

EXHIBIT A



**INVITATION TO BID
41ST YEAR CDBG
PUBLIC WORKS IMPROVEMENTS GRADING AND STORM DRAINAGE
BLOCK GRANT PROJECT
TECHNICAL SPECIFICATIONS AND GENERAL REQUIREMENTS**

**PREPARED BY:
CITY OF HALLANDALE BEACH
PUBLIC WORKS DEPARTMENT
CRAVEN, THOMPSON & ASSOCIATES, INC.
AND PROCUREMENT DEPARTMENT**

PROJECT MANUAL
TABLE OF CONTENTS

<u>SECTION/PAGES</u>	<u>DESCRIPTION</u>
<u>DIVISION 1</u>	<u>GENERAL REQUIREMENTS</u>
Section 01010 - 1	SUMMARY OF WORK
Section 01024 - 1 thru 10	MEASUREMENT AND PAYMENT
Section 01040 - 1 thru 2	COORDINATION
Section 01041 - 1 thru 4	PROJECT COORDINATION
Section 01050 - 1 thru 3	FIELD ENGINEERING
Section 01100 - 1 thru 5	SPECIAL PROJECT PROCEDURES
Section 01200 - 1 thru 3	PROJECT MEETINGS
Section 01310 - 1 thru 2	CONSTRUCTION SCHEDULE
Section 01330 - 1 thru 5	SHOP DRAWINGS, PRODUCT DATA AND SAMPLES
Section 01340 - 1 thru 4	SUBMITTALS
Section 01410 - 1 thru 3	TESTING LABORATORY SERVICES
Section 01420 - 1 thru 2	REFERENCE STANDARDS
Section 01510 - 1 thru 3	TEMPORARY UTILITIES
Section 01561 - 1 thru 6	PROTECTION OF EXISTING FACILITIES
Section 01570 - 1 thru 3	MAINTENANCE OF TRAFFIC
Section 01571 - 1 thru 4	TEMPORARY CONTROLS
Section 01600 - 1 thru 3	MATERIALS AND EQUIPMENT
Section 01630 - 1 thru 3	PRODUCT OPTIONS AND SUBSTITUTIONS
Section 01700 - 1 thru 3	CONTRACT CLOSEOUT

TECHNICAL SPECIFICATIONS

DIVISION 2

Section 02210 - 1
Section 02220 - 1 thru 3
Section 02221 - 1 thru 13
Section 02230 - 1 thru 4
Section 02240 - 1 thru 4
Section 02300 - 1 thru 28
Section 02305 - 1 thru 7
Section 02310 - 1 thru 4
Section 02370 - 1 thru 5
Section 02535 - 1 thru 4
Section 02630 - 1 thru 9
Section 02631 - 1 thru 3
Section 02741 - 1 thru 17
Section 02751 - 1 thru 13
Section 02761 - 1 thru 3
Section 02775 - 1 thru 3
Section 02810 - 1 thru 18
Section 02900 - 1 thru 11
Section 02919 - 1 thru 2
Section 02922 - 1 thru 7

SITE WORK

SUBSURFACE INVESTIGATION
CONSTRUCTION VIDEOGRAPHY
DEMOLITION
SITE CLEARING
DEWATERING
EARTHWORK
EXCAVATION AND BACKFILLING FOR UTILITIES
SITE GRADING
EROSION CONTROL & SLOPE PROTECTION
STRUCTURES & MAINTENANCE ACCESS STRUCTURES (M.A.S.)
STORM DRAINAGE FACILITIES
EXFILTRATION TRENCH DRAINS
ASPHALTIC CONCRETE PAVING, GENERAL
PORTLAND CEMENT CONCRETE PAVING
PAVEMENT MARKING AND CAR STOPS
CONCRETE SIDEWALK
UNDERGROUND IRRIGATION
LANDSCAPE WORK
TOPSOIL
SODDING

APPENDICES

APPENDIX A

PERMITS

SECTION 01010

SUMMARY OF WORK

PART 1 - GENERAL

1.01 PROJECT

A. This Project consists of:

- The base bid consists of Grading and Storm Drainage Improvements, ADA connections, new sidewalk installation, preparation and implementation of Maintenance of traffic Plan(s), coordination with franchise utilities, and all else necessary for a complete and functional project that meets or exceeds all requirements of the City of Hallandale Beach.

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

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, earthwork, pavement restoration, curb and gutter, storm drainage, and sidewalk installation 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 CITY.
- B. Payment for the various items of the Bid Schedule 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 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, including but not limited to, sprinkler systems, drainage systems, 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.

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 videography, protection of existing trees with tree barricade, 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*
5%	25%
10%	50%
25%	75%
50%	100%

*Mobilization pay item will be limited to 10% 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.

As an exception to partial payments being made based on Percent of Original Contract Amount Earned, the CITY will pay the CONTRACTOR the invoice price of the Contract Bond when the Engineer has been furnished with a certified copy of the invoice from the Bonding Company. No other work will be required to receive payment for the Contract Bond included in the bid price for Mobilization.

1.03 TESTING AND MAINTENANCE OF TRAFFIC (Bid Item No. 2)

A. See Maintenance of Traffic Section 01570, and all other references to traffic control in this document and any regulatory requirements. See Testing Laboratory Services Section 01410.

B. Lump sum price named in the Bid Schedule shall include the preparation and processing of Maintenance of Traffic Plans for City and Broward County Traffic Engineering Division

permit approval and installation thereafter, including a Florida Licensed Professional Traffic Engineer preparing the MOT plans. No lane closures during Holiday periods.

- C. Payment for testing and maintenance of traffic will be made at the lump sum price named in the Bid Schedule. Payment for testing and maintenance of traffic will be made in equal monthly amounts during the duration of the contract time and shall include preparation of as-builts (refer to General Notes and Specifications-Engineers As-built Requirements).

