

LIST OF TECHNICAL SPECIFICATIONS

Division 1 – General Requirements

01025	Measurement and Payment
01152	Applications for Payment
01153	Change Order Procedures
01201	Preconstruction Conference
01340	Shop Drawings, Product Data and Samples
01560	Temporary Controls
01700	Contract Close-Out
01710	Cleaning
01720	Project Record Documents

Division 2 - Site Work

02110	Clearing and Grubbing
02270	Erosion Control
02300	Site Earthwork
02302	Excavation & Fill
02318	Swale Construction
02630	Storm Sewerage
02770	Concrete Pavement
02714	Stabilized Subgrade
02980	Sodding, Seeding and Mulching

TECHNICAL SPECIFICATIONS

DIVISION 01

SECTION 01025

MEASUREMENT AND PAYMENT

PART 1 – GENERAL

1.01 GENERAL

Measurement and payment will be based upon work completed and accepted in accordance with the Contract Documents. No separate payment will be made for excavation, trenching dewatering, backfilling, leakage tests, density tests, or other incidental items of work not shown in the Contract Documents.

1.02 EQUIPMENT AND MATERIALS IN STORAGE

No payment for materials and equipment in proper storage at the site of the work or other approved storage site will be made.

1.03 MEASUREMENT

Mobilization: Measurement shall be on a lump sum basis, and shall be limited to the following maximum amounts:

<u>ORIGINAL CONTRACT AMOUNT (\$)</u>	<u>MAXIMUM AMOUNT OF</u>
<u>FROM MORE THAN</u>	<u>ITEM FOR MOBILIZATION</u>
<u>TO AND INCLUDING</u>	
0	3,000
100,000	15,000
500,000	30,000
1,000,000	60,000
2,000,000	90,000
3,000,000	120,000
4,000,000	125,000
5,000,000	150,000
6,000,000	175,000
7,000,000	200,000
10,000,000	250,000

Should the lump sum price bid for the item Mobilization exceed the maximum permissible amount for this item, as specified herein, the bid price will be reduced to the maximum permissible amount, and the reduced price will be used in correctly determining the total price for comparison of bids received.

- A. Insurances: The measurement for procuring and providing the required insurances shall not exceed 2 percent of the total Contract Amount unless justified by the Contractor. Adequate justification by the Contractor shall be copies of invoices or contracts between the Contractor and insurance broker for the specified insurances.
- B. Conformance with Project Conditions: The Measurement and Cost of complying with all the Contract Conditions, including those associated with project permits, which are not specified pay items shall be included in the pay items for individual

items to be installed. This paragraph does not apply to unforeseen underground conditions or changes in the work which are included under the Change Order provisions of the Contract Conditions.

- C. Specified Pay Items: The method Of Measurement and the Cost for providing and installing the project as designed shall be as included in the Schedule of Contract Prices as listed in the Agreement and as further described in the Sections of Division 2 – Site Work.

1.04. PAYMENT

Payment will be made at the respective contract unit and/or lump sum price for each item shown in the Agreement, installed and accepted, which price and payment shall constitute full compensation for furnishing all materials and performing all work in connection therewith and incidental thereto. No separate payment will be made for the preparation of record drawings.

1.05. RESTORATION OF DAMAGED SURFACES, STRUCTURES AND PROPERTY

Where pavement, trees, shrubbery, fences, or other property or surface structures not designated as pay items, or outside the limits of pay items, have been damaged, removed, or disturbed by the Contractor, whether deliberately or through failure to carry out the requirements of the Contract Documents, state laws, municipal ordinances, or the specific direction of the Engineer, or through failure to employ usual and reasonable safeguards, such property and surface structures shall be replaced or repaired at the expense of the Contractor to a condition equal to that before work began within a time frame approved by the Engineer.

**** END OF SECTION ****

SECTION 01152**APPLICATIONS FOR PAYMENT****PART 1 -- GENERAL****1.01 REQUIREMENTS INCLUDED**

Submit Applications for Payment to Engineer in accordance with the schedule established by Conditions of the contract and Agreement between Owner and Contractor.

