (see above)
2" compression by 1-1/2" male iron pipe thread

METER COUPLING (Consumer Side): 3/4" or 1"

<input type="checkbox"/>	FORD	<input type="checkbox"/>	AY MCDONALD
<input type="checkbox"/>	3/4" PART #C38-23-2-5-NL	<input type="checkbox"/>	3/4" PART #74620 (3/4"X3/4"X2.50")
	1" PART #C38-44-2-625-NL		1" PART #74620 (1"X1"X2.63")

Submittal: DUAL WATER SERVICE (CONTINUED)

CORPORATIONS:

2"AWWA tapping thread by 2" compression coupling.

FORD

☐

FB1000-7NL

AY MCDONALD

☐

3128B

Must use:

2" female by compression fitting

and

2" x 2"Brass Bushing

FORD

☐

FC1477NL

AY MCDONALD

☐

4754-22

FORD

☐

C18-67

AY MCDONALD

☐

3126-626

Submittal: EXTENDED & MULTIPLE WATER SERVICE

The City of West Palm Beach specifies a 2" water service for multiple. A multiple service line is any service with more than two (2) single services or combination of two (2) services that include a 1" or larger meter. Two-inch (2") water service is required for any single service in excess of 50'. The next two pages will pertain only to the additional materials needed beyond those specified under the submittals for 1", 2" or Dual Services. Select the required materials from those lists and the additional materials listed in these submittals.

All 2" water service lines shall be extended from a minimum of pipe size of 4". Review and select material listed in the "Pressure Pipe Submittal Package" for the material needed.

The Engineer of Record (EOR) shall be responsible to calculate and properly size the service piping to meet hydraulic flow demand from the main through the meter(s), backflow preventer(s) and to the residence or business.

CURB STOPS:

2" compression by 2" female IPT. To be placed on the end of an extended service.

☐

FORD B41-777

☐

AY MCDONALD 6106-22

VALVE BOXES:

Heavy duty, Cast Iron ASTM-A48 Class 30, 2 piece, 5-1/4" opening, flanged base, 18" to 24" adjustable, screw type, valve box, with locking lid (for all paved areas), embossed with "WATER" on the lid for water mains and services

Tyler/Union

SIGMA

Bingham & Taylor

☐

461-S

☐

461-S Part # VB261X/60WT

☐

Non-Flip Option

(SIGMA and Tyler are interchangeable)

Model: _____

VALVE BOX LIDS: (Box Lid shall match Box Manufacturer)

Non-Locking Lid:

Cast Iron ASTM-A48, Class 30, embossed with "SEWER" on the lid for force mains, embossed with "WATER" on the lid for water mains and services.

☐

Tyler/Union

☐

SIGMA

☐

Bingham & Taylor

Locking lid (For all paved areas):

Cast Iron ASTM-A48, Class 30, embossed with "SEWER" on the lid for force mains. To be used on Tyler model 461S, 5-1/4", screw type box.

☐

Tyler/Union

☐

SIGMA

☐

Bingham & Taylor

Locking lid (in paved areas):

Cast Iron ASTM-A48 Class 30, embossed with "WATER" on the lid for water mains and services.

☐

Tyler/Union

☐

SIGMA

☐

Bingham & Taylor

VALVE EXTENSION STEMS:

Utilized on all in-ground valves 36" or more below finished grade. Used in place of the American Trench Adapter (valve box). Valve extension must be secured to the valve stem, not set over the operating key.

☐

Mueller

☐

Proselect

Submittal: EXTENDED & MULTIPLE WATER SERVICE (CONTINUED)

UNDERGROUND VALVE IDENTIFICATION (UVI) TAGS:

To be used when the Tyler-style valve box with the Debris Cap is used, such as with the American Trench Adapter. Dimensions: 3" x 1/4", Brass, with 2-1/2" theft proof "J" rod anchor. Stamped: 1/4" to 3/8" Capital lettering. Each valve will have the following minimum information on the tag, words in parentheses are examples of wording to use: City code (WPB), valve size (6"), type of valve (RV, BV, PV), type of use (WM, FM), and operation instructions (R-21) right 21 turns to open, plus valve number, if applicable. In paved and unpaved areas, the UVI will be placed in the concrete collar around valve boxes.

☐ WAGCO MARKER

BRASS BUSHING:

All brass shall be of non-lead brass (maximum lead content of 0.10% by weight).

2" male IPT by 1" female IPT solid brass bushing. To be placed on the end of the curb stop for an extended 1" or Dual service. Use 2 bushings in the tee listed below for two one inch or dual services. See the 2 by 1" - "Y" fitting which can be used in lieu of the 2" tee, brass bushing and compression fittings.

☐ LEE BRASS

☐ MERIT BRASS

BRASS TEE:

All brass shall be of non-lead brass (maximum lead content of 0.10% by weight).

2" male IPT. To be placed on the end of the extended service for a multiple service connection. See the 2 by 1" - "Y" fitting to be used in lieu of the tee, brass bushing and compression fittings.

☐ LEE BRASS

☐ MERIT BRASS

BRASS FITTINGS:

All brass shall be of non-lead brass (maximum lead content of 0.10% by weight).

1" compression by 1" female IPT to be placed in the bushings on the run of the tee for multiple services. See the 2 by 1" - "Y" fitting to be used in lieu of the tee, brass bushing and compression fittings.

☐ FORD

☐ MUELLER

☐ AY MCDONALD

2" male IPT by 2" Female IPT

☐ FORD

☐ MUELLER

☐ AY MCDONALD

BRASS NIPPLE:

All brass shall be of non-lead brass (maximum lead content of 0.10% by weight).

2" threaded by 6" long solid brass nipple. To be placed between the curb stop and tee for multiple services.

☐ LEE BRASS

☐ FORD

BRASS "Y" BRANCH:

All brass shall be of non-lead brass (maximum lead content of 0.10% by weight).

2" by 1" compression double ended "Y" branch fitting. Placed on end of curb stop to multiple services. Use in lieu of the tee, brass bushing and compression fittings.

☐ FORD

☐ MUELLER

Submittal: MISCELLANEOUS PARTS

On occasion, a variety of parts are required to install service lines and these parts are not listed in the AML. Parts to be utilized in the construction on water distribution mains and service lines, which are not contained in the AML, shall be submitted as a shop drawing for approval.

All brass shall be of non-lead brass (maximum lead content of 0.10% by weight).

Submittal: 3" OR LARGER WATER SERVICE

GENERAL REQUIREMENTS:

1. See the standard detail sheet WS-6 and WS-6.1 for the location of the material for a large meter installation. Review Section One "Pressure Pipe" for the approved material requirements for water mains and make your selections from that list and submit those applicable sheets. Remember each meter installation will have its own character and may call for additional material.
2. Backflow preventers are required behind the meter so the pipe is not required to be offset back down to the proper laying depth until after the backflow preventer installation.
3. The material list pertains to a meter that will be set on a new or existing stub. Materials for each individual service will call for additional materials, refer to the plan design. The itemized list of material used for the water service will not include the following; tapping valve and sleeve, material for the backflow preventer riser after the meter installation, and material to go from a larger direct tap for fire flow to tee off to the water service.
4. Location and piping for the meter may be rotated to fit the available parkway, sidewalk and/or easement space.
5. A single tapping valve and sleeve may be made on a City water main for both the private fire line and metered service. A tee can be installed in the line after the tapping valve and sleeve for the metered service. If this is the way it is to be installed, then separate valves will need to be installed after the tee to operate the fire line and metered line separately. The tapping valve and sleeve will need to be sized for the larger of the two services (6" private fire line and 4" water service would call for a 6" minimum tap).
6. The following is an itemization of minimum amount and type of materials specifically detailed for a three inch meter. For a 4", 6 or 8" meter, delete item "E" and change all other items to the meter size. For a more thorough list of the specifications for the material, refer to Section One "PRESSURE PIPE".
7. The contractor may choose to use F.J. instead of M.J. Fittings on the meter assembly, but not in the roadway. The tapping valve, and first elbow (item "G") in the service line must be M.J.

Submittal: 3" OR LARGER WATER SERVICE (CONTINUED)

VALVE BOXES:

Two (2) required on the valves listed above.

Heavy duty, Cast Iron ASTM-A48 Class 30, 2 piece, 5-1/4" opening, flanged base, 18" to 24" adjustable, screw type, valve box, with locking lid (for all paved areas), embossed with "WATER" on the lid for water mains and services

☐ Tyler/Union ☐ Russell/Russco ☐ Bingham & Taylor
461-S 461-S Part # VB261X/60WT Non-Flip Option
(Russco and Tyler are interchangeable) Model Num.: _____

VALVE BOX LIDS: (Box Lid shall match Box Manufacturer)

Two (2) required on the valves listed above.

Non-Locking Lid:

Cast Iron ASTM-A48, Class 30, embossed with "SEWER" on the lid for force mains, embossed with "WATER" on the lid for water mains and services.

☐ Tyler/Union ☐ SIGMA ☐ Bingham & Taylor

Locking lid (For all paved areas):

Cast Iron ASTM-A48, Class 30, embossed with "SEWER" on the lid for force mains. To be used on Tyler model 461S, 5-1/4", screw type box.

☐ Tyler/Union ☐ SIGMA ☐ Bingham & Taylor

Locking lid (in paved areas):

Cast Iron ASTM-A48 Class 30, embossed with "WATER" on the lid for water mains and services.

☐ Tyler/Union ☐ SIGMA ☐ Bingham & Taylor

VALVE EXTENSION STEMS:

Utilized on all in-ground valves 36" or more below finished grade. Used in place of the American Trench Adapter (valve box). Valve extension must be secured to the valve stem, not set over the operating key.

☐ Mueller ☐ Proselect

UNDERGROUND VALVE IDENTIFICATION (UVI) TAGS:

To be used when the Tyler-style valve box with the Debris Cap is used, such as with the American Trench Adapter. Dimensions: 3" x 1/4", Brass, with 1-1/2" theft proof "J" rod anchor. Stamped: 1/4" to 3/8" Capital lettering. Each valve will have the following minimum information on the tag, words in parentheses are examples of wording to use: City code (WPB), valve size (6"), type of valve (RV, BV, PV), type of use (WM, FM), and operation instructions (R-21) right 21 turns to open, plus valve number, if applicable. In paved and unpaved areas, the UVI will be placed in the concrete collar around valve boxes.

☐ WAGCO MARKER

Submittal: 3" OR LARGER WATER SERVICE (CONTINUED)

ITEM "A", VALVES:

2 required, 4", Resilient Wedge, M. J., 2" square operating nut. To be installed in line with the meter, on each side and as close as the pipe and fittings will allow. If one will fit in the meter box, usually the one after the meter then delete one each of the valve boxes and debris caps.

ITEM "B", FLANGE ADAPTERS: (2 required)

3", Megalug series 2100 flange to P.E. pipe (restrained). One on each side of the meter/strainer/test port.

ITEM "C", METER: (1 required)

Meter to be paid by Contractor and supplied by City of West Palm Beach

"C-1" a length of pipe 5 times the diameter of the pipe before the strainer/meter and

"C-2" a length of pipe 3 times the diameter of the pipe after the meter.

ITEM "D", STRAINER : (1 required)

As manufactured by Badger Meter, flanged, NSF 61 Envirobrass II housing, stainless steel strainer with twice the flow capacity as the meter, stainless steel bolts and nuts. Does not take the place of the straight pipe (C-1). Not required when the meter comes supplied with a built in strainer (Fire Flow Meter).

ITEM "E", REDUCERS: (2 required)

4 by 3", P. E. on the 4" end is allowed to save on the amount of Megalugs and pipe to be used. The reducers cannot be used in lieu of the straight pipe listed under item "C".