1.04 ENVIRONMENTAL PROTECTION PLAN (NPDES & SWPPP) (Bid Item No. 3)

- A. Measurement for payment for implementation of the Environmental Protection Plan, which includes NPDES and SWPPP requirements, will be based on the preparation and implementation of the plan 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 Schedule. Payment for preparation and implementation of the Environmental Protection Plan will be made in equal monthly amounts during the duration of the original contractual Substantial Completion contract time. This item shall include preparing Stormwater Prevention Pollution Plan (SWPPP) prior to submittal of NOI (Notice of Intent), submitting NOI (Notice of Intent) to use Generic Permit for Stormwater Discharge from Construction Activities two (2) days prior to the start of construction to the Florida Department of Environmental Protection (FDEP), retention of records required by the permit, retaining copy of SWPPP at construction site, implementation of the SWPPP, submitting NOT (Notice of Termination) of Generic Permit Coverage to FDEP to discontinue permit coverage, 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, straw bales, gutterbuddies adjacent to existing and proposed curb inlets, drainage structure/inlet protection, and turbidity barriers.

1.05 FURNISH AND CONSTRUCT CONCRETE SIDEWALKS (Bid Item No. 4 and 5)

- A. Measurement for payment for furnishing and constructing concrete sidewalks will be based upon the actual number of square yards of such sidewalks constructed as shown in the drawings, all in accordance with the requirements of the Contract Documents.
- B. Payment for furnishing and constructing concrete sidewalks will be made at the unit price per square yard named in the Bid Schedule which price shall constitute full compensation for completing said work, including all earthwork, excavation, clearing, grading, compaction of subgrade, importing and placement of clean fill material to meet proposed sidewalk grades, backfilling of sidewalk, furnishing and construction of the concrete sidewalk, ADA accessible ramps, driveway turnouts, adjustment of existing water meters and sewer cleanouts to finished grade, furnishing and setting for expansion joint material, reinforcement, disposal of excess material, and the appurtenant items for which separate payment is not specifically included in the Bid Schedule.

1.06 FURNISH AND INSTALL CAST-IN-PLACE TRUNCATED DOME DETECTABLE WARNING (Bid Item No. 6)

- A. Measurement for payment for furnishing and installing cast-in-place truncated dome detectable warning will be based upon the actual number of square feet of such cast-in-place truncated domes detectable warning installed, all in accordance with the requirements of the Contract Documents.
- B. Payment for furnishing and installing cast-in-place truncated dome detectable warning will be made at the unit price per square foot named in the Bid Schedule which price shall constitute full compensation for completing said work, including all placement in concrete, finishing concrete, etc. and all necessary for complete and functional installation per the manufacturer's specification.
- C. Payment will be made only for the actual number 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.
- D. Cast-in-place truncated dome detectable warnings shall conform to FDOT design standards, current edition.

1.07 REMOVE AND RE-PLACE TYPE "F" CURB AND GUTTER / VALLEY GUTTER / DROP CURB (Bid Item No. 7)

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

1.08 CLEAR AND GRADE SWALES (Bid Item No. 8)

- A. Measurement for payment for clearing and grading swale will be based upon the number of square yards actually cleared and graded from edge of pavement to existing/proposed sidewalk, not including driveways, and on private property, all in accordance with the requirements of the Contract Documents.
- B. Payment for clearing and grading will be made at the unit price per square yard of clearing and grading named in the Bid Schedule which price shall constitute full compensation, including earthwork, compaction, importing and placement of clean fill material, removal and disposal of existing paved swale cross section, installation of 8" thick stabilized shoulder (LBR 40), removal and disposal of excess material and unsuitable material, grading of swale area, removal and disposal of trees (<12" Diameter), removal of obstacles in swale, and protection of trees to remain. However, the ENGINEER may direct the CONTRACTOR to

relocate trees to adjacent private property when requested by homeowners. Homeowners 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.

1.09 FURNISH & PLACE SOD (Bid Item No. 9 and 10)

- A. Measurement for payment for furnishing and installing sod will be based upon the number of square yards of sod actually installed, all in accordance with the requirements of the Contract Documents.
- B. Payment for sod will be made at the unit price per square yard of sod named in the Bid Schedule which price shall constitute full compensation for furnishing and installing the sod and topsoil.
- C. Contractor shall account for the sod thickness when installing within swale area adjacent to pavement or concrete. Install so that top of mowed sod will be flush with the edge of pavement or concrete.

1.10 RESTORATION OF CONCRETE DRIVEWAYS AND SIDEWALKS (Bid Item No. 11)

- A. Measurement for payment for restoration of driveways will be based upon the actual number of square yards of such Concrete, Textured Concrete or Paver driveways restored, all in accordance with the requirements of the Contract Documents.
- B. Payment for restoration of driveways will be made at the unit price per square yard named in the Bid Schedule which price shall constitute full compensation for completing said WORK, including all removal and disposal of existing material, earthwork, grading, base compaction, construction of the driveway to the same depth and material as the existing one (6" min. concrete thickness), base material, sand, furnishing and setting for expansion joint material, disposal of excess material, densities passed, coordination with city and homeowner, and the appurtenant items for which separate payment is not specifically included in the Bid Schedule.
- C. Driveway and walkway restoration on private property shall be done as approved by the CITY and ENGINEER, to accommodate grade changes.

1.11 RESTORATION OF ASPHALT DRIVEWAYS (Bid Item No. 12)

- A. Measurement for payment for restoration of asphalt driveways will be based upon the actual number of square yards of such asphalt driveways restored, all in accordance with the requirements of the Contract Documents.
- B. Payment for restoration of asphalt driveways will be made at the unit price per square yard named in the Bid Schedule which price shall constitute full compensation for completing said WORK, including all removal and disposal of existing asphalt pavement (regardless of thickness), base material, subgrade, etc.; earthwork, grading, furnish and placing 1" Type S-III asphalt, furnish and installing 6" limerock base (LBR 100), compacted subgrade, disposal

of excess material, densities passed, coordination with city and homeowner, and the appurtenant items for which separate payment is not specifically included in the Bid Schedule.