1.02 RELATED REQUIREMENTS

A. In other parts of the Construction Documents:

1. Agreement between Owner and Contractor
2. General Conditions of the Contract
3. Supplemental Conditions of the Contract
4. Contractor's Application for Payment
5. Final Payment

1.03 FORMAT AND DATA REQUIRED

- A. Submit itemized applications typed in a format approved by Engineer. All applications for payment must be numbered, dated, and signed by the Contractor.
- B. Provide itemized data on payment application (format, schedules, line items and values accepted by Engineer).

1.04 PREPARATION OF APPLICATION FOR EACH PROGRESS PAYMENT

A. Application Form:

1. Fill in required information, including that for Change Orders executed prior to the date of submittal of application
2. Fill in summary of dollar values
3. Execute certification with the signature of a responsible officer of the contract firm
4. Have Engineer's representative review and sign application prior to submission to Owner

1.05 SUBSTANTIATING DATA FOR PROGRESS PAYMENTS

- A. When the Owner or the Engineer requires substantiating data, Contractor shall submit suitable information, with a cover letter identifying:
1. Project
 2. Application number and date
 3. Detailed list of enclosures

- B. Submit one copy of data and cover letter for each copy of application.

1.06 PREPARATION OF APPLICATION FOR FINAL PAYMENT

- A. An Application for Payment is required for release of final retainage
- B. Only one application will be acceptable in any one month

1.07 SUBMITTAL PROCEDURE

- A. Submit Applications for Payment to Engineer at the time stipulated in the Agreement
- B. Number: Four original executed copies of each progress Application
- B. When Engineer finds the Application properly completed and correct, he will execute and transmit the applications for payment to the Owner

PART 2 -- PRODUCTS

Not applicable

PART 3 -- EXECUTION

Not applicable

**** END OF SECTION ****

SECTION 01153**CHANGE ORDER PROCEDURES****PART 1 -- GENERAL****1.01 REQUIREMENTS INCLUDE**

- A. Promptly implement Change Order Procedures
 - 1. Provide full written data required to evaluate changes.
 - 2. Maintain detailed records of work done on a time-and-material/force account basis.
 - 3. Provide full documentation to Engineer on request.
- B. Designate in writing the member of Contractor's organization:
 - 1. Who is authorized to accept changes in the Work
 - 2. Who is responsible for informing others in the contractor's employ of the authorization of changes in the Work.
- C. Owner will designate in writing the person who is authorized to execute Change Orders.

1.02 RELATED REQUIREMENTS

- A. The amount of established unit prices.
- B. Conditions of the Contract:
 - 1. Methods of determining cost or credit to Owner resulting from changes in Work made on a time-and-materials basis.
 - 2. Contractor's claims for additional costs.
- C. Section 01152: Applications for Payment.
- D. Exhibit A Schedule of Bid Prices
- E. Section 01720: Project Record Documents.

1.03 DEFINITIONS

- A. Change Order: See General Conditions

1.04 PRELIMINARY PROCEDURES

- A. Owner or Engineer may initiate changes by submitting a proposal Request to Contractor. Request will include the following:

1. Detailed description of the Change, Products, and location of the change in the Project.
 2. Supplementary or revised Drawings and Specifications.
 3. The projected time span for making the change, and a specific statement as to whether overtime work is, or is not, authorized.
 4. A specific period of time during which the requested price will be considered valid.
 5. Such request is for information only, and is not an instruction to execute the changes, nor to stop work in progress.
- B. Contractor may initiate changes by submitting a written notice to Engineer, containing:
1. Description of the proposed changes.
 2. Statement of the reason for making the changes.
 3. Statement of the effect on the Contract Sum and the Contract Time.
 4. Statement of the effect on the work of separate contractors.
 5. Documentation supporting any changes in Contract Sum or Contract Time, as appropriate.

1.05 CONSTRUCTION CHANGE AUTHORIZATION

- A. In lieu of Proposal Request, Engineer may issue a "Work Directive Change" for Contractor to proceed with a change for subsequent inclusion in a Change Order.
- B. Authorization will describe changes in the work, both additions and deletions, with attachments of revised Contract Documents to define details of the change.
- C. Owner and Engineer will sign and date the Work Directive Change as authorization for the Contractor to proceed with the Changes.