ITEM "F", METER VAULTS: (1 to 2 required)

Vaults for 3 and 4" compound meters will be 48" wide and 48" long and 18" deep. All lids will have the metal, hinged, meter readers lid within the heavy duty, hot dipped galvanized, steel, traffic rated lid (2-piece). 4" Fire flow and larger meters will call for a minimum of a 48" wide and 72" vault with a three piece lid. The hinged meter reader's lid will be centered over the meter dial. All boxes and lids will be H-20 traffic rated. Due to the size of the services the bypass (see item "H") may need to be installed in a separate 48 by 48" vault.

All lids will have a blank mushroom screwed into the hole drilled for the touch read module. Use TR/PL Housing Item No. 45 with Sensor Button (blank) Item No. 53907152-39004.



US Precast



Brooks

ITEM "G", MECHANICAL OFFSET:

The service at the meter is to be offset higher than the depth of the road crossing. To bring up the service to the proper grade (14" of cover) use one group of the following:

1. M.J., 18" Offset, (2) M.J. 45 degree bends, cement mortar lined,
2. M.J. 90 degree bends, Backflow preventer(s) are required behind the meter so the pipe is not required to be offset back down to the proper laying depth until after the backflow preventer installation.

Submittal: 3" OR LARGER WATER SERVICE (CONTINUED)

ITEM "H", BY-PASS:

Bypass piping around meter to allow meter to be tested, repaired or replaced. Bypass piping to be same size as metered service piping (4, 6, or 8").

(2) 4", Resilient Wedge Gate Valves, F.J., with wheel handles

(2) 4", Megalug series 2100, flange to P.E. pipe (restrained). One on each side of the two valves.

(2) 4", M. J., tees, cement mortar lined. One on the outside of each of Item # A.

(1) 4" x 2", F.J. By threaded tee or 4 x 4 tee with a tapped plate, to be installed between the F.J. valves, with the 2" threaded "branch" looking straight up.

with,

(1) 2 x 6" brass nipple threaded into the tee to,

(1) 2" locking style curb cock,

(2) 4" M. J. 90 degree bends,

ITEM "I", TEST PORT:

Flanged tee is to be bolted to the back of the meter and may be used as part of "C-2".

(1) 3" Flanged tee with 2" threaded branch.

(1) 2" by 3" brass nipple.

(1) 2" Stainless steel ball valve or curb stop with handle.

ITEM "J", MISCELLANEOUS ITEMS:

(16) 4" Megalug series 1100 restrainer glands for M. J. fittings (minimum).

(2) 3" Megalug series 1100 restrainer glands for M. J. fittings (minimum).

3", DIP, Class 52, cement mortar lined.

List Manufacturer: _____

4", DIP, Class 52, cement mortar lined.

List Manufacturer: _____

3", DIP, Class 53, FJ, cement mortar lined.

List Pipe Manufacturer and Company installing the flanges (attach certification letter from shop):

4", DIP, Class 53, FJ, cement mortar lined.

List Pipe Manufacturer and Company installing the flanges (attach Certification letter from shop):

(2) 4" Megalug series 2100 may be used in lieu of the flanged pipe.

Submittal: PRIVATE FIRE LINES

GENERAL REQUIREMENTS:

1. Review Section One "Pressure Pipe" for the approved material requirements for water mains. Private Fire Line (PFL) installation will have its own challenge and may require additional material.
2. Backflow preventers are required at the property line.
3. The material list pertains to a new tap for a private fire line (PFL). Information and materials for each individual case will call for additional materials, refer to the plan design for this material. The itemized list of material used for the private fire line will not include the material for the backflow preventer riser after the property line.
4. A single tapping valve and sleeve may be made on a City water main for both the PFL and the metered service. A tee can be installed in the line after the tapping valve and sleeve for the metered service. If this is the way it is installed, then separate valves will need to be installed after the tee to operate the fire line and metered line separately. The tapping valve and sleeve will need to be sized for the larger of the two services (6" private fire line 4" water service would call for a 6" minimum tap). This material is listed separately under "DUAL SERVICE MATERIAL"
5. There is no standard detail sheet for a Private Fire Line. A breakdown of the minimum required material for a private fire line installation are listed below. Remember each PFL installation will have its own character and may call for additional material.
6. The following is an itemization of minimum amount and type of materials specified for a 4" fire line. For a 6", 8" or 10" PFL revise all items to the corresponding meter size. For a 3" PFL, add the items under "D". See a 2" water service and an extended water service for the materials used for a 2" PFL.

Submittal: PRIVATE FIRE LINES (CONTINUED)

VALVES:

Two (2) required, 4", Resilient Wedge, M. J., 2" square operating nut. To be installed in line with the meter, on each side and as close as the pipe and fittings will allow. If one will fit in the meter box, usually the one after the meter then delete one each of the valve boxes and debris caps.

VALVE BOXES:

Two (2) required on the valves listed above. Heavy duty, Cast Iron ASTM-A48 Class 30, 2 piece, 5-1/4" opening, flanged base, 18" to 24" adjustable, screw type, valve box, with locking lid (for all paved areas), embossed with "WATER" on the lid for water mains and services

<input type="checkbox"/> Tyler/Union	<input type="checkbox"/> SIGMA	<input type="checkbox"/> Bingham & Taylor
461-S	461-S Part # VB261X/60WT	Non-Flip Option
	(SIGMA and Tyler are interchangeable)	Model_____

VALVE BOX LIDS: (Box Lid shall match Box Manufacturer)

Two (2) required on the valves listed above.

Non-Locking Lid:

Cast Iron ASTM-A48, Class 30, embossed with "SEWER" on the lid for force mains, embossed with "WATER" on the lid for water mains and services.

<input type="checkbox"/> Tyler/Union	<input type="checkbox"/> SIGMA	<input type="checkbox"/> Bingham & Taylor
--------------------------------------	--------------------------------	---

Locking lid (For all paved areas):

Cast Iron ASTM-A48, Class 30, embossed with "SEWER" on the lid for force mains. To be used on Tyler model 461S, 5-1/4", screw type box.

<input type="checkbox"/> Tyler/Union	<input type="checkbox"/> SIGMA	<input type="checkbox"/> Bingham & Taylor
--------------------------------------	--------------------------------	---

Locking lid (in paved areas):

Cast Iron ASTM-A48 Class 30, embossed with "WATER" on the lid for water mains and services.

<input type="checkbox"/> Tyler/Union	<input type="checkbox"/> SIGMA	<input type="checkbox"/> Bingham & Taylor
--------------------------------------	--------------------------------	---

Submittal: PRIVATE FIRE LINES (CONTINUED)

DEBRIS CAP:

2-required in the valve boxes listed above. All Debris Caps within the system shall have color coded operating handles to the following standard; "Yellow" for curb stops and valves on water services.

VALVE EXTENSION STEMS:

Utilized on all in-ground valves 36" or more below finished grade. Used in place of the American Trench Adapter (valve box). Valve extension must be secured to the valve stem, not set over the operating key.

☐

Mueller

☐

Proselect

UNDERGROUND VALVE IDENTIFICATION (UVI) TAGS:

To be used when the Tyler-style valve box with the Debris Cap is used, such as with the American Trench Adapter. Dimensions: 3" x 1/4", Brass, with 2-1/2" theft proof "J" rod anchor. Stamped: 1/4" to 3/8" Capital lettering. Each valve will have the following minimum information on the tag, words in parentheses are examples of wording to use: City code (WPB), valve size (6"), type of valve (RV, BV, PV), type of use (WM, FM), and operation instructions (R-21) right 21 turns to open, plus valve number, if applicable. In paved and unpaved areas, the UVI will be placed in the concrete collar around valve boxes.

☐

WAGCO MARKER

TAPPING SLEEVE:

One (1) required, size of the main to be tapped by 4"

MISCELLANEOUS ITEMS:

One (1) 4" Megalug series 1100 restrainer glands for M.J.fittings.

REDUCER:

For a 3" PFL, One (1) 4" X 3", M.J. Reducer, to be installed in the City Right of Way, just before the property line.

(1) Additional 4" Megalug series 1100 restrainer glands for M. J. fittings.

(1) 3" Megalug series 1100 restrainer glands for M. J. fittings.

Submittal: PRIVATE FIRE LINES (CONTINUED)

VALVES:

Two (2) required,

(1) M.J., R.W. Valve, on the building side of the tee to isolate the PFL (sized to fit the run).

(1) M.J., R.W. Valve, on the branch of the tee to isolate the water service (sized to fit the branch).

VALVE BOXES:

Two (2) required on the valves listed above.

Heavy duty, Cast Iron ASTM-A48 Class 30, 2 piece, 5-1/4" opening, flanged base, 18" to 24" adjustable, screw type, valve box, with locking lid (for all paved areas), embossed with "WATER" on the lid for water mains and services

☐

Tyler/Union
461-S

☐

SIGMA
461-S Part # VB261X/60WT
(SIGMA and Tyler are interchangeable)

VALVE BOX LIDS: (Box Lid shall match Box Manufacturer)

Two (2) required on the valves listed above.

Non-Locking Lid:

Cast Iron ASTM-A48, Class 30, embossed with "SEWER" on the lid for force mains, embossed with "WATER" on the lid for water mains and services.

☐

Tyler/Union

☐

SIGMA

Locking lid (For all paved areas):

Cast Iron ASTM-A48, Class 30, embossed with "SEWER" on the lid for force mains. To be used on Tyler model 461S, 5-1/4", screw type box.

☐

Tyler/Union

☐

SIGMA

Locking lid (in paved areas):

Cast Iron ASTM-A48 Class 30, embossed with "WATER" on the lid for water mains and services.

☐

Tyler/Union

☐

SIGMA

DEBRIS CAP:

Two (2) required in the valve boxes listed above.

All Debris Caps within the system shall have color coded operating handles for each type service. "Yellow" for curb stops and valves on water services.

VALVE EXTENSION STEMS:

Utilized on all in-ground valves 36" or more below finished grade. Used in place of the American Trench Adapter (valve box). Valve extension must be secured to the valve stem, not set over the operating key.

☐

Mueller

☐

Proselect

UNDERGROUND VALVE IDENTIFICATION (UVI) TAGS:

To be used when the Tyler-style valve box with the Debris Cap is used, such as with the American Trench Adapter. Dimensions: 3" x 1/4", Brass, with 2-1/2" theft proof "J" rod anchor. Stamped: 1/4" to 3/8" Capital lettering. Each valve will have the following minimum information on the tag, words in parentheses are examples of wording to use: City code (WPB), valve size (6"), type of valve (RV, BV, PV), type of use (WM, FM), and operation instructions (R-21) right 21 turns to open, plus valve number, if applicable. In paved and unpaved areas, the UVI will be placed in the concrete collar around valve boxes.

☐

WAGCO MARKER

Submittal: PRIVATE FIRE LINES (CONTINUED)

TEE:

M.J, Run of the tee sized to fit the PFL, branch sized by the service size required (4", 6" or 8").

MISCELLANEOUS ITEMS:

Minimum of 7 Megalug series 1100 restrainer glands for M. J. fittings to be used on the tee and valves.

PIPE:

Service line pipe shall be continuous length with no joints or fittings allowed the service, except at the corporation and angle stop.

1" CTS polyethylene water service tubing. (Manufactured by Endot Industries).

1" Copper tubing, ASTM B88, and WWT-799, type "K", soft or hard drawn, rolls or 20' straight lengths.

(Copper tubing use requires the approval of the City of West Palm Beach).