- C. Driveway and walkway restoration on private property shall be done as approved by the CITY and ENGINEER, to accommodate grade changes.

1.12 FURNISH & PLACE PAVEMENT RESTORATION (Bid Item No. 13)

- A. Measurement for payment for pavement restoration will be based upon the actual number of square yards of pavement area restored, all in accordance with the requirements of the Contract Documents.
- B. Payment for pavement restoration will be made at the unit price per square yard named in the Bid Schedule, which price shall constitute full compensation for completing said WORK, including furnishing and placement of LBR 40 subgrade, lime rock base (LBR 100), prime coat, first asphalt lift consisting of 1" Type S-III asphalt and final asphalt lift consisting of 1" Type S-III asphalt in order to match the existing top of asphalt grade, tack coat, asphalt excavation, grading, densities passed, temporary pavement markings, re-placement of existing striping with new thermoplastic pavement markings, removal and disposal of all necessary pavement, and installation of temporary asphalt as deemed necessary by the ENGINEER.
- C. Payment for the final lift of asphalt to complete the pavement section will be paid under the asphalt overlay bid item.

1.13 MILL EXISTING ASPHALT (Bid Item No. 14)

- A. Measurement for payment to mill existing asphalt will be based upon the actual number of square yards of milled asphalt, all in accordance with the requirements of the Contract Documents.
- B. Payment to mill existing asphalt will be made at the unit price per square yard named in the Bid Schedule, which price shall constitute full compensation for completing said WORK, including removal and disposal of existing asphalt to be milled, cleaning the milled surface, and all other activities necessary to complete this item.

1.14 ASPHALT OVERLAY (Bid Item No. 15)

- A. Measurement for payment for asphalt overlay will be based upon the actual number of square yards of asphalt overlay, all in accordance with the requirements of the Contract Documents.
- B. Payment for asphalt overlay will be made at the unit price per square yard named in the Bid Schedule, which price shall constitute full compensation for completing said WORK, including grading, compaction, tack coat, furnishing and placement of Type S-III overlay, and re-placement of existing pavement markings with new thermoplastic.
- C. Minimum asphalt thickness shall be 1".

1.15 FURNISH & PLACE CLEAN FILL (Bid Item No. 16)

- A. Measurement for payment for clean fill will be based upon the actual number of cubic yards of clean fill compacted and installed, all in accordance with the requirements of the Contract Documents.
- B. Payment for clean fill will be made at the unit price per cubic yards named in the Bid Schedule, which price shall constitute full compensation for importing and placement of clean fill, earthwork, compaction, removal and disposal of excess material and unsuitable material, grading, as shown in the Contract Documents.
- C. This bid item is specifically for the importing and placement of clean fill to re-place unsuitable soils found within the proposed storm drainage trench.

1.16 FURNISH & INSTALL IRRIGATION SYSTEM RESTORATION (Bid Item No. 17)

- A. Measurement for payment for furnish and install irrigation system restoration will be based upon the actual number, each lot, of such irrigation systems restored in swales and to replace systems on private property, all in accordance with requirements of the Contract Documents.
- B. Payment for irrigation system restoration will be made at the unit price, each lot, named in the Bid Schedule which price shall constitute full compensation for the complete restoration of the irrigation system including capping existing system during construction and installing new irrigation. New irrigation system shall be connected to existing private property irrigation systems. Corner lots will be paid as one lot. Irrigation systems shall provide full coverage of the swale and/or match coverage/heads prior to construction.
- C. Irrigation systems shall be restored with pipe matching the size of the existing pipe and necessary adapters and coupling at each end splicing the restored pipe in place. All WORK shall meet the approval of the ENGINEER.

1.17 REMOVE AND DISPOSE OF EXISTING CATCH BASIN (Bid Item No. 18)

- A. Measurement for payment to remove and dispose of existing catch basins will be based upon the actual number, each, of such structures removed all in accordance with the Contract Documents.
- B. Payment for removal and disposal of existing catch basins will be made at the unit price, each named in the Bid Schedule which price shall constitute full compensation for the removal and disposal of each structure and shall include, but not be limited to, excavation, removal, disposal, backfill of excavation and all restoration WORK complete.

1.18 REMOVE AND DISPOSE OF EXISTING STORM DRAINAGE PIPING AND EXFILTRATION TRENCH (Bid Item No. 19)

- A. Measurement for payment to remove and dispose of existing drainage pipe and exfiltration trench will be based upon the actual number of linear feet of such pipe actually removed all in accordance with the Contract Documents.

- B. Payment for removal and disposal of existing drainage pipe and exfiltration trench will be made at the unit price per linear foot of pipe named in the Bid Schedule which price shall constitute full compensation for the removal and disposal of such drainage pipe and rock or felt including but not limited to excavation, compaction, backfilling, all restoration WORK, and all else necessary for the complete removal and disposal of existing drainage pipe.

1.19 FURNISH AND INSTALL DRAINAGE STRUCTURES/CATCH BASINS
(Bid Item No. 20)

- A. Measurement for payment to furnish and install drainage structures or catch basins will be based upon the actual quantity, each, of such structures constructed, all in accordance with the requirements of the Contract Documents.
- B. Payment for furnishing and installing drainage structures or catch basins will be made at the unit price, each, named in the Bid Schedule which price shall constitute full compensation for the completed installation of the structure including but not limited to excavation, dewatering, backfill and compaction, installation of flowable fill (per Section 121 of FDOT Standard Specifications for Road and Bridge Construction-2010) two (2) feet around structure, pollution retardant baffle (P.R.B.), soft digging and underground utility exploration prior to structure and piping installation, adjustment of existing water services, manhole frame and covers, catch basin/curb inlet frame and grates, brickwork, mortar, connecting existing inverts to new structure and furnishing and installation of the reinforced concrete structure.