1.06 DOCUMENTATION OF PROPOSALS AND CLAIMS

- A. Support each quotation for a lump sum proposal, and for each unit price which has not previously been established, with sufficient substantiating data to allow Engineer to evaluate the quotation.
- B. On request, provide additional data to support time and cost computation including the following:
 1. Labor required.
 2. Equipment required.
 3. Products required:
 - a. Recommended source of purchase and unit cost.
 - b. Quantities required.
 4. Taxes, insurance bonds.
 5. Credit for work deleted from Contract, similarly documented.
 6. Overhead and profit.

7. Justification for any change in Contract Time.
- C. Support each claim for additional costs, and for work done on a time-and-material / force account basis, with documentation as required for a lump sum proposal, plus the following additional information:
1. Name of the Owner's authorization agent who ordered the work, and date of the order.
 2. Dates and time work performed, and by whom.
 3. Time record, summary of hours worked, and hourly rates paid.
 4. Receipts and invoices for:
 - a. Equipment used, listing dates and times of use.
 - b. Products used, listing quantities.
 - c. Subcontracts.

1.07 PREPARATION OF CHANGE ORDERS

- A. Engineer will prepare each Change Order.
- B. Form: Change Order format provided in the Contract Documents.
- C. Change Order will describe changes in the Work, both additions and deletions, with attachments of revised Contract Documents to define details of change.
- D. Change Order will provide an accounting of the adjustment in the Contract Sum and in the Contract Time.

1.08 LUMP SUM / FIXED PRICE CHANGE ORDER

- A. Content of Change Orders will be based on either:
 1. Engineer's Proposal Request and Contractor's responsible Proposal as mutually agreed upon between Owner and Contractor.
 2. Contractor's Proposal for a change, as recommended by Engineer.
- B. Owner and Engineer will sign and date the Change Order as authorization for the contractor to proceed with the changes.
- C. Contractor shall sign and date the Change Order to indicate agreement with the terms therein.

1.09 UNIT PRICE CHANGE ORDER

- A. Content of Change Orders will be based on, either:
 1. Engineer definition of the scope of the required changes.
 2. Contractor's Proposal for a change, as recommended by Engineer.
 3. Survey of completed work.

- B. The amount of the unit prices shall be:
 - 1. Those stated in the Agreement.
 - 2. Those mutually agreed upon between Owner and Contractor.
- C. When quantities of each of the items affected by the Change Order can be determined prior to start of the work:
 - 1. Owner and Engineer will sign and date the Change Order as authorization for Contractor to proceed with the changes.
 - 2. Contractor shall sign and date the Change Order to indicate agreement with the terms therein.
- D. When quantities of the items cannot be determined prior to start of the work:
 - 1. Engineer or Owner will issue a Change Order directing Contractor to proceed with the change on the basis of unit prices, and will cite the applicable unit prices.
 - 2. At completion of the change, Engineer will determine the cost of such work based on the unit prices and quantities used.
 - a. Contractor shall submit documentation to establish the number of units of each item and any claims for a change in Contract Time.
 - 3. Engineer will sign and date a second Change Order to establish the change in Contract Sum and in Contract Time.
 - 4. Owner and Contractor will sign and date the second Change Order to indicate their agreement with the terms therein.

1.10 TIME AND MATERIAL / FORCE ACCOUNT CHANGE ORDER / CONSTRUCTION AUTHORIZATION

- A. Engineer and owner will issue a Work Directive Change directing Contractor to Proceed with the changes on a time-and-material / force account basis.
- B. At completion of the change, Contractor shall submit itemized accounting and supporting data as provided in the Article "Documentation of Proposals and Claims" of this section.
- C. Engineer will determine the allowable cost of such work, as provided in General Conditions and Supplementary Condition.
- D. Engineer will sign and date the Change Order to establish the change in Contract Sum and in Contract Time.
- E. Owner and Contractor will sign and date the Change Order to indicate their agreement therein.

1.11 CORRELATION WITH CONTRACTOR'S SUBMITTALS

- A. Contractor shall periodically revise Schedule of Values and Request for Payment forms to record each change as a separate item of Work, and to record the adjusted Contract Sum.
- B. Contractor shall periodically revise the Construction Schedule to reflect each change in Contract Time.
 - 1. Revise sub-schedules to show changes for other items of work affected by the changes.
- C. Upon completion of work under a Change Order, enter pertinent changes in Record Documents.