☐
☐
☐

Endotrace, CTS, polyethylene, with attached tracing wire
Mueller Industries, Inc.
Cerro Flow Products LLC

FITTINGS:

☐
☐
☐
☐
☐

Brass, 90 degree elbows, compression to female IPT.
To screw into the ball valves on the backflow preventer.
Brass, 90 degree elbows, compression on both ends.
Located at the bottom of the backflow preventer.
Brass or copper, 90 degree elbows, solder to female IPT.
To screw into the ball valves on the backflow preventer.
Size: _____
Brass or copper, 90 degree elbows, solder joint on both ends.
Located at the bottom of the backflow preventer.

ACCEPTABLE JOINTS:

☐
☐

Solder Joints, per Plumbing and Health Department regulations (lead free).
Use NPT by copper tubing compression fittings, such as:
Pack Joint, 110 Mac-Pak or "T" Compression

Submittal: BACKFLOW PREVENTER(S)

NOTE: It is recommended that you review the City's Manual on Cross Connection Control. All backflow prevention assemblies used on City properties such as buildings, irrigation systems, lift stations, water re-pump stations, water treatment facilities and wastewater treatment facilities must comply with the latest list of Approved Backflow Prevention Assemblies from the University of South California's Foundation.

List the backflow prevention assemblies to be used; include type, manufacturer, model number, model name (if applicable) size and what type of system it will protect.

The following are the minimum standards to be met:

1. All assemblies must appear on the latest approval list from the University of South California's Foundation for Cross Connection Control
2. Only assemblies on that list that are currently being manufactured will be allowed.

BACKFLOW PREVENTER TYPE	TYPE OF SYSTEM TO BE PROTECTED	MAKER	MODEL NUMBER	SIZE	ORIENTATION
RP	Domestic	Watts	709DC-A	3"	

EXAMPLE

Submittal: BACKFLOW PREVENTER(S) (CONTINUED)

GENERAL REQUIREMENTS:

The following lists of material are for:

1. 3" or larger, single, approved Double Check Detector Assembly (DCDA) or a 3" or larger, single, approved Reduced Pressure Principle Assembly (RPPA).
2. Additional material will be required for a parallel 3" or larger RPA with the first assembly.
3. ¾" to 2", single, approved Reduced Pressure Principle Assembly (RPPA).
4. Additional material for a ¾" to 2" parallel RPPA with the first assembly.
5. Additional material for a ¾" RPPA for a City owned lift station.
6. Dual, parallel installations of RPPA's are not required, but it is strongly suggested for restaurants and businesses that cannot afford to have their water turned off during regular working hours.
7. Backflow prevention assemblies and piping are required behind the meter on private property. The Public Utilities Department shall approve the material used through the backflow prevention assembly installation.
8. Location and piping for the backflow prevention assemblies may be rotated to fit the available property lay-out space with no increase in materials or distance from the property line.
9. Landscaping is a requirement for the installation of backflow preventers. Since backflow preventers must be installed at the property line, hedges must be planted around the assemblies to hide them. The hedges are also suggested as a security measure, this may avoid the backflow prevention assemblies not to be tampered by vandals.
10. See the standard detail sheet for the minimum design standards required for backflow installations. Remember the standard detail sheet is the standard, each backflow installation will have its own character and may call for additional material.
11. Some backflow prevention assemblies come built with elbows into the body and others are built with the purpose of being installed in the vertical position. By using these assemblies you can reduce the amount of fittings used. Call your supplier or our backflow techs for a list of this type of approved assemblies.
12. The Fire Department of the local Municipality that the DCDA is installed may have their own requirements. Check with the local official on these items. One item is the installation of tamper switches on the OS & Y valves to insure against them being operated.
13. The following is an itemization of minimum amount and type of materials specifically detailed for a 3" DCDA or RPPA. For a 4", 6" or 8" backflow preventer, change all items to the size required.
14. All backflow preventers used must be new, on the latest USC, FCCC approved list and be a device that is currently manufactured.

Submittal: BACKFLOW PREVENTER(S) (CONTINUED)

3" OR LARGER, SINGLE DCDA OR RPPA INSTALLATION:

FITTINGS:

(4) 3", 90 degree elbows are required. Most installers use two F.J. elbows at the top where they are attached to the flanged valves on the assembly and two MJ elbows on the bottom. All flanged elbows are allowed, but it is suggested that mechanical joint elbows be used underground.

FLANGE ADAPTERS:

(2) 3", Megalug series 2100 flange to P.E. pipe (restrained). If flanged pipe is not used or flanged joint (F.J.) by plain end (P.E.) Pipe is used then flange joint to plain end adapters will be required.

MISCELLANEOUS ITEMS:

(4) 3" Megalug series 1100 restrainer glands for M. J. fittings (minimum).

3", DIP, Class 52, cement mortar lined. List Manufacturer:

3", DIP, Class 53, FJ, cement mortar lined. Supply Company installing the flanges on the pipe.

NOTE: If pipe flanged on both ends is used it must be manufactured to fit the correct height requirement for the backflow preventers, or the assembly will not be approved.

Supports under each device.

Electrical conduit, wiring and two tamper switches. May be required to be installed on the O. S. & Y. Valves on DCDA only. Check with local Fire Department and Building Official.

FIRE DEPARTMENT CONNECTIONS (FDC): (Not a Public Utilities Requirement or review item)

To reduce the amount of pipe and fittings many contractors are placing the siamese connections on the back of the DCDA. It must be understood in West Palm Beach it is required that the FDC must not be more than 150' (hose length) from the closest City fire hydrant. To install the FDC on the backflow preventer do not place a flanged 90 degree bend on the back of the DCDA, but instead place the following (WITH PERMISSION AND MATERIAL REVIEW FROM THE BUILDING DEPARTMENT AND THE FIRE DEPARTMENT):

3" F. J. Tee, one end of run coming off of the DCDA, the branch going down and;

3" flanged 90 degree bend, on the other end of the run and then;

3" wafer check valve, then;

3" flange tapped for 3" IPT, then;

3" steel nipple (IPT), and a

3" FDC (Siamese).

Check with your local Fire, Mechanical, Plumbing plan reviewers and construction inspectors for the requirements of the local municipality you are working in.

3" OR LARGER, PARALLEL RPA INSTALLATION

3", F. J., Tee, run and branch same size to fit the riser pipe.

(2) or (4), 3", DIP, length to fit, Class 53, F.J., cement mortar lined spool pieces. None may be required if there is enough space between the tee and 90 degree bends to separate the backflow preventers. Supply certification letter from the Company installing the flanges.

¾" to 2", SINGLE RPA INSTALLATION

The brass fittings listed in these specifications must meet 85-5-5-5 ASTM B62 Cast Brass Specs. If solder joint fittings are used they must meet the brass spec unless they are pressed cooper fittings. All brass shall be of non-lead brass (maximum lead content of 0.10% by weight).

- End of Section -



**APPROVED MATERIALS LIST
SECTION THREE
GRAVITY SEWERS**

GRAVITY SEWERS STANDARDS ARE TO BE USED FOR:

1. The City of West Palm Beach approves materials to be utilized in the sanitary collection system, wastewater lift stations, force mains, and services within the rights-of-ways and easements of:
 - A. City of West Palm Beach
2. If DIP pipe and or fittings are required, review and use the appropriate pages in Section One "Pressure Pipe" submittal package for materials.

Submittal: SANITARY GRAVITY SEWER

These submittals shall cover non-pressurized sanitary gravity sewer pipe for the City of West Palm Beach.

GRAVITY SANITARY SEWER PIPE:

PVC sewer pipe shall conform to the requirements of ASTM D-3034 standard with minimum wall thickness of SDR 26.

☐ J-M ☐ Napco ☐ Diamond Plastic Corporation

☐ CertainTeed

PVC sewer pipe required when a gravity main or gravity lateral intersect with a DIP water main pipe, shall be C-900, Class 150, DR 18, PVC water main pipe or (if not available Class 350, ductile iron, epoxy lined, pipe. Review Section 1, Pressure Pipe).

☐ J-M ☐ Napco ☐ Diamond Plastic Corporation

☐ CertainTeed

GRAVITY SEWER FITTINGS:

PVC sewer fittings shall conform to the requirements of ASTM D-3034 standard with minimum wall thickness of SDR 26. Fittings 8-inch and smaller shall be molded in one piece with gasket joints that are of a molded "locked-in" design to prevent loss during transport or "fish mouthing" during pipe insertion. The minimum socket depths shall comply with ASTM D-3034. Fittings 10-inch and larger shall be molded or fabricated with manufacturers standard pipe bells and gaskets. Gaskets shall have minimum cross sectional area of 0.20 square inch and conform to ASTM F0477 standard. All fittings shall be supplied by one manufacturer. Fitting types that are not approved are any "Tee", "Tee Wye" or "Cross" type fittings. Flows into a run from a branch must be at a minimum of a 30 degree angle. The smallest allowed main size is 8" the smallest allowed lateral size (owned by the City) is 6".

☐ IPEX ☐ PLASTIC TRENDS
☐ Multi Fitting ☐ HARRINGTON CORP.

CLEAN - OUTS:

PVC clean-outs shall have a handhold ring and cover for protection placed over it.

☐ U. S. F Model 7610
☐ SIGMA Model VB2610 (65lbs) set

TAPS INTO EXISTING PIPE:

Tie-in to an existing main that has been Insituformed or lined by another method.

☐ Inserta Tee

INSIDE DROP BOAL:

☐ Manufacturer: _____

Model Num.: _____

Submittal: SANITARY GRAVITY SEWER (CONTINUED)

MANHOLE RING AND COVERS:

Manhole lid style "D" must be used in sidewalk and pedestrian crossing areas (non-skid, pedestrian traffic design). Ordering information must include: with "WEST PALM BEACH" and "SANITARY" embossed in the lid. If it is a privately owned sewer system then "SANITARY" only is embossed in the lid.

☐ USF: 420 ring and cover with an O-ring seal built into the lid (420-ORS).
Style: _____

MANHOLE LID AND RING SEAL:

Manhole lids that do not have O-ring seals are required to be retrofitted with seals. Between the lid and casting.

☐ CRETEX

JOINT SEALANT FOR MANHOLES, AIR RELEASE MANHOLES, AND WETWELLS

☐ K.T. SNYDER COMPANY, INC.: RAM-NEK, plastic gasket joint material.
MADEWELL: 806 Flexible Joint Sealant.

PVC MANHOLE TO PIPE ADAPTERS:

Used to seal the pipe to the manhole. All adapters will be made to fit PVC, SDR-26 pipe. Adapters for use with all new construction. PVC adapters shall have double gasketed bell, with sand coating cast into the outside to allow for adherence to the concrete seal.

☐ HARCO - The Harrington Corp., P.O. Box 10335, Lynchburg, VA 24306
☐ Approved Equal: Manufacturer - _____

OTHER MANHOLE TO PIPE ADAPTERS:

Used to seal the pipe to the manhole. All adapters will be made to fit PVC, SDR-26 pipe. Adapters for use with all new construction. Adapters shall have stainless steel ring seals to seal the adapter to the pipe and to the manhole if they are not poured in place.

☐ Press Seal Gasket Corporation - Press-Boot
☐ U.S. Precast Manhole w/HDPE liner cast-in boot to sleeve connection
☐ U.S. Precast HDPE liner system "Turn Back" joint installed after cast

MANHOLE PRECAST ADJUSTING:

Brick is allowed to be used to raise to grade manholes or air release manholes.

Concrete reinforced 12" wide, 2" high with OD of 36" precast concrete rings are required.

☐ TRI-COUNTY CONCRETE PRODUCTS

Submittal: SANITARY GRAVITY SEWER (CONTINUED)

COUPLINGS FOR USE ON EXISTING FACILITIES (VCP, ETC):

Must have the stiffening collars (shear rings) or they cannot be used.