1.20 CONSTRUCT CONCRETE APRONS (Bid Item No. 21)

- A. Measurement for payment to construct concrete aprons will be based upon the actual number, each, of such aprons constructed, all in accordance with the requirements of the Contract Documents.
- B. Payment for the item construct concrete apron will be made at the unit price, each named in the Bid Schedule which price shall constitute full compensation for the completed installation of the concrete apron including but not limited to excavation, backfill, compaction, saw cutting control joints and all else necessary for a complete and functional installation.

1.21 FURNISH & INSTALL DRAINAGE PIPING (Bid Item No. 22)

- A. Measurement for payment for furnishing and installing drainage pipe will be based upon the number 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 drainage pipe will be made at the unit price per linear foot of pipe named in the Bid Schedule.
- C. Payment shall include, but is not limited to, providing all necessary pipe excavation, dewatering, bedding backfilling, compaction, gaskets, wrapping of each joint with filter fabric, masonry pipe plug at end of pipe, soft digging and underground utility exploration

prior to structure and piping installation, temporary pavement restoration, and temporary relocation of existing utilities as required for a complete and functional installation.

1.22 FURNISH & INSTALL EXFILTRATION TRENCH (Bid Item No. 23)

- A. Measurement for payment for furnishing and installing exfiltration trench will be based upon the number 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 exfiltration trench will be made at the unit price per linear foot of pipe named in the Bid Schedule.
- C. Payment shall include providing all necessary pipe excavation, dewatering, bedding backfilling, compaction, slotted/perforated drainage pipe w/ filter fabric liner wrapped around pipe, #5 ballast rock, filter fabric wrapped around rock trench, wrapping of each pipe joint with filter fabric, gaskets, soft digging and underground utility exploration prior to structure and piping installation, pavement restoration, and temporary relocation of existing utilities as required for a complete and functional installation.

1.22 FURNISH & PLACE THERMOPLASTIC PAVEMENT MARKING (Bid Item No. 24 - 26)

- A. Measurement for payment for furnishing and placing pavement markings will be based upon the number of linear feet of such markings actually constructed as determined by measurement along the centerline of the pavement markings in place, including temporary striping, temporary layout, final thermoplastic striping, etc. all in accordance with the requirements of the Contract Documents.
- B. Payment for furnishing and placing pavement markings will be made at the unit price per linear foot or each of pavement markings named in the Bid Schedule.

1.23 RELOCATE TREES AND PALMS (Bid Item No. 27)

- A. Measurement for relocation of existing trees 10” diameter or less, or clear trunk 15’ max will be made on a unit price per each, tree relocated. The CONTRACTOR shall be paid the amount indicated in the bid proposal for each, tree relocated for the proper execution of the work as directed by the ENGINEER. This price paid shall be for each, tree including obtaining appropriate tree removal permits, backfill, and disposal of all debris associated with the removal or relocation of the tree.
- B. Payment to relocate trees will be made at the unit price each, named in the Bid Schedule. Relocation of trees shall include obtaining of appropriate tree removal/relocation permits, spading of the tree, root pruning, replanting, maintenance, backfill, and the removal disposal of all vegetative matter associated with the removal or relocation of trees as required by the Contract Documents or directed by the ENGINEER.
- C. The Engineer may direct the Contractor to relocate trees to adjacent private property when requested by homeowners. Homeowners must sign a waiver and assume maintenance responsibility for trees in such situations. Contractor shall stake ROW limits a minimum of

two weeks in advance of construction in order to coordinate with adjacent property owners and possible conflicting utilities.

1.24 RELOCATE DECORATIVE FEATURES (AT SOUTHEAST INTERSECTION OF N.W. 7th AVENUE AND N.W. 4th COURT) (Bid Item No. 28)

- A. Measurement for payment for relocation of decorative features from right of way onto private property all in accordance with the Contract Documents.
- B. Payment for relocation of decorative features from right of way onto private property will be made at the lump sum price named in the Bid Schedule which price shall constitute full compensation for the relocation of decorative features including but not limited to plants, shrubs and decorative stones from right of way onto private property.
- C. This line item includes complete restoration of private property including but not limited to existing sodding and irrigation all else necessary for a complete and functional installation.
- D. This line item also includes coordination with homeowner and site visit to verify the extent of decorative features to be relocated onto private property. Contractor shall stake ROW limits a minimum of two weeks in advance of construction in order to coordinate with adjacent property owners.

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 CITY 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 CITY, 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 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 City.
- 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 City, 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. Coordinate 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

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. As-builts, 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.
8. 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 land surveyor to perform project related surveys.

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.
 - 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.

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, all referenced to data established by survey control points. Record locations, 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. Site improvements, including storm sewer system.
 - 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.
- 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 CITY 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 water, sanitary sewer, franchise utilities and storm drains. The Project is located within the City of Hallandale Beach, in Broward 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 City 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 City 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 City 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 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 CITY 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 CITY 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 City and Engineer. Thereafter, the CONTRACTOR shall add calendar dates and shall modify and/or correct the schedule until satisfactory to the City, 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 CITY. 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 CITY.

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 City'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.

END OF SECTION 01100

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 CONFERENCE

- A. The CONTRACTOR 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 CITY 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 periodic progress meetings held at the project site on a regularly scheduled basis agreed upon by all interested parties at pre-construction meeting.
- B. Attend special meetings called by CITY or ENGINEER during progress of work.
- C. Progress meetings will be administered by the CONTRACTOR who will prepare the agenda for the meeting and incorporate items provided by the CITY and ENGINEER. 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 distribute 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 CITY's professional and administrative project representatives, including the ENGINEER.

1.04 PUBLIC INFORMATION MEETING

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.

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 City 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 City, 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 City 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 City.

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 City, 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 City. The CONTRACTOR shall submit for approval such supplementary schedules as may be required by the City to demonstrate the manner in which the scheduled progress will be regained.