PART 2 -- PRODUCTS

Not Applicable

PART 3 -- EXECUTION

Not Applicable

**** END OF SECTION ****

SECTION 01201**PRE-CONSTRUCTION CONFERENCE****PART 1 -- GENERAL****1.01 REQUIREMENTS INCLUDED**

- A. Engineer shall schedule and administer the preconstruction conference and shall perform the following duties:
 - 1. Prepare agenda for meeting.
 - 2. Give notice of meeting three days in advance of meeting date.
 - 3. Make physical arrangements for meeting.
 - 4. Preside at meeting.
 - 5. Record the minutes which shall include all significant proceedings and decisions.
 - 6. Reproduce and distribute copies of minutes within fifteen (15) working days after meeting. Minutes shall be distributed to all participants in the meeting and to all parties affected by decisions made at the meeting.

1.02 RELATED REQUIREMENTS

- A. Section 01340: Shop Drawings, Product Data and Samples.
- B. Section 01720: Project Record Documents.

1.03 PRECONSTRUCTION CONFERENCE

- A. Engineer will schedule meeting with Contractor, Owner and other affected parties.
- B. Location of the preconstruction meeting: The project site or a nearby office to be selected by Owner/Engineer.
- C. Attendance:
 - 1. Owner/Owner's representative.
 - 2. Engineer/Engineer's representative.
 - 3. Contractor/Contractor's superintendent.
 - 4. Local utilities representatives.
 - 5. Local government agencies representative.
- D. Agenda:
 - 1. Record of Attendance.
 - 2. Project Summary Description.
 - 3. Local Utilities to be affected.
 - a. Water lines
 - b. Sewer lines

- c. Telephone lines
 - d. Cable TV lines
 - e. Electric lines
4. Contractor Responsibilities:
- a. Start date
 - b. Completion date
 - c. Liquidated damages
 - d. Contract amount
 - e. Work schedule
 - f. Space utilization
 - g. Rights-of-Way occupancy
 - h. Progress Payment Application
 - i. As-builts (Records/Drawings)
 - j. Photographs
 - k. Shop drawings
 - l. Subcontractors
 - m. Project coordination
 - n. Guarantee, Warranties, Maintenance Manuals
5. Owner Responsibilities:
- a. Property and right-of-way purchase
 - b. Monthly meetings
 - c. Special meetings
 - d. Partial and final payment
 - e. Change Orders
 - f. Periodic site visits
 - g. Public announcements and public relations
 - h. Project acceptance
6. Engineer Responsibilities:
- a. Technical representative of Owner
 - b. Interpreter of contract documents
 - c. Periodic inspections of job progress
 - d. Reviews partial and final payment applications
 - e. Prepares Change Orders
 - f. Checks and approves shop drawings
 - g. Reviews record drawings
 - h. Performs final inspection and issues certificate of completion
7. Resident Inspector Responsibilities:
- a. Engineer's and Owner's representative on site
 - b. Review materials and work and reports any deficiencies to Engineer
 - c. Reviews applications for payment
 - d. Works with Contractor on public notification of work items

- e. Attends progress meetings
- f. Observes testing work
- g. Maintains daily diary of work tasks
- h. Furnishes reports to Engineer as deemed advisable

PART 2 -- PRODUCTS

Not Applicable

PART 3 -- EXECUTION

Not Applicable

**** END OF SECTION ****

SECTION 01340**SHOP DRAWINGS, PRODUCT DATA AND SAMPLES****PART 1 -- GENERAL****1.01 REQUIREMENTS INCLUDED**

- A. Submit Shop Drawings, Product Data, Samples and Certificates required by the Contract Documents.
- B. Review and approval by Contractor of submitted material.

1.02 RELATED REQUIREMENTS

- A. In other parts of the Contract Documents:
 - 1. Definitions and Additional Responsibilities of Parties:
 - a. General Conditions of the Contract
- B. Specified in other sections:
 - 1. Section 01720: Record Documents
- C. Designate in the construction schedule, or in separate coordinated schedule, the dates for the 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 sheet and detail of schedule shown on Contract Drawings.
- B. Minimum sheet size: Manufacturer's standard; adequate to clearly illustrate.

1.04 PRODUCT DATA

- A. Preparation:
 - 1. Clearly mark each copy to identify applicable products, models, options, and other data.
 - 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.
3. Include manufacturer's installation instructions when required by the Specifications Section.