- ☐ FERNCO, RC Series
- ☐ MISSION COUPLING

COUPLINGS FOR USE TO CHANGE PIPE TYPE:

Required when installing DIP in a PVC run of main or a lateral that is too close to another utility.

- ☐ HARRINGTON
- ☐ 8", PVC, C900 (DIP) x SDR 26 Bell to Bell Adapters.

MANHOLE COATINGS AND LININGS:

To be applied per manufacturers specifications and by a certified applicator (Supply letter of certification).

INTERIORS:

SPRAY OR BUSH APPLIED (by certified applicator)

- ☐ MADEWELL: Mainstay ML72 sprayable micro silica cement mortar base, with DS-5 epoxy lining coat.
- ☐ LAFARGE ALUMINATES: SewperCoat PG (new and rehabbed manholes)
- ☐ FLOWRITE FIBERGLASS LINING SYSTEMS (for rehabilitation of manholes)
- ☐ SPECTRAGUARD by SPECTRUM (new and rehabbed manholes)
- ☐ SPECTRASHEILD by Concrete Conservation, Inc.

FACTORY APPLIED (joints sealed in the field by a certified applicator)

- ☐ U. S. PRECAST/AGRU: Studded polypropylene welded liner fabric. Must be applied by a certified pre-caster.
- ☐ U. S. PRECAST/AGRU: Studded HDPE welded liner fabric. Must be applied by a certified pre-caster.
- ☐ T-LOCK: Polyethylene or polybutylene welded fabric. Must be applied by a certified pre-caster.

EXTERIOR:

- ☐ KOPPERS: 300M
- ☐ MAB: Ply-Tile Epoxy Tar Coating for exterior coating of manholes.

MANHOLE AND LIFT STATION WETWELL SEALANT:

On Rehabilitation projects It is required that all joints in manholes and lift station wetwells be sealed on the outside with an 8" wide band of Wrapid Seal on flat surfaces and a 12" wide band on angled surfaces at all riser rings and manhole castings. Must be used in conjunction with the joint sealant.

- ☐ CANUSA
- ☐ Wrapid Seal

- End of Section -



**APPROVED MATERIALS LIST
SECTION FOUR
LIFT STATIONS**

LIFT STATION STANDARDS ARE TO BE USED FOR:

1. The City of West Palm Beach approves materials to be utilized in the sanitary collection system, wastewater lift stations, force mains, and services within the rights-of-ways and easements of:
 - A. City of West Palm Beach
2. If DIP pipe and or fittings are required, review and use the appropriate pages in Section One “Pressure Pipe” submittal package for materials
3. When addressing backflow prevention in lift station water service application, refer to appropriate pages in Section 2 “Backflow Preventers” submittal package.

Submittal: LIFT STATION**PUMP:**

The pump manufacturer or builder shall supply a minimum five (5) year warrant on the equipment starting with the date of final acceptance by the City. The pump manufacturer shall supply three (3) sets of operation and maintenance manuals for the equipment.

☐ FLYGHT (3085, 3102, 3127, 3153, 3171, 3202 or 3301)

MODEL S/N: _____

MOTOR: _____

IMPELLER: _____

PUMP RATE: _____

PUMPS TO OPERATE AT _____ GPM, TDH (TOTAL DYNAMIC HEAD) = _____ FT.

HORSEPOWER: _____

OUTLET: _____

MANHOLE AND LIFT STATION WETWELL SEALANT:

On Rehabilitation projects, It is required that all joints in manholes and lift station wetwells be sealed on the outside with an 8" wide band of Wrapid Seal on flat surfaces and a 12" wide band on angled surfaces at all riser rings and manhole castings. Must be used in conjunction with the joint sealant.

☐ CANUSA
Wrapid Seal

WET WELL COATING

To be applied per manufactures specifications and by a certified applicator. The applicator shall supply the letter of certification.

☐ SEWPERCOAT
Applicator: _____

☐ SPECTRASHIELD
Applicator: _____

☐ Approved Equal
Manufacturer/Model Num.: _____
Applicator: _____
Reference: _____

ACCESS DOOR

☐ BILCO TYPE J-AL ALUM. Leaf Access Door with 316 SS Hardware
☐ Approved Equal
Manufacturer/Model Num.: _____
Reference: _____

FALL PROTECTION

☐ HALLIDAY X RETRO-GRATE
☐ Approved Equal
Manufacturer/Model: _____
Reference: _____

Submittal: LIFT STATION (CONTINUED)

CHECK VALVE (AWWA C508)

☐

APCO
Series 6000

☐

Kennedy
Model: _____

☐

Mueller
Model: _____

PRESSURE TRANSDUCER

Contractor shall supply calibration certificate for all installments.

☐

TE Connectivity
MEAS KPSI 750

PRESSURE GAUGE AND DIAPHRAGM SEALS

Contractor shall use Glycerin fill for all Pressure Gauges.

☐

ASHCROFT

Model: _____

☐

WIKA

Model: _____

PRESSURE TRANSMITTER

Contractor shall supply **calibration certificate** for all instrumentation.

☐

ROSEMOUNT, EMERSON
Model Num.3051

Submittal: LIFT STATION PANEL**RTU PANEL**

All Applicable electrical codes (latest edition) must be adhered to including WPB, NEC, and FP&L company requirements.

- ☐ CC CONTROLS
5760 Corporate Way, WPB FL 33407
- ☐ DCR ENGINEERING SERVICE INC.
502 County Rd. 640, Mulberry FL 33860
- ☐ REVERE INC.
3810 Drain Field Rd, Lakeland FL 33811

CONTROL PANEL

Refer to Submersible Lift Station - Bill of Material standard detail.

NOTE: All electrical components and systems shall be UL listed, and shall be assembled in a UL listed/approved facility.

LANDSCAPE - HEDGE

Refer to City's landscaping code (Chapter 94 of the Code of Ordinances, Article XIV)

- ☐ Silver Buttonwood
- ☐ Coco Plum
- ☐ Jamaica Caper

LANDSCAPE – PHOTO SCREEN

- ☐ 9 oz. Key Banner Mesh, Single Sided, Mesh Digital Banner
Fire retardant, Meets NFPA 701
Latex and UV inks
Outdoor use

- End of Section -



**APPROVED MATERIALS LIST
SECTION FIVE
STORMWATER/DRAINAGE**

STORM SEWERS STANDARDS ARE TO BE USED FOR:

1. The City of West Palm Beach approves materials to be utilized in the storm water system, and services within the rights-of-ways and easements of:
 - A. City of West Palm Beach

Submittal: STORMWATER MANAGEMENT STRUCTURES

MANHOLE RING AND COVER STANDARD:

Ordering information must include: with "WEST PALM BEACH" and "STORM WATER" embossed in the lid. If it is a privately owned sewer system then "STORM WATER" only is embossed in the lid.

☐
☐

USF: 240 ring and cover with an O-ring seal built into the lid (240-ORS).
Lid style "D" for walkways and sidewalk areas

CURB INLET TOP, FRAME, AND GRATE:

Combination Inlet Frame, Grate, and Curb Box

☐

Neenah
R-3067 Grate Type R

☐

USF Curb & Gutter Inlet Frame, Hood and Grate Series
5130-6431 Heavy Duty Flow Area (190)

Enviro Notice Plates

☐

Neenah
R-3000-B Surface Mount

☐

Neenah
R-3000-D Surface Mount

CATCH BASINS:

Combination Frame and Grate

☐

USF Frame and Grate
4138-6218 Heavy Duty Flow Area (380)

EXFILTRATION TRENCH:

FILTER FABRIC

Non-woven and woven geotextile fabric, needle punched fibers, 100% polypropylene.

☐
☐

Advanced Drainage Systems, Inc. (ADS)
Amoco Fabrics and Fiber Company

Approved Use:

Weights	Storm Pipe Joints	Exfiltration Trench
2.3 oz.	Y	N
3.5 oz.	Y	N
4 oz.	Y	Y
6 oz.	Y	Y

- End of Section -



**APPROVED MATERIALS LIST
SECTION SIX
HARDSCAPE/FIXTURES**

HARDSCAPE/FIXTURE STANDARDS ARE TO BE USED FOR:

1. The City of West Palm Beach approves materials to be used within the rights-of-ways and easements of:
 - A. City of West Palm Beach

Submittal: HARDSCAPE

PEDESTRIAN SURACES:

- ☐ Detectable Warning Products (Comply with Florida Department of Transportation Standard Specifications for Road and Bridge Construction, Section 527)
- ☐ Yellow (preferred)
- ☐ Black
- ☐ Forest Green
- ☐ Other: _____ (Specify Color)

- End of Section -



**APPROVED MATERIALS LIST
SECTION SEVEN
STREET/PUBLIC LIGHTING**

STREET/PUBLIC LIGHTING STANDARDS ARE TO BE USED FOR:

1. The City of West Palm Beach approves materials to be used within the rights-of-ways and easements of:
 - A. City of West Palm Beach

Submittal: This section is under development

This section is under development

- End of Section -



**APPROVED MATERIALS LIST
SECTION EIGHT
LANDSCAPE**

LANDSCAPE STANDARDS ARE TO BE USED FOR:

1. The City of West Palm Beach Engineering Department / Parks and Recreations Department approves materials to be used within the rights-of-ways, easements and public property of:
 - A. City of West Palm Beach

Submittal: This section is under development

This section is under development

- End of Section -



**APPROVED MATERIALS LIST
SECTION NINE
IRRIGATION**

IRRIGATION STANDARDS ARE TO BE USED FOR:

1. The City of West Palm Beach Parks and Recreation Department approves materials to be used in the irrigation systems and services within the rights-of-ways and easements of:
 - A. City of West Palm Beach

Submittal: IRRIGATION SYSTEM COMPONENTS

CONTROLLERS:

The City of West Palm Beach utilizes two (2) types of irrigation controllers. Both types are manufacturer specific units. Exceptions will not be permitted.