END OF SECTION 01310

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, 4 copies of each shop drawing submittal. 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 prints of 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 3 copies of a submittal are returned to the CONTRACTOR marked "NO EXCEPTIONS TAKEN", formal revision and resubmission of said submittal will not be required.
- E. If 3 copies of a submittal are 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 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 of said revised submittal to the ENGINEER.
- H. Fabrication of an item shall be commenced only after the ENGINEER and CITY 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".
 - 3 copies returned to CONTRACTOR
 - 2 copies transmitted to the OWNER
 - 1 copy to remain with the ENGINEER
 - 2 copies for the Resident Project Representative
2. Shop drawings marked "RESUBMIT" or "REJECTED".
 - 2 copies returned to CONTRACTOR
 - 2 copies remain with the ENGINEER
 - 4 copies to be discarded

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, CITY'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. 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 CITY. The CONTRACTOR shall submit to the CITY for selection of one firm, the names and qualifications of at least three independent testing laboratories that are pre-qualified as complying with "Recommended Requirements for Independent Laboratory Qualification" by the American Council of Independent Laboratories and which are recognized in the industry as specialized in the types of inspections and tests to be performed. The CONTRACTOR shall not change testing laboratories without prior approval by the CITY.

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
 - 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

1.05 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 selected testing laboratory and shall forward to the CITY 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 CITY 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 tests not specified in Contract Documents, but determined by CONTRACTOR to be of his benefit and ordered by him.
- C. 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 WATER

- A. 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. Install branch piping with taps located so that water is available throughout the construction by the use of hoses.
- C. Provide potable water service with approved backflow prevention devices for construction personnel
- D. 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 City.
- 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 notify the Sunshine State One Call Center 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 Traffic Engineer/Consultant, registered as a Professional Engineer in the State of Florida or Certified by the State of Florida, to prepare detailed Maintenance of Traffic (MOT) Plans for permit approval by the CITY, Broward County Traffic Engineering Division (BCTED), and other governmental agencies having jurisdiction prior to the start of construction activities. The CONTRACTOR shall be responsible for the implementation of the approved MOT plans.
- C. The Maintenance of Traffic 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 Broward County's Minimum Standards Applicable to Public Rights of Way Under Broward 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 MOT Plans to the ENGINEER, City, and BCTED, for review and permit approval, **two week** before the Pre-Construction Meeting. The detailed 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 M.O.T. 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 Maintenance of Traffic 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 detailed Maintenance of Traffic Plan shall include provisions for pedestrian traffic as well as vehicular (including bus) traffic.

- C. The Maintenance of Traffic Plan 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 in 1.01 C 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 insure 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, the City, and BCTED.
- B. Sidewalks, gutters, drains, fire hydrants and private drives shall, in so far 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 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 City, the ENGINEER, and BCTED concerning maintenance of traffic and selection of detours required.
- 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 of Par. 1.01 C, and be subject to the approval of the City, the ENGINEER, and BCTED. 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 City 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. The Broward County Traffic Engineering Division, FDOT and/or City of Hallandale Beach 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 air-borne 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 CITY 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 CITY's decision to accept or reject requested substitutions. Only the CITY 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 three (3) copies 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 performers 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 three (3) copies 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 CITY as well as final payment to the CONTRACTOR and normal termination of the Contract.

1.02 SUBSTANTIAL COMPLETION

- A. When CONTRACTOR determines that the Work is substantially complete, he shall submit to ENGINEER a written notice that the Work or designated portion thereof, is substantially complete. The notice shall be accompanied by a report of the results of inspection, testing and adjustments of the completed systems, a list of items to be completed or corrected, the required record closeout documents and all special tools, spare parts, extra stock, maintenance materials, keys and similar operational items, as applicable.
- B. ENGINEER will review the documents submitted and, accompanied by the CONTRACTOR, will conduct a construction review to determine the status of completion. If incomplete, the CONTRACTOR shall remedy the deficiencies encountered and the ENGINEER will again review the Work.
- C. The process will be repeated until ENGINEER determines that the Work is substantially complete, at which time he will issue to CONTRACTOR, with copy to CITY, a Certificate of Substantial Completion along with a punchlist of items to be completed or corrected. If, upon Substantial Completion the CITY occupies the Work, the CITY will allow CONTRACTOR reasonable access to complete or correct punchlist items and other related Work.
- D. In the event such occupancy by the CITY is planned, the Certificate of Substantial Completion shall include a written recommendation as to the division of responsibilities and liabilities pending final acceptance between CITY and CONTRACTOR with respect to security, operation, safety, maintenance, utilities, insurance, warranties and guarantees for their written acceptance. However, no occupancy or separate operation of part of the Work will be accomplished prior to compliance with Contract requirements in respect of property insurance. No such use or occupancy shall commence before the insurers have acknowledged notice thereof and in writing effected the changes in coverage necessitated thereby by endorsement on the property insurance policy or policies. Such policy or policies shall not be cancelled or lapse on account of any such partial use or occupancy.

1.03 FINAL CONSTRUCTION REVIEW

- A. When Work is complete, including the punchlist items, CONTRACTOR shall notify ENGINEER in writing that the Work is completed and ready for final construction review. ENGINEER, accompanied by the CONTRACTOR, will make a final construction review to verify status of completion with reasonable promptness and when satisfied that the Work is acceptable under the Contract Documents, he will so advise CITY 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 CITY 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 Record 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 there from 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 CITY.

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 CITY for payment.

END OF SECTION 01700

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. In preparing the Bid, the CONTRACTOR shall make all subsurface or surface investigations necessary to provide proper background and knowledge to determine the nature and extent of work required.

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 CITY 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 compact disk /DVD on label, listing:

1. Name of Project and City of Hallandale 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 (two sets).
 - 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 prepare, process, obtain approval, and implement an approved Maintenance of Traffic plan which shall also comply with Section 01570, Maintenance of Traffic.