1.06 MANUFACTURER'S CERTIFICATES

- A. Submit Certificates, in duplicate, in accordance with requirements of each specification section.

1.07 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 the time of submission of ANY AND ALL DEVIATIONS in the submittals from requirements of the Contract Documents. All of the Contractor's comments and notations shall be in red ink.
- E. Begin no fabrication of work which requires submittals until return of submittals with Engineer's approval.

1.08 SUBMISSION REQUIREMENTS

- A. Make submittals promptly in accordance with approved schedule, and in such sequence as to cause no delay in the work of any other Contractor.
- B. Number of submittals required:
1. Shop Drawings: Submit the number of opaque reproductions which the contractor requires, plus four (4) copies which will be retained by the Engineer. Submittals may be made in digital format if approved by Engineer.
 2. Product Data: Submit the number of copies which the Contractor requires, plus four (4) which will be retained by

the Engineer. Submittals may be made in digital format if approved by Engineer.

C. Submittals shall contain:

1. The date of submission and the dates of any previous submissions.
2. The project title and number
3. Contract identification
4. The name of:
 - a. Contractor
 - b. Supplier
 - c. Manufacturer
5. Identification of the project, with 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 AWWA Specification numbers.
9. Identification of deviations from Contract Documents
10. Identification of revisions on resubmittals.
11. An 8" x 5" blank space for Contractor and Engineer stamps
12. Contractor's stamp or review and approval, initialed or signed, certifying to review of 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.

1.09

RESUBMISSION REQUIREMENTS

- A. Make any corrections or changes in the submittals required by the Engineer and resubmit until approved.
- B. Shop Drawings and Product Data:
 1. Revise initial drawings or data, and resubmit as specified for 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.

1.10

DISTRIBUTION

- A. Distribute reproductions of Shop Drawings and copies of Product Data which carry the Engineer's stamp or review 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.

1.11 ENGINEER'S DUTIES

- A. Review submittals with reasonable promptness and in accordance with schedule.
- B. Affix stamp and initials / signature, and indicate requirements for resubmittal, or review without comments of submittal. All of Engineer's comments shall be made in green ink.
- C. Return submittals to Contractor for distribution, or for resubmission.

PART 2 -- PRODUCTS

Not Applicable

PART 3 -- EXECUTION

Not Applicable

**** END OF SECTION ****

SECTION 01560**TEMPORARY CONTROLS****PART 1 -- GENERAL****1.01 REQUIREMENTS INCLUDED**

- A. Furnish, install, and maintain temporary control facilities required for construction; remove on completion of entire project any features not intended to remain on the project site.
- B. Provide noise control, dust control, water control, debris control, pollution control and erosion control as specified in the appropriate sections of these documents.

1.02 REQUIREMENTS OF REGULATORY AGENCIES

- A. Comply with federal, state, and local codes and regulations and utility company requirements.
- B. Comply with Department of Transportation requirements.

PART 2 -- PRODUCTS**2.01 MATERIALS (GENERAL)**

- A. Materials may be new or used, but must be adequate in capacity and quality for the required usage, MUST NOT create unsafe conditions and MUST NOT violate requirements of applicable codes and standards.

2.02 TEMPORARY NOISE CONTROL

- A. Mechanical equipment shall be fitted with mufflers to reduce noise from internal combustion type engines.
- B. Bells, sirens, alarms, etc., shall be adjusted to provide adequate warnings to personnel on the project site; however, they shall be regulated to an intensity that is amenable to the neighboring communities.
- C. Exterior construction work noises shall be kept to a minimum during evening, night, and early morning hours. In addition, weekend and holiday noises shall be limited to acceptable levels.
- D. In addition to on-site control, noise considerations shall be made to off-site vehicles and equipment (mobilization, demobilization, deliveries, etc.).

2.03 TEMPORARY DUST CONTROL

Dust formed as a result of the construction shall be controlled by the Contractor. Cleaning of work areas and application of dust control materials are the most effective methods of dust control.