Type I: Electrical Irrigation Controller (Utilized when electric service is available or may be installed)

- ☐ Toro Sentinel (Poured Concrete Slab) (Type I)
- ☐ SSA-K-12-PSI-6-N-S4-DR
- ☐ SSA-K-24-PSI-6-N-S4-DR
- ☐ SSA-K-36-PSI-6-N-S4-DR
- ☐ SSA-K-48-PSI-6-N-S4-DR

Type II: Solar Irrigation Controller (Utilized on small irrigation systems where electric service is not available)

- ☐ Leit Solar 4000 Series (Includes 2 Leit Operations Keys and Interface Kit) (Type II)

COMMUNICATIONS:

The Toro Sentinel controller is utilized by the City as a comprehensive irrigation management system. The City utilizes telemetry communications in conjunction with the Toro Sentinel controller. The following items must be included with a Toro Sentinel System:

- ☐ Antenna (AA101K) Unity Gain Kit (One Per Controller) Kenwood UHF Handheld Radio (TK3170K4)(Programmed to City Frequency), Kenwood Battery LITH ION (KNB35L),
- ☐ Kenwood Antenna UHF 3160/3180 (KRA27M), Kenwood Rapid Charge 110V (KSC25), With Marine-Grade Weather-Proof Clear Plastic UHF Radio Sealed Bag

HARDWARE:

- ☐ BPD I Kaddy Shack Controller Protection Enclosure (KS-2) Forest Green w/Concrete Slab BPD I Guard
- ☐ Shack Backflow Enclosure (GS-4) Forest Green w/Concrete Slab

VALVE BOX:

- ☐ Ametek 6" Round Plastic Valve Box w/Latching Lid
- ☐ Ametek 10" Round Plastic Valve Box w/Latching Lid
- ☐ Ametek 12" X 16" Rectangular Plastic Valve Box w/Latching Lid

PIPE (PVC):

- ☐ 6" Mainline Class 200 PVC "O" Ring w/Ductile Iron Fittings
- ☐ 4" Mainline Class 200 PVC "O" Ring w/Ductile Iron Fittings
- ☐ 3" Mainline Class 200 PVC "O" Ring w/Ductile Iron Fittings
- ☐ 2 1/2" Schedule 80 Lateral Supply Line to Zones
- ☐ 2" Schedule 80 Lateral Supply Line to Zones
- ☐ 1 1/2" Schedule 80 Lateral Supply Line to Zones
- ☐ 1 1/4" Schedule 40 Lateral Supply Line to Zones
- ☐ 1" Schedule 40 Lateral Supply Line to Zones
- ☐ 3/4" Schedule 40 Lateral Supply Line to Zones
- ☐ 1/2" Schedule 40 Lateral Supply Line to Zones
- ☐ Funny Pipe, Super Blue Flex, EHD 1295-010-D, 100' Coil

Submittal: IRRIGATION SYSTEM COMPONENTS (CONTINUED)

PIPE (DIRECTIONAL DRILL CONDUIT):

<input type="checkbox"/>	4" Directional Bore, Schedule 80 PVC
<input type="checkbox"/>	4" Directional Bore, HDPE, ASTM F 2160
<input type="checkbox"/>	4" Directional Bore, HDPE, UL 651B (Electrical Wiring)
<input type="checkbox"/>	6" Directional Bore, Schedule 80 PVC
<input type="checkbox"/>	6" Directional Bore, HDPE, ASTM F 2160
<input type="checkbox"/>	6" Directional Bore, HDPE, UL 651B (Electrical Wiring)
<input type="checkbox"/>	8" Directional Bore, Schedule 80 PVC
<input type="checkbox"/>	8" Directional Bore, HDPE, ASTM F 2160
<input type="checkbox"/>	8" Directional Bore, HDPE, UL 651B (Electrical Wiring)
<input type="checkbox"/>	12" Directional Bore, Schedule 80 PVC
<input type="checkbox"/>	12" Directional Bore, HDPE, ASTM F 2160
<input type="checkbox"/>	12" Directional Bore, HDPE, UL 651B (Electrical Wiring)

FITTINGS (PVC):

<input type="checkbox"/>	1/2" – 1 1/4" Fittings and Adapters, Schedule 40
<input type="checkbox"/>	1 1/2" – 2 1/2" Fittings and Adapters, Schedule 80
<input type="checkbox"/>	Shrub Adapter, Irritrol HS 100

VALVES:

<input type="checkbox"/>	1 1/2" Nibco, Class 125 Bronze Gate Valve (T113 – 1 1/2")
<input type="checkbox"/>	2" Nibco, Class 125 Bronze Gate Valve (T113 – 2")
<input type="checkbox"/>	3" Nibco, Class 125 Bronze Gate Valve (T113 – 3")
<input type="checkbox"/>	3/4" Zone Valve: Irritrol 700 PRS Series with CDR Box
<input type="checkbox"/>	1" Zone Valve: Irritrol 700 PRS Series with CDR Box
<input type="checkbox"/>	1 1/2" Zone Valve: Irritrol 700 PRS Series with CDR Box
<input type="checkbox"/>	2" Zone Valve: Irritrol 700 PRS Series with CDR Box
<input type="checkbox"/>	2" Air Relief Valve

HEADS / BUBBLERS:

<input type="checkbox"/>	Toro 4" Pop-Up Spray #570 Z-4P-PRX Series
<input type="checkbox"/>	Toro 6" Pop-Up Spray #570 Z-6P-PRX Series
<input type="checkbox"/>	Toro 12" Pop-Up Spray #570 Z-12P-PRX Series
<input type="checkbox"/>	Hunter PGP Series, Pop-up Rotar
<input type="checkbox"/>	Irritrol # 533 Flood Bubblers

BACKFLOW:

<input type="checkbox"/>	1" Febco 825Y
<input type="checkbox"/>	1 1/4" Febco 825Y
<input type="checkbox"/>	1 1/2" Febco 825Y
<input type="checkbox"/>	2" Febco 825Y
<input type="checkbox"/>	Approved Equal

SENSORS:

<input type="checkbox"/>	1 1/2" Data Industries IR Series (IR220P) Flow Sensor
<input type="checkbox"/>	2" Data Industries IR Series (IR220P) Flow Sensor
<input type="checkbox"/>	3" Data Industries IR Series (IR220P) Flow Sensor

- End of Section -



**APPROVED MATERIALS LIST
SECTION TEN
RECLAIMED WATER SYSTEM**

RECLAIMED WATER SYSTEM STANDARDS ARE TO BE USED FOR:

1. Reclaimed water distribution system. Distribution System Utility Service Area includes:
 - A. City of West Palm Beach

Submittal: This section is under development

This section is under development

- End of Section -

APPENDIX D – GEOTECHNICAL REPORT



July 1st, 2022

Attention: Mr. Sam Palermo
Higgins Engineering
4623 Forest Hill Boulevard
Suite 113
West Palm Beach, Florida 33415

Re: Report of Geotechnical Engineering Services
Pilgrim & Puritan Drainage Study
West Palm Beach, FL 33405
PACIFICA Project No.: 320-22121

Dear Mr. Rodriguez:

As requested, **Pacifica Engineering Services, LLC (PACIFICA)** has completed a geotechnical engineering study for above-referenced project. The scope of this work was completed in accordance with PACIFICA Proposal No. 610-12012013 dated October 26th, 2021. Signed authorization was provided by the signature of the proposal on June 13th, 2022.

The project is located at the eastern ends of Puritan and Pilgrim Road in West Palm Beach, Florida. The purpose of this study is to provide geotechnical input for the design team on subsurface conditions and hydraulic conductivity results at the study site. A site vicinity map is attached hereto. The percolation tests were performed at the indicated locations. A location map depicting the approximate location of the percolation tests is attached hereto.

Two (2) Standard Penetration Test (SPT) geotechnical borings were performed to assess the subsurface conditions. The borings were advanced to depths of 10 feet below existing site grades at the time of the geotechnical exploration. A boring location plan can be found in the Attachments section of this report. The SPT borings were performed using a D-90 truck mounted geotechnical drilling rig equipped with an automatic hammer utilizing mud rotary drilling techniques. The SPT samples were collected continuously. After the samples were collected in the split barrel sampler they were bagged, labeled and transported back to the laboratory for description and limited testing. After the geotechnical borings were completed, they were backfilled using access auger cuttings and the ground surface was generally leveled.

Two (2) percolation test was performed at boring location B-1 and B-2 at a depth of 10 feet below grade. The percolation test was performed in general accordance with the South Florida Water Management District (SFWMD) procedures for the "Usual Condition Constant Head" Percolation Test. Standard Penetration Test (SPT) sampling was performed simultaneously as the boreholes were advanced using a 6-inch diameter casing. A 4-inch diameter perforated PVC pipe was placed in the boreholes prior to retrieving the casing. Water was then pumped into the boreholes in order to raise the water level as close to the ground surface as possible. Once the inflow equalized with the outflow rate, the average pumping rate and level of the water for this stabilized flow rate was recorded. After the percolation test was completed, it was backfilled using access auger cuttings and the ground surface was generally leveled.

The results of the percolation tests are attached to this report. Table 1 below shows the condensed results. The full results located in the attachments should be used when the exfiltration trenches are being designed. It should be noted that the designer should apply an appropriate factor of safety to the reported values.

TABLE 1: PERCOLATION TEST RESULTS

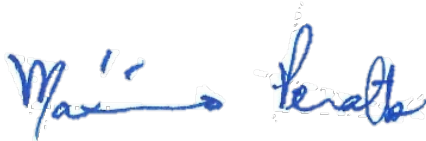
Location	Date	Depth of Test (ft)	Depth of Groundwater Prior to Test (ft)	Average Flow Rate (gpm)	K, Hydraulic Conductivity (cfs/ft ² -ft)
B-1	6-30-2022	10	6.3	12.1	5.9E-04
B-2	6-30-2022	10	6.8	17.0	8.0E-04

PACIFICA appreciates the opportunity to provide geotechnical engineering services on this project and look forward to an opportunity to participate in construction related aspects of the development. If you have any questions or should additional information be required, please do not hesitate to contact our office at (561) 491-8460.

Sincerely,

Pacifica Engineering Services

Florida Certification of Authorization License No. 32328



Maximo Peralta Alvarez, P.E.
Senior Geotechnical Engineer
FL License No. 84213

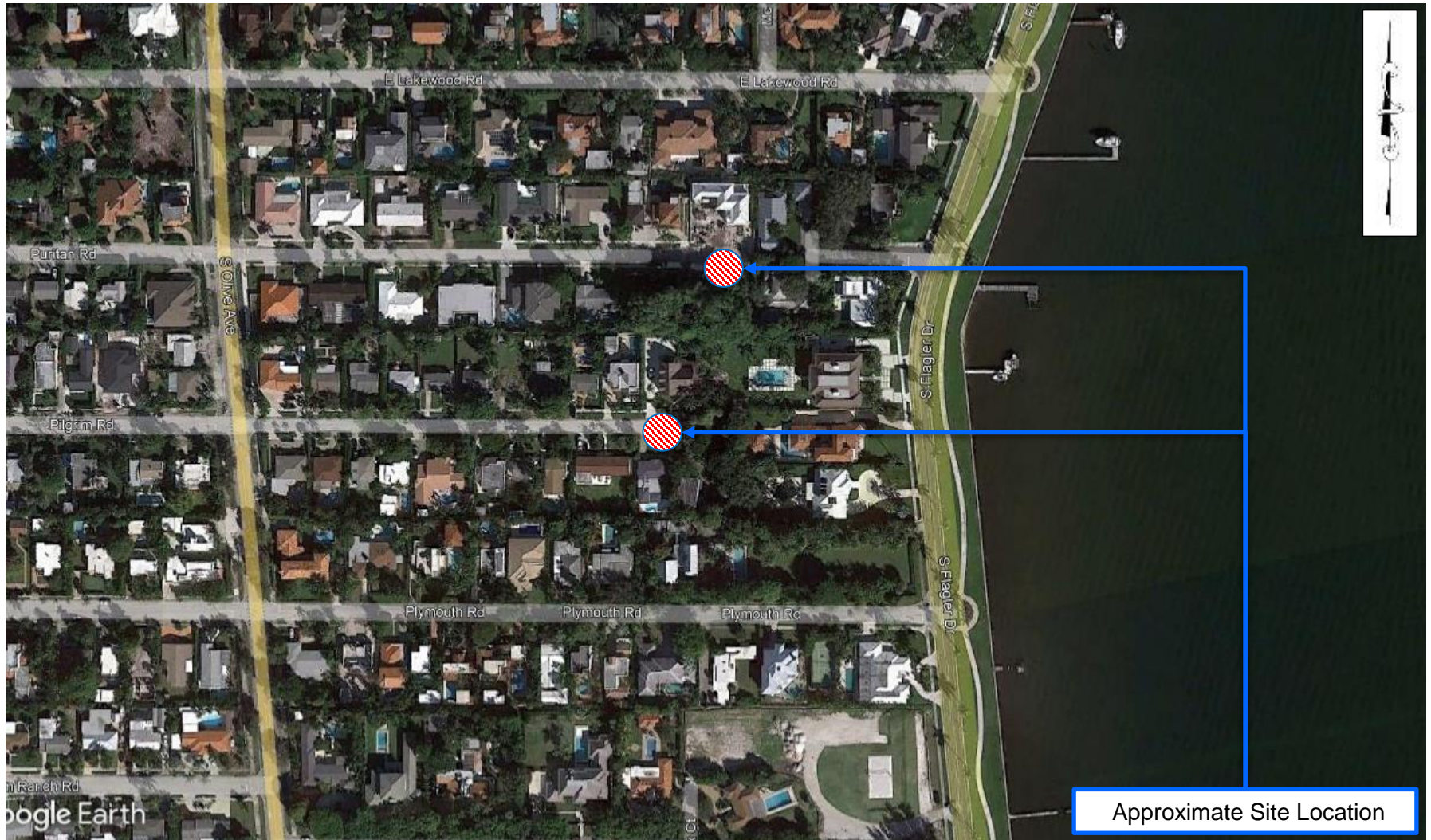


Marc Restrepo, E.I.
Staff Geotechnical Engineer

Attachments

Sheet 1: Site Vicinity Map
Sheet 2: Boring Location Plan – Aerial
Boring Logs
Percolation Test Results