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 must be approved by the OWNER and appropriate authorities having jurisdiction.

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 demolition.

END OF SECTION 02221

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 CITY or property owner. Trees or shrubs shall be placed on adjacent property if requested by CITY 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, no trees with a trunk diameter of 3" or greater than 4-1/2' above grade shall be removed without the approval of the 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 02630 - Storm Drainage Facilities.
- D. Section 02631 - Exfiltration Trench Drains.

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. 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 SFWMD, Broward County Environmental Licensing and Building Permitting Division (BCELBDP), etc. may 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 CONSULTANT 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 is advised that the Broward County Environmental Licensing and Building Permitting Division has identified that this project is within a Zone 1 Wellfield and also have identified contaminated sites within ¼ mile radius of the project site. The CONTRACTOR may be required to provide testing and monitoring of the dewatering operations, and to institute dewatering methods and controls, as required by BCELBDP, SFWMD, etc. 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 National Geodetic Vertical Datum 1929 (NGVD).

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 / 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 refer to the erosion control drawings, if provided, 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. Requirements of Section 01550, Section 1.02B shall also apply.

- 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>	Percentage of Maximum Density <u>AASHTO T- 180</u>	Testing Frequency <u>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

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, of 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

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 prepared by a Florida Licensed Professional Surveyor 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.

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 a minimum of 90% 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 at least 90% 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 and storing storm water within the right-of-way. 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 will be made per square yard and shall be included in the unit price bid for Clearing and Grade Swale.

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 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 ENDWALLS, CATCH BASINS, INLETS AND JUNCTIONS BOXES

- A. Endwalls, catch basins, inlets and junction boxes shall be constructed at the locations shown and to the dimensions indicated on site plans. Unless otherwise specified on the plans, inlets, junction boxes, catch basins, and similar structures may be constructed of brick, concrete block, poured concrete or precast concrete. Precast catch basins shall conform to latest A.C.I. and P.C.A. specifications. Concrete shall have not less than 4,000 psi compressive strength at 28 days. Minimum wall thickness shall be six inches.
- B. Unless otherwise specified on the plans, all concrete for these structures shall be Class I concrete as specified in the Florida Department of Transportation "Standard Specifications for Road and Bridge Construction", latest revision, Section 345. Mortar for use in constructing and plastering shall be as previously set forth in this section.
- C. Brick shall be solid hard-burned clay conforming to ASTM Serial C-32-93, Grade SM. Concrete brick shall conform to ASTM Serial C-55-75, Grade P-I. Concrete block shall conform to ASTM Serial C-90-78, Grade PI.

- D. All brick or concrete block structures covered in this Section shall be plastered inside and outside with 1/2 inch of cement mortar. Inside surfaces shall be smooth and even.
- E. Base slabs and walls of concrete structures shall be constructed in a continuous pour between expansion joints.
- F. For each grate type inlet, two layers of Mirafi 140 fabric of "Poly Filter X" polypropylene material or approved equal shall be sandwiched between 2 x 2 x 10/10 welded wire fabric cut to the grate size and attached to the underside of the grate. The sandwiched filter material shall be wired to the cross members of the grate each way on 4-inch centers. After inlet construction and the roadway construction is completed and the project site work (including landscaping) has been established, the filter material and fabric shall be removed with any retained silt or sand.

2.04 CASTINGS (INCLUDING FRAMES, COVERS AND GRATINGS)

- A. Iron castings shall conform to ASTM A-48, "Specifications for Gray Iron Castings", and shall be Class 30. Frames and grates may be Class 20.
- B. 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.
- C. 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.
- D. 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.
- E. 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 contact.

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 of Carbolite (Koppers) 300-M or Protecto 401 (8 mils per coat) or approved equal, first coat is red and the second coat is black. The exterior shall be painted in a similar manner.

3.02 CONCRETE GRADE RINGS

- A. All concrete grade rings shall meet ASTM C478 and shall be a minimum 4,000 psi @ 28 days. Concrete grade rings shall be a minimum thickness of 2 inches and a maximum thickness of 6 inches. No more than 8 inches of concrete grade rings shall be installed on one M.A.S. Concrete grade rings shall be laid in mortar and all joints shall be finished smooth and not be less than ¼ inch or more than ½ inch in thickness. Concrete grade rings shall be painted with two coats of Carbolite (Koppers) 300-M (8 mils per coat) or approved equal.

3.03 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.

3.04 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. ADS HIGH PERFORMANCE POLYPROPYLENE STORM GRAY PIPE OR APPROVED EQUAL:
 - 1. High Performance polypropylene storm gray pipe shall be produced by a reputable manufacturer engaged in the full time business of manufacturing of piping.
 - 2. All High Performance polypropylene storm gray pipe shall have a smooth wall interior and annular exterior corrugations conforming to the requirements of ASTM F2736 and AASHTO M330.
 - 3. Joints: Pipe shall be joined with a gasket integral bell and spigot joint meeting the requirements of ASTM F2736. Joint must be completely water tight according to the requirements of ASTM 3212. Spigots shall have gaskets meeting requirements of ASTM F477. The gasket joint on the inside of the bell shall be installed on the pipe at the plant by the pipe manufacturer and covered with a removable, protective wrap to ensure the gasket is free from debris. A joint lubricant provided from the manufacturer shall be used on the gasket and bell during assembly. All materials and accessories for the gasket joint and the methods of jointing shall be in strict conformance with the pipe manufacturer's direction and recommendation.

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 re-built 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 install two (2) feet around each structure with flowable fill (per Section 121 of FDOT Standard Specifications for Road and Bridge Construction-2010) and the remaining surrounding backfill shall 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 by the ENGINEER 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 02631

EXFILTRATION TRENCH DRAINS

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 Exfiltration Trench System work, as indicated on the Drawings, as specified herein or both, except as for items specifically indicated as "NIC ITEMS".