2.04 TEMPORARY WATER CONTROL

- A. The flow of water through the construction site shall be controlled by the Contractor such that it does not damage any constructed items; however, it shall be diverted and channeled to effectively leave the site as soon as possible. Puddling and ponding on the site is not permitted.
- B. Water shall be controlled such that it does not enter excavated areas, nor is deposited on or against constructed features. Unless excavated areas are disconnected from the F.W.C.D. sub-lateral and areas are intended for temporary dewatering storage.
- C. F.W.C.D. sub-lateral ditch flows must be maintained during the course of construction.

2.05 TEMPORARY DEBRIS CONTROL

- A. Provision shall be made by each Contractor to have available adequate containers to hold any and all debris that is to be generated from the project. Containers should be covered to prevent wind blowing paper, plastic, and lightweight products around and off the site.
- B. Instructions shall be given to personnel to utilize the trash containers. Containers shall be placed in convenient places at the site.
- C. At least once per week, a thorough cleaning of trash and debris shall be made at the construction site. An acceptable method of disposal shall be employed.

**** END OF SECTION ****

SECTION 01700
CONTRACT CLOSEOUT

PART 1 -- GENERAL

1.01 REQUIREMENTS INCLUDED

- A. Comply with requirements stated in General and Special Conditions of the Contract and in Specifications for administrative procedures in closing out the work.
- B. Related requirements in other parts of the Contract Documents:
 - 1. Fiscal provisions, legal submittals, and additional administrative requirements
 - 2. General Conditions of the Documents:
 - a. Record Documents
 - b. Final Inspection
 - c. Substantial Completion
 - d. Application for Final Payment
 - e. Final Payment and Acceptance
 - f. Guarantee of Work
- C. Related requirements specified in other sections:
 - 1. Section 01710: Cleaning
 - 3. Section 01720: Project Record Documents

1.02 SUBSTANTIAL COMPLETION

- A. When Contractor considers his work is substantially complete, he shall submit to Engineer:
 - 1. A written notice that the work, or designated portion thereof, is substantially complete.
 - 2. A list of items to be completed or corrected.
- B. Within a reasonable time after receipt of such notice, Engineer will make an inspection to determine the status of completion.
- C. Should Engineer determine that the work is not substantially complete:
 - 1. Engineer will promptly notify the Contractor, in writing, giving the reasons.
 - 2. Contractor shall remedy the deficiencies in the work, and shall send a second written notice of substantial completion to Engineer
 - 3. Engineer will re-inspect the work

- D. When Engineer concurs that the work is substantially complete, he will:
1. Prepare a Certificate of Substantial Completion, accompanied by a list of items to be completed or corrected
 2. Submit the Certificate to Owner and Contractor for their written acceptance of the responsibilities assigned to them in the certificate.

1.03 FINAL INSPECTION

- A. When Contractor considers the work is complete, he shall submit written certification that:
1. Contract Documents have been reviewed
 2. Work has been inspected for compliance with Contract Documents
 3. Work has been completed in accordance with Contract Documents
 4. Equipment and systems have been tested in the presence of the Owner's representative and are operational
 5. Equipment and systems instructions to Owner's personnel have been completed in accordance with Contract Documents
 6. Work is completed and ready for final inspection
- B. Engineer will make an inspection to verify the status of completion with reasonable promptness after receipt of such certification.
- C. Should Engineer consider that the work is incomplete or defective:
1. Engineer will promptly notify the Contractor, in writing, listing the incomplete or defective work.
 2. Contractor shall take immediate steps to remedy the stated deficiencies, and send a second written certification to Engineer that the work is complete.
 3. Engineer will re-inspect the work
- D. When Engineer finds that the work is acceptable under the Contract Documents, he shall request the Contractor to make closeout submittals.

1.04 RE-INSPECTION FEES

Should the Engineer perform re-inspection due to failure of the work to comply with the claims of status of completion made by the Contractor, Contractor will compensate Engineer/Owner for such additional services.

1.05 ADDITIONAL SERVICES

Should Engineer be required to provide representation at the site for the administration of the Contract for Construction, more than thirty days after the specified Date of Substantial Completion of the work, Contractor will compensate Engineer for such additional services.