SITE VICINITY MAP



Approximate Site Location

GEOTECHNICAL ENGINEERING SERVICES

Pilgrim & Puritan Drainage Study

Pilgrim and Puritan Road, West Palm Beach, Florida

DATE: 06/30/2022

DRAWN: MR

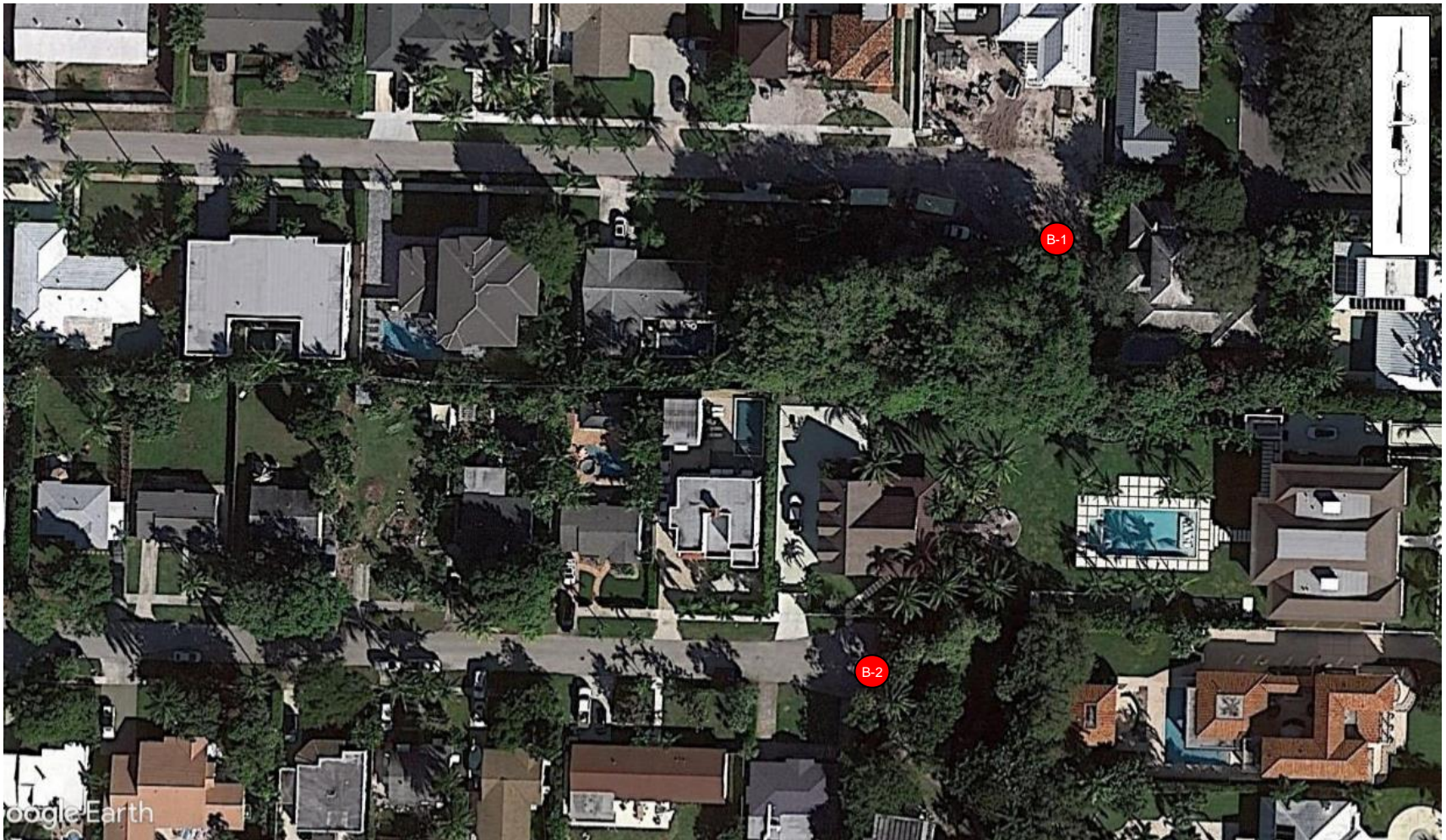
SHEET NO.: 1

PACIFICA PROJ. NO: 320-22121

CHKD: MP



BORING LOCATION PLAN - AERIAL



B-#

Approximate SPT Boring / Percolation Location

GEOTECHNICAL ENGINEERING SERVICES

Pilgrim & Puritan Drainage Study

Pilgrim and Puritan Road, West Palm Beach, Florida

DATE: 06/30/2022

DRAWN: MR

SHEET NO.: 1

PACIFICA PROJ. NO: 320-22121

CHKD: MP





Test Boring Log

Client **Higgins Engineering**
Project Pilgrim & Puritan Drainage Study
Boring Location See Boring Location Plan
Elev. Ref. N/A
Remarks The stratification lines represent approximate boundaries.
The transition may be gradual.

Boring No. **B-1**
Date Started 7/1/2022
Date Completed 7/1/2022
Project No. 320-22121
Sheet No. 1 of 1
Ground Water Depth 6.3 feet

ELEV. (ft)	Depth (ft)	Graphic Log	DESCRIPTION OF MATERIALS	SAMPLE						
				No.	Type	USCS Classification	Blows	REC-OVERY	REC %	SPT N. Value
	0.0		2" Asphalt / 8" Base: Gray Sandy LIMEROCK	1		SP	13-13-8-13			21
	2.0		Gray to Light Gray Fine SAND							
	4.0		Light Brown to Light Gray Fine SAND	2		SP	12-13-17-13			30
	6.0			3			10-10-8-8			18
	8.0		Brown Fine SAND	4		SP	4-5-5-7			10
	10.0			5			5-6-7-6			13
			Boring Terminated at 10.0 feet							

General Notes

Driller: S.C.
Hammer Type: Automatic
Rig Type: D90
Drilling Method: SPT



601 North Congress Avenue - Suite 303 | Delray Beach, Florida 33445
(561) 419-8460








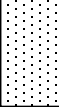


SPT Split Spoon Sampler
 Groundwater at Time of Drilling
WOH= Weight of Hammer



Test Boring Log

Client **Higgins Engineering**
Project **Pilgrim & Puritan Drainage Study**
Boring Location **See Boring Location Plan**
Elev. Ref. **N/A**
Remarks **The stratification lines represent approximate boundaries.
The transition may be gradual.**

Boring No. **B-2**
Date Started **7/1/2022**
Date Completed **7/1/2022**
Project No. **320-22121**
Sheet No. **1 of 1**
Ground Water Depth **6.8 feet**

ELEV. (ft)	Depth (ft)	Graphic Log	DESCRIPTION OF MATERIALS	SAMPLE							
				No.	Type	USCS Classification	Blows	REC-OVERY	REC %	SPT N. Value	
▼	0.0		4.5" Asphalt / 6" Base: Gray Sandy LIMEROCK	1			10-9-7-8			16	
	2.0		Gray to Light Gray Fine SAND			SP					
	4.0		Light Brown to Light Gray Fine SAND	2		SP	4-5-6-5			11	
	6.0		Light Gray Fine SAND	3		SP	4-3-3-3			6	
	8.0		Brown Fine SAND	4		SP	2-3-2-2			5	
	10.0			5			2-3-3-4			6	
				Boring Terminated at 10.0 feet							

General Notes

Driller: **S.C.**
Hammer Type: **Automatic**
Rig Type: **D90**
Drilling Method: **SPT**



601 North Congress Avenue - Suite 303 | Delray Beach, Florida 33445
(561) 419-8460

SPT Split Spoon Sampler
 Groundwater at Time of Drilling
WOH= Weight of Hammer



Percolation Test

Client	Higgins Engineering	Boring No.	B-1
Project	Pilgrim & Puritan Drainage Study	Date Started	7/1/2022
Boring Location	See Boring Location Plan	Date Completed	7/1/2022
Elev. Ref.	N/A	PACIFICA Proj. No.	320-22121
Remarks			

Subsurface Profile	
Depth (ft)	Soil Description
0-0.8	2" Asphalt / 8" Base: Gray Sandy LIMEROCK
0.8-2	Gray to Light Gray Fine SAND
2-6	Light Brown to Light Gray Fine SAND
6-10	Brown Fine SAND

Percolation Results								
Diameter		Depth of Hole (ft)	Depth of Groundwater Level		Hydraulic Head (ft)	Saturated Hole Depth (ft)	Average Flow Rate (gpm)	K, Hydraulic Conductivity cfs/ft ² -ft
Casing (in)	Perforated PVC (in)		Below Ground Surface (ft)					
			Prior to Test	During Test				
6	4	10	6.3	0	6.3	3.7	12.1	5.9E-04

Note:

- (1) The above hydraulic conductivity values are for a french drain installed to the same depth as the borehole tests. The values represent an ultimate value. The designer should apply the appropriate factor of safety.
- (2) The hydraulic conductivity values were calculated based on the South Florida Water Management District's USUAL OPEN HOLE CONSTANT HEAD percolation test procedure as shown on the "Equations in SFWMD Permit Information Manual, Volume IV".
- (3) A diameter of four inches was used in the computation of the Hydraulic Conductivity value presented in the above table.