1.03 RELATED WORK

- A. Section 02305 - Excavation and Backfilling for Utilities.
- B. Section 02535 - Structures and M.A.S.
- C. Section 02630 - Storm Drainage Facilities.

1.04 EXISTING UTILITIES

- A. Locate and stake all existing underground utilities that may be in the area of the drainage system.

1.05 SUBMITTALS

- A. Submit Plan Drawings showing the locations of all piping and underground utilities that may be in conflict with the Drainage System.
- B. Submit samples of the #5 ballast rock for approval.
- C. Submit samples and product data of filter fabric.

PART 2 - PRODUCTS

2.01 DRAINAGE PIPE AND BALLAST ROCK

- A. Drainage pipe shall be in conformance with material as specified in Section 02630 and have the maximum number of perforations allowable per the manufacturer's recommendations.
- B. Ballast rock shall be from fresh water and washed free of deleterious matter.
- C. Trench liner shall be Mirafi 140N soil filtration fabric or approved equal.
- D. All pipe joints shall be completely wrapped in filter fabric.

2.02 FILTER FABRIC

- A. Filter fabric shall be a non woven fabric consisting of polypropylene fibers treated to resist biological degradation and meet the requirements of FDOT Index 199 and FDOT Section 985.
- B. Manufacturers or Equal:
 - 1. Mirafi 140 N

PART 3 - EXECUTION

3.01 INSTALLATION

- A. Lay out Exfiltration Trench System as shown on the Plans.
- B. The bottom of the trench shall provide a minimum of 12 inches of ballast rock below the drain pipe.
- C. Drain pipes shall terminate a minimum of 2 feet beyond the end of the trench or connect to a catch basin as required.
- D. Cover temporary pipe ends with No. 10 galvanized or aluminum screen with openings no larger than 1/2" x 1/2".
- E. Bottom, sides and top of trench to be lined with trench lining material with a minimum of 2 feet of overlap at the top of the trench.

- F. A minimum of 4 feet of solid drain pipe shall be installed between drainage structures and the beginning of the trench.

3.02 CLEANUP

- A. Remove all excess rock, liner and pipe from the site.

3.03 PROTECTION AND CLEANING

- A. The CONTRACTOR shall maintain all pipe installations and drainage structures in a condition such that they will function continuously. The pipe and drainage structure shall be kept clean of silt, debris and other foreign matter until the project is accepted.

END OF SECTION 02631

SECTION 02741

ASPHALTIC CONCRETE PAVING - 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. 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, Broward County and Florida Department of Transportation Standard Specifications for Road and Bridge Construction.
 - 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 "NIC 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 02630 - Storm Drainage Facilities.
- D. Section 02751 - Portland Cement Concrete Paving.

1.04 REFERENCE STANDARDS

- A. American Association of State Highway and Transportation Officials (AASHTO)
 - 1. M140 - Standard Specification for Emulsified Asphalt Nineteenth Edition; Revised Per Interim Specifications - Specifications - 1999 R(1998)
 - 2. M226 - Standard Specification for Viscosity Graded Asphalt Cement Nineteenth Edition R(1996)
 - 3. T245 - Standard Method of Test for Resistance to Plastic Flow of Bituminous Mixtures Using Marshall Apparatus Nineteenth Edition; ASTM D1559-76
- B. American Society for Testing and Materials (ASTM)
 - 1. D1559 - Test Method for Resistance to Plastic Flow of Bituminous Mixtures Using Marshall Apparatus.
 - 2. D2041 - Standard Test Method for Theoretical Maximum Specific Gravity and Density of Bituminous Paving Mixtures
 - 3. D2171 - Standard Test Method for Viscosity of Asphalts by Vacuum Capillary Viscometer (RAP Asphalt Mixes)
- C. Asphalt Institute (AI)
 - 1. MS-2 - Mix Design Method for Asphalt Concrete and Other Hot Mix Types
 - 2. MS-22 - Principles of Construction of Hot-Mix Asphalt Pavement, Addendum

1.05 TRAFFIC CONTROL

- A. The CONTRACTOR shall provide and maintain access to and from all properties along the line of his 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 ENGINEER and shall be in effect only for a specified area or paving project.

1.07 QUALITY ASSURANCE

A. D.O.T. Standard Specifications.

1. Work and materials shall conform to all applicable requirements of Florida Department of Transportation "Standard Specifications for Road and Bridge Construction - 2010" (referred to herein as D.O.T.).

B. American Society for Testing and Materials.

1. ASTM 3515-80 "Standard Specification for Hot-Mixed, Job Laid, Bituminous Paving Mixtures."

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 Asphalt Institute Manual MS-2, the "Marshall Stability Method"; 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 State Department of Transportation (DOT) material specifications or regulatory authorities having jurisdiction for each proposed material.

B. The CONTRACTOR may submit to the OWNER a superpave asphalt mix design for review and approval, in lieu of a Marshall Mix Design asphalt, meeting the specifications of the governing State Department of Transportation or regulatory authorities having jurisdiction.

C. Material Certificates: CONTRACTOR shall submit certificates stating that asphalt mix to be supplied complies with the specifications of the governing State Department of Transportation (DOT) 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 ENGINEER. Contractor shall not utilize electronic files from the ENGINEER 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.

Percent

- | | | |
|----|---|---|
| 1. | Carbonates of Calcium | Min.70.0 (Miami Limerock) and Magnesium.
(24' roadway)
Min 60.0 (Miami Limerock) and Magnesium.
(22' roadway)
95.0 (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% shall pass a 3-1/2" 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 D.O.T. Section 911.

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 ENGINEER, 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 Grade RC-70, cut-back asphalt, D.O.T. Section 916-2.

B. Prime coat shall have full compatibility with surface treatment asphalt.

C. The bituminous material shall conform to the requirements of the Florida Department of Transportation Standard Specifications for Road and Bridge Construction, Section 300-2.