Percolation Test

Client	Higgins Engineering	Boring No.	B-2
Project	Pilgrim & Puritan Drainage Study	Date Started	7/1/2022
Boring Location	See Boring Location Plan	Date Completed	7/1/2022
Elev. Ref.	N/A	PACIFICA Proj. No.	320-22121
Remarks			

Subsurface Profile	
Depth (ft)	Soil Description
0-0.9	4.5" Asphalt / 6" Base: Gray Sandy LIMEROCK
0.9-2	Gray to Light Gray Fine SAND
2-4	Light Brown to Light Gray Fine SAND
4-6	Light Gray Fine SAND
6-10	Brown Fine SAND

Percolation Results								
Diameter		Depth of Hole (ft)	Depth of Groundwater Level		Hydraulic Head (ft)	Saturated Hole Depth (ft)	Average Flow Rate (gpm)	K, Hydraulic Conductivity cfs/ft ² -ft
Casing (in)	Perforated PVC (in)		Below Ground Surface (ft)					
			Prior to Test	During Test				
6	4	10	6.8	0	6.8	3.2	17.0	8.0E-04

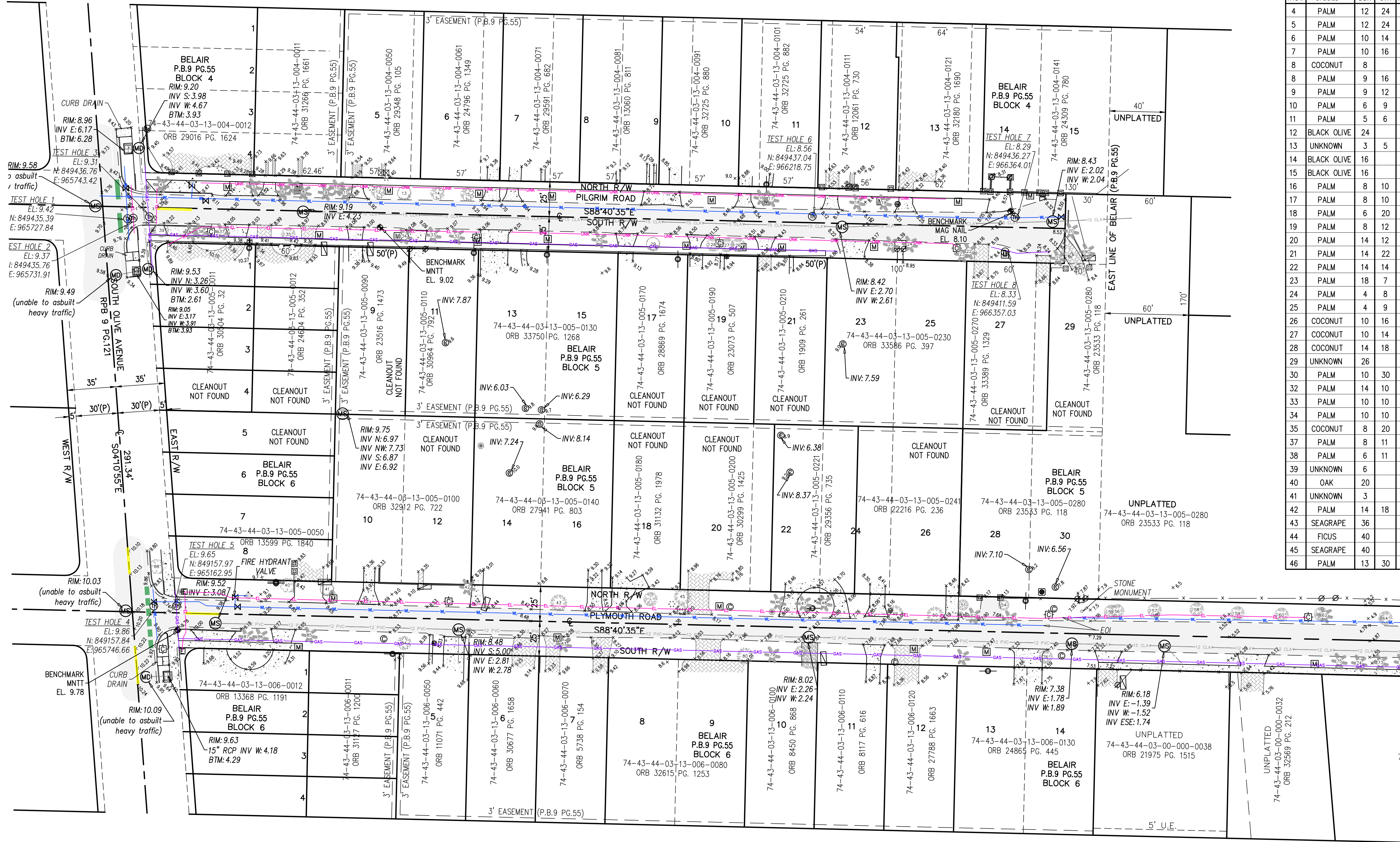
Note:

- (1) The above hydraulic conductivity values are for a french drain installed to the same depth as the borehole tests. The values represent an ultimate value. The designer should apply the appropriate factor of safety.
- (2) The hydraulic conductivity values were calculated based on the South Florida Water Management District's USUAL OPEN HOLE CONSTANT HEAD percolation test procedure as shown on the "Equations in SFWMD Permit Information Manual, Volume IV".
- (3) A diameter of four inches was used in the computation of the Hydraulic Conductivity value presented in the above table.

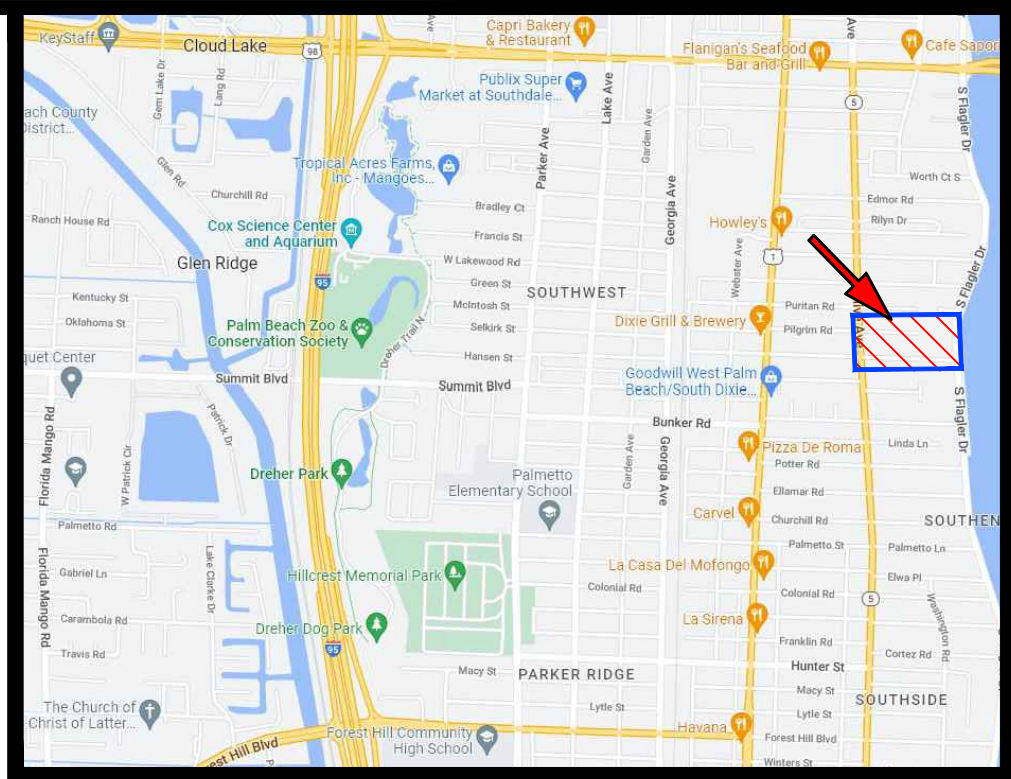
APPENDIX E – PERMITS

APPENDIX F – SURVEY

V:\3\Autocad\2022\drawing files\22-113\22-113 Pilgrim Plymouth Rd - Specific Purpose Survey.dwg, 10/30/2023 11:47:59 AM



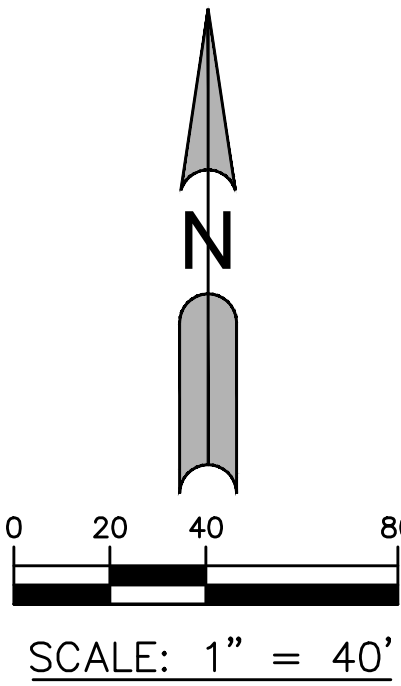
TREE TABLE							
TAG #	SPECIES	DBH	CTH	TAG #	SPECIES	DBH	CTH
4	PALM	12	24	47	PALM	13	30
5	PALM	12	24	48	PALM	13	30
6	PALM	10	14	49	SEAGRAPE	20	
7	PALM	10	16	50	SEAGRAPE	20	
8	COCONUT	8		51	FICUS	30	
8	PALM	9	16	52	PALM	13	24
9	PALM	9	12	54	FICUS	36	
10	PALM	6	9	55	COCONUT	13	6
11	PALM	5	6	55	PALM	13	22
12	BLACK OLIVE	24		56	COCONUT	10	8
13	UNKNOWN	3	5	57	COCONUT	10	30
14	BLACK OLIVE	16		58	COCONUT	11	30
15	BLACK OLIVE	16		59	COCONUT	11	26
16	PALM	8	10	60	COCONUT	11	13
17	PALM	8	10	61	COCONUT	11	30
18	PALM	6	20	62	PALM	24	14
19	PALM	8	12	64	COCONUT	13	30
20	PALM	14	12	65	COCONUT	10	30
21	PALM	14	22	66	COCONUT	10	4
22	PALM	14	14	67	COCONUT	13	18
23	PALM	18	7	68	COCONUT	12	26
24	PALM	4	8	69	COCONUT	12	18
25	PALM	4	9	70	PALM	8	14
26	COCONUT	10	16	71	PALM	8	14
27	COCONUT	10	14	72	PALM	5	
28	COCONUT	14	18	73	PALM	5	
29	UNKNOWN	26		74	PALM	5	
30	PALM	10	30	75	PALM	5	
32	PALM	14	10	76	COCONUT	12	8
33	PALM	10	10	77	PALM	5	9
34	PALM	10	10	78	FICUS	7	
35	COCONUT	8	20	79	PALM	11	6
37	PALM	8	11	80	SEAGRAPE	40	
38	PALM	6	11	83	PALM	10	30
39	UNKNOWN	6		84	BLACK OLIVE	24	
40	OAK	20		85	PALM	12	18
41	UNKNOWN	3		86	PALM	5	7
42	PALM	14	18	87	PALM	10	10
43	SEAGRAPE	36		88	OAK	14	
44	FICUS	40		89	PALM	8	4
45	SEAGRAPE	40		90	PALM	10	32
46	PALM	13	30	91	COCONUT	8	



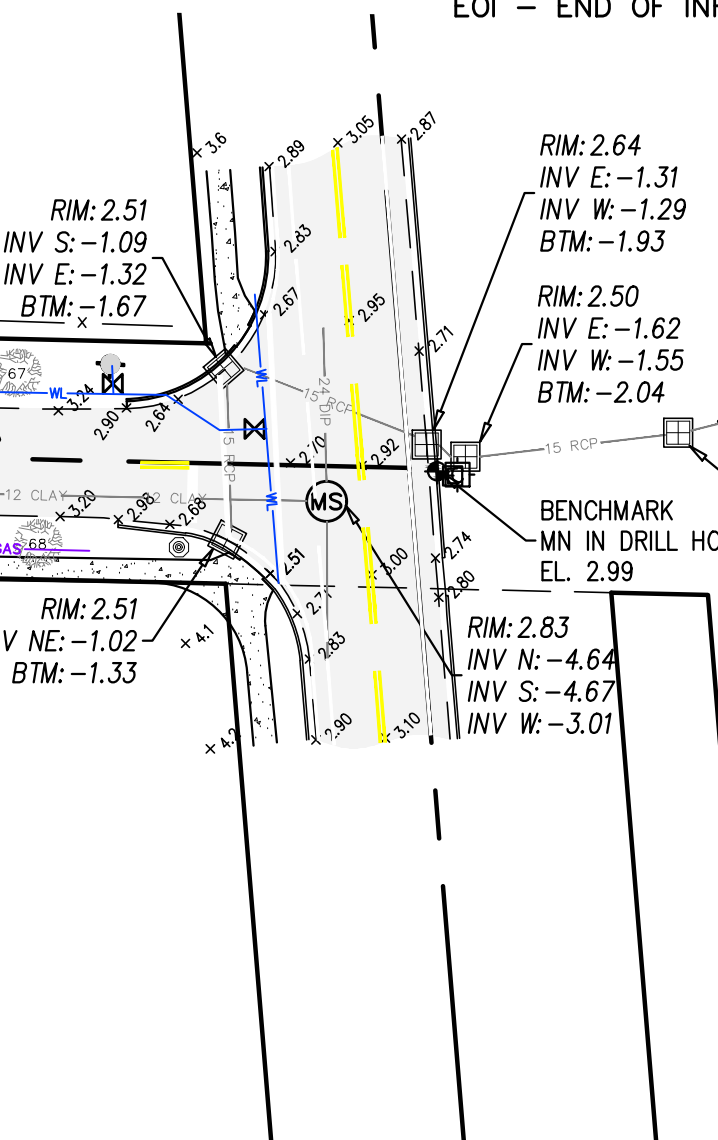
VICINITY MAP

NOT TO SCALE

ABBREVIATIONS:
P.B. - PLAT BOOK
RPB - ROAD PLAT BOOK
ORB - OFFICIAL RECORD BOOK
PG. - PAGE
R/W - RIGHT-OF-WAY
C - CENTERLINE
U.E. - UTILITY EASEMENT
IR - IRON ROD
IR/C - IRON ROD WITH CAP AS NOTED
IP - IRON PIPE
C.M. - 4"x4" CONCRETE MONUMENT
MN - MAG NAIL
MNTT - MAG NAIL & TIN TAB
PK - PARKER KALON NAIL
NAD - NORTH AMERICAN DATUM
NAVD - NORTH AMERICAN VERTICAL DATUM
LB - LICENSED BUSINESS
EL. - ELEVATION
INV - INVERT
BTM - BOTTOM
DIP - DUCTILE IRON PIPE
PVC - POLYVINYL CHLORIDE PIPE
CMP - CORRUGATED METAL PIPE
RCP - REINFORCED CONCRETE PIPE
HDPE - HIGH DENSITY POLYETHYLENE PIPE
U/G - UNDERGROUND
DBH - DIAMETER AT BREAST HEIGHT
CTH - CLEAR TRUNK HEIGHT
EOI - END OF INFORMATION



SCALE: 1" = 40'



LEGEND					
BENCHMARK		MANHOLE DRAINAGE		YARD DRAIN	
BACKFLOW PREVENTER		MANHOLE SANITARY		CURB	
CATCH BASIN		MAILBOX		FENCE-CHAINLINK	
CLEANOUT		VALVE-GAS		FENCE-WOOD	
CONCRETE COLUMN		VALVE-IRRIGATION		ASPHALT	
CONCRETE LIGHT POLE		VALVE-SEWER		BRICK	
ELECTRIC BOX		VALVE-WATER		CONCRETE	
FIBER OPTIC MARKER		SIGN		ROCK	
FIRE HYDRANT		TEST HOLE		U/G LOCATES-ELECTRIC	
GATE POST		WATER METER		U/G LOCATES-GAS	
GROUND LIGHT		WOOD POST		U/G LOCATES-UNKNOWN	
				U/G LOCATES-WATER LINE	

TREES	
BLACK OLIVE TREE(X=TAG #)	
COCONUT TREE(X=TAG #)	
FICUS TREE(X=TAG #)	
MYRTLE TREE (X=TAG #)	
OAK TREE(X=TAG #)	
PALM TREE(X=TAG #)	
UNKNOWN TREE (X=TAG #)	

SURVEY REPORT:

- THIS IS A SPECIFIC PURPOSE SURVEY, PREPARED IN ACCORDANCE WITH THE APPLICABLE PORTIONS OF THE STANDARDS OF PRACTICE SET FORTH IN RULE 5J-17.051 THROUGH 5J-17.053, FLORIDA ADMINISTRATIVE CODE.
THE FIELD WORK WAS COMPLETED ON DECEMBER 2, 2022
THIS IS NOT A BOUNDARY SURVEY.
- THE SURVEY WAS BASED ON THE PLAT OF BELAIR, PLAT BOOK 9, PAGE 55; ROAD PLAT BOOK 9 PAGE 121; AND ON THE ABUTTING DEEDS NOTED ON THE SURVEY.
- BEARINGS ARE BASED ON S88°40'35"E (ASSUMED) ALONG THE CENTERLINE OF PILGRIM ROAD.
- THIS SURVEY WAS PREPARED WITHOUT THE BENEFIT OF A TITLE COMMITMENT.
NO SEARCH OF THE PUBLIC RECORDS HAS BEEN PERFORMED BY BROWN & PHILLIPS, INC.
THERE MAY BE ADDITIONAL EASEMENTS AND/OR RESTRICTIONS NOT SHOWN ON THIS SURVEY THAT MAY BE FOUND IN THE PUBLIC RECORDS OF PALM BEACH COUNTY.
- THIS SURVEY WAS PREPARED FOR THE SPECIFIC PURPOSE OF PROVIDING TOPOGRAPHIC INFORMATION TO CRAVEN THOMPSON & ASSOCIATES, INC., FOR THE DESIGN OF SANITARY SEWER SYSTEMS.
THIS SURVEY IS NOT VALID FOR ANY OTHER USE.
- ADDITIONS OR DELETIONS TO SURVEY MAPS OR REPORTS BY OTHER THAN THE SIGNING PARTY OR PARTIES IS PROHIBITED WITHOUT WRITTEN CONSENT OF THE SIGNING PARTY OR PARTIES.

- THIS SURVEY WAS PREPARED FOR THE PARTIES LISTED BELOW AND IS NOT ASSIGNABLE:
- CRAVEN THOMPSON & ASSOCIATES, INC.
- CITY OF WEST PALM BEACH
THE USE OF THE DATA SHOWN HEREON BY ANY OTHER PARTY SHALL BE AT THE RISK OF THE USER.
- THIS MAP IS INTENDED TO BE DISPLAYED AT A SCALE OF 1"=40', ON A 24"x 36" SHEET.
- SOME TOPOGRAPHIC FEATURES MAY BE EXAGGERATED IN SCALE FOR CLARITY.
THE CENTER OF THE SYMBOL OF SUCH FEATURES IS THE CORRECT LOCATION.
- NO UNDERGROUND INSTALLATIONS OR IMPROVEMENTS HAVE BEEN LOCATED AS PART OF THIS SURVEY.
- ELEVATIONS SHOWN HEREON ARE IN NORTH AMERICAN VERTICAL DATUM OF 1988, AND ARE REFERENCED TO PALM BEACH COUNTY BENCHMARK "N 233", ELEVATION=.
- ×60 DENOTES SPOT ELEVATION, REFERENCED TO NORTH AMERICAN VERTICAL DATUM OF 1988.
- © COPYRIGHT 2022 BY BROWN & PHILLIPS, INC.
REPRODUCTIONS OF THIS SURVEY ARE NOT VALID WITHOUT THE ORIGINAL SIGNATURE AND STAMP, OR A DIGITALLY VERIFIED ELECTRONIC SIGNATURE AND SEAL, OF A FLORIDA LICENSED SURVEYOR AND MAPPER EMPLOYED BY BROWN & PHILLIPS, INC.

BROWN & PHILLIPS, INC.
PROFESSIONAL SURVEYING SERVICES
CERTIFICATE OF AUTHORIZATION # LB 6473
1860 OLD OKEECHOBEE ROAD, SUITE 509, WEST PALM BEACH, FLORIDA 33409 561-615-3988

SKETCH OF SPECIFIC PURPOSE SURVEY

PILGRIM ROAD &
PLYMOUTH ROAD
WEST PALM BEACH, FL

DRAWN: AB

CHECKED: JEP

F.B.CITY OF WPB #20

PAGES: 5-10

PROJ. #22-113

SCALE: 1"=40'

DATE: OCT. 2022

SHEET 1 of 1

JOHN E. PHILLIPS III
PROFESSIONAL LAND SURVEYOR
STATE OF FLORIDA No. 4826
DATE:

APPENDIX G – 10-2 ERP CERTIFICATION



FLORIDA DEPARTMENT OF
Environmental Protection

Bob Martinez Center
2600 Blair Stone Road
Tallahassee, Florida 32399-2400

Ron DeSantis
Governor

Jay Collins
Lt. Governor

Alexis A. Lambert
Secretary

**SELF-CERTIFICATION FOR
A STORMWATER MANAGEMENT SYSTEM IN UPLANDS SERVING
LESS THAN 10 ACRES OF TOTAL PROJECT AREA AND
LESS THAN 2 ACRES OF IMPERVIOUS SURFACES**

Owner(s)/Permittee(s):	City of West Palm Beach
File No:	0467703001EG
File Name:	UTILITY IMPROVEMENTS
Site Address:	Bellair WPB Subdivision West Palm Beach FL - 33405
County:	Palm Beach
Latitude:	26° 40' 2.8389"
Longitude:	-80° 3' 6.0948"
Total Project Area:	2.46
Total Impervious Surface Area:	1.64
Approximate Date of Commencement of Construction:	03/02/2026
Registered Florida Professional:	Leonard Gamble
License No.:	65921
Company:	CravenThompson & Associates, Inc.

Date: December 29, 2025

Leonard Gamble certified through the Department's Enterprise Self-Service Application portal that the project described above was designed by the above-named Florida registered professional to meet the following requirements:

- (a) The total project area involves less than 10 acres and less than 2 acres of impervious surface;
- (b) Activities will not impact wetlands or other surface waters;
- (c) Activities are not conducted in, on, or over wetlands or other surface waters;
- (d) Drainage facilities will not include pipes having diameters greater than 24 inches, or the hydraulic equivalent, and will not use pumps in any manner;
- (e) The project is not part of a larger common plan, development, or sale; and
- (f) The project does not:

- 1.Cause adverse water quantity or flooding impacts to receiving water and adjacent lands;
- 2.Cause adverse impacts to existing surface water storage and conveyance capabilities;
- 3.Cause a violation of state water quality standards; or
- 4.Cause an adverse impact to the maintenance of surface or ground water levels or surface water flows established pursuant to s. 373.042 or a work of the district established pursuant to s. 373.086, F.S.

This certification was submitted before initiation of construction of the above project. The system is designed, and will be operated and maintained in accordance with applicable rules adopted pursuant to part IV of chapter 373, F.S. There is a rebuttable presumption that the discharge from such system will comply with state water quality standards. Therefore, construction, alteration, and maintenance of the stormwater management system serving this project is authorized in accordance with s.403.814(12), F.S.

In accordance with s. 373.416(2), F.S., if ownership of the property or the stormwater management system is sold or transferred to another party, continued operation of the system is authorized only if notice is provided to the Department within 30 days of the sale or transfer. This notice can be submitted to:

FDEP Southeast District
3301 Gun Club Road, MSC 7210-1
West Palm Beach, FL33406

This certification was submitted along with the following electronic documents:

If you have submitted this certification as a Florida Registered Professional, you may wish to sign and seal this certification, and return a copy to the Department, in accordance with your professional practice act requirements under Florida Statutes.

I, Leonard Gamble, License No. 65921, do hereby certify that the above information is true and accurate, based upon my knowledge, information and belief. In the space below, affix signature, date, seal, company name, address and certificate of authorization (if applicable).

This sealed certification may be submitted to the Department, either electronically (as an attachment in Adobe PDF or other secure, digital format) at SED_Permitting@FloridaDEP.gov, or as a hardcopy, at the postal address below:

FDEP Southeast District
3301 Gun Club Road, MSC 7210-1
West Palm Beach, FL33406