D. 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, Section 300-2.

2.05 ASPHALT

A. 1. The asphaltic concrete surface course shall be in accordance with Broward County, Florida Department of Transportation Standard Specifications for Type S-1 and Type S-III Asphaltic Concrete Surface Course.

2. Pavement within public road right-of-way which has been disturbed by this construction shall be replaced with the same type to match the existing pavement section.

3. 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 DOT standards).

B. General composition of mixtures:

1. The aggregate in the asphaltic concrete shall be crushed stone and manufactured sand screening of natural sand or combination of both when necessary to meet requirements of composition of mix. All aggregate shall have a Los Angeles abrasion loss of less than 40%.
2. The mineral aggregate shall be so graded, and the prescribed constituents, prepared as hereinafter set out, shall be combined in such proportions as to produce a mixture conforming to the following general composition limits by weight:

<u>Constituent</u>	<u>Passing Sieve</u>	S-1 <u>Percent by Weight</u>	S-III <u>Percent by Weight</u>
Course Aggregate	3/4"	100	100
	1/2"	88-98	100
	3/8"	75-93	88-98
	No. 4	47-75	60-90
Total Course Aggregate	No. 10	31-53	40-70
Fine Aggregate	No. 40	19-35	20-45
	No. 80	7-21	10-30
Filler	No. 200	2-6	2-6
Total Fine Aggregate and Filler	No. 10	100	100
Total Mineral Aggregate		100	100
Total Mix		100	100
<u>Constituent</u>		<u>Percent by Weight</u>	
Total Mineral Aggregate		91-95	
Asphalt Cement		5-9*	
(Bitumen) Total Mix		100	

*For highly absorptive aggregates the upper limit may be raised.

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 manhole, 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 gal/sy.
- 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 Broward County Highway Construction & Engineering Services Division Standard Specification 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 ENGINEER 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% 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% 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 manhole 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 a 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 ENGINEER 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 ENGINEER 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, at his own expense, 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 1/4", 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 ENGINEER. 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 1/2" 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 ENGINEER. An average required density shall be 98% of maximum density obtainable under AASHTO Method T-180. No section of base shall be accepted when more than 10% of tests fall below 98% of maximum density and in no case shall a density of less than 96% of maximum be accepted.
- I. Testing: The CONTRACTOR shall coordinate with ENGINEER 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 ENGINEER 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 ENGINEER.

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 ENGINEER, 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 ENGINEER.
 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 1/4" 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° and 240° 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° 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% 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, manhole, 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 ENGINEER.
 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 ENGINEER.
 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 ENGINEER.

3.09 ASPHALT OVERLAY

- A. Clean existing asphalt and clear of loose aggregate. Road edges shall be milled to a minimum depth of 1".
- B. Risers shall be installed to bring existing manhole 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, manhole 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% to 20% 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°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 ENGINEER:
 1. In-place compacted thickness will not be acceptable if exceeding following allowable variation from required thickness:
 - a. Base Course: Not greater than 1/2" of specified thickness.
 - b. Wearing Course: Not greater than 1/4" of specified thickness.
 2. Test finished surface of each asphalt concrete course for smoothness, using 10' 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: 1/4".
 - b. Wearing Course Surface: 1/8".
- B. Check surface area at intervals as directed by the ENGINEER.
- 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 ENGINEER.
- C. Leave project area clean, orderly and free of any hazardous conditions.

END OF SECTION 02741

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

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, 01410, and 01451 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 ACU 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. Crafcoc 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. Crafcoc 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 OWNER 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 02761

PAVEMENT MARKING AND CAR 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 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 Alkyd Thermoplastic Paint and fully retroreflectorized. Reflectivity shall be 250 millicandellas for white and 175 millicandellas for yellow.

- 2.02 Thermoplastic paint shall conform to the applicable Technical Specifications (Section 711) of the Florida Department of Transportation and Broward County Standards.
- 2.03 Traffic paint shall conform to the applicable Technical Specifications (Section 710) of the Florida Department of Transportation and Broward County Standards.
- 2.04 Reflectors shall be in accordance with Broward 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.

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 by water blasting or sandblasting only as to not materially or structurally damage the surface or texture of the pavement. 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 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 shall be 4". Sidewalk installed thru a driveway or subject to vehicular traffic shall be minimum 6".

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 cast-in-place and 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 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.

G. 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 heads 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 prove 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 ¾ 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:

$$L = \frac{SD(P)^{1/2}}{133,200}$$

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

- A. The CONTRACTOR shall be responsible for maintenance until the inspection for completion and final acceptance. The responsibilities include the following:
- B. Repair of all damage to installed material and equipment as needed.
- C. Adjustment of all sprinkler heads with regard to proper height after landscape installation, arc coverage, radius and operation at least once a week.
- D. 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.
- E. 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 Broward County Highway Construction & Engineering Division, Broward County Environmental Protection Department, FP&L, and Broward County Traffic Division 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 effect 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. New Plant Material: Trees, palms and shrubs, fertilize with Agriform planting tablets, 20-20-5 formula, 21 grams.
- B. New Ground Covers: Fertilize with an approved fertilizer 50% or greater organic 6-6-6 or 8-8-8 with minor elements including, but not limited to, iron zinc and manganese.
- C. 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.
- D. 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" dated 2010 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. The fertilizer shall be suitable for the type of sod and area as recommended by the State Department of Agriculture.

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. After sod has been installed, water 2-3 times a day for the first two weeks. Water sod to the point where sod has absorbed the water, but make sure it is not to the point where it is soggy.
- C. After first two weeks, water once a day for an additional two weeks. Water sod to the point where sod has absorbed the water, but make sure it is not to the point where it is soggy.
- D. Maintain lawns and watering for not less than 30 days after Substantial Completion Certification, and longer as required to establish an acceptable lawn.
- E. 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.

F. 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