1.06 CONTRACTOR'S CLOSEOUT SUBMITTALS TO ENGINEER

- A. Evidence of compliance with requirements of governing authorities: Certificate of Occupancy (if applicable)
- B. Project Record Documents: To requirements of Section 01720, including AutoCad "As-Built" survey drawings.
- C. Evidence of Payment and Release of Liens: To requirements of General and Supplementary Conditions
- D. All Test Reports
- E. One (1) Year Letter of Warranty

1.07 FINAL ADJUSTMENT OF ACCOUNTS

- A. Submit a final statement of accounting to Engineer
- B. Statement shall reflect all adjustments to the Contract Sum:
 - 1. The original Contract Sum
 - 2. Additions and deductions resulting from:
 - a. Previous change orders
 - b. Allowances
 - c. Unit prices
 - d. Deductions for uncorrected work
 - e. Deductions for liquidated damages
 - f. Deductions for re-inspection payments
 - g. Other adjustments
 - 3. Total Contract sum, as adjusted
 - 4. Previous payments
 - 5. Sum remaining due
- C. Engineer will prepare a final change order, reflecting approved adjustments to the Contract sum which were not previously made by change order.

1.08 FINAL APPLICATION FOR PAYMENT

- A. Contractor shall submit the final Application for Payment in accordance with procedures and requirements stated in the Conditions of the Contract.

PART 2 -- PRODUCTS

Not applicable

PART 3 -- EXECUTION

Not applicable

**** END OF SECTION ****

SECTION 01710**CLEANING****PART 1 -- GENERAL****1.01 REQUIREMENTS INCLUDED**

Execute cleaning, during progress of the work, and at completion of the work, as required by General conditions.

1.02 DISPOSAL REQUIREMENTS

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

PART 2 -- PRODUCTS**2.01 MATERIALS**

- A. Use only those cleaning materials which will not create hazards to health or property and which will not damage finishes and surfaces.
- B. Use only those cleaning materials and methods recommended by manufacturer of the surface material to be cleaned.
- C. Use cleaning materials only on surfaces recommended by cleaning material manufacturer.

PART 3 -- EXECUTION**3.01 DURING CONSTRUCTION**

- A. Execute periodic cleaning to keep the work, the site, and adjacent properties free from accumulation of waste materials, rubbish, and windblown debris resulting from construction operations.
- B. Dispose of waste materials, cartons, crating, debris, and rubbish at designated waste receptacles.
- C. Contractor shall maintain a broom-cleaned site during the entire construction phase.
- D. For exterior utility work (such as underground pipelines, roadways, service areas, etc.), these shall be cleaned daily. Not less frequently than once weekly. Roadways shall be mechanically broomed.

3.02 DUST CONTROL

- A. General Contractor shall broom-clean interior spaces prior to the start of completing painting and continue cleaning on an as-needed basis until painting is finished.
- B. Schedule operations so that dust and other contaminants resulting from the cleaning process will not fall on wet or newly-coated surfaces.

3.03 FINAL CLEANING

- A. Remove grease, mastic, adhesives, dust, dirt, stains, fingerprints, labels, and other foreign materials.
- B. Contractor shall broom-clean paved surface; rake-clean other surfaces of the grounds.
- C. Prior to final completion, Contractor shall conduct an inspection of all work areas to verify that the entire work area is clean.

**** END OF SECTION ****

SECTION 01720**PROJECT RECORD DOCUMENTS****PART 1 -- GENERAL****1.01 REQUIREMENTS INCLUDED**

- A. Contractor shall maintain at the site for the Owner one record copy of the following:
 - 1. Drawings
 - 2. Specifications
 - 3. Addenda
 - 4. Change orders and other modifications to the Contract
 - 5. Engineer field orders or written instructions
 - 6. Approved shop drawings, product data, and samples
 - 7. Field test records
- B. Related requirements in the other parts of the Contract Documents:
 - General Conditions of the Contract; Schedules, Reports and Records
- C. Related requirements specified in other sections:
 - Section 01340: Shop Drawings, Product Data and Samples

1.02 MAINTENANCE OF DOCUMENTS AND SAMPLES

- A. Contractor shall store documents and samples in the field office apart from documents used for construction.
 - 1. Provide files and racks for storage of documents.
 - 2. Provide locked cabinet or secure storage space for storage of samples.
- B. File documents and samples in accordance with Specifications – Table of Contents.
- C. Maintain documents in a clean, dry, legible condition and in good order. Do not use record documents for construction purposes.
- D. Make documents and samples available at all times for inspection by Engineer.

1.03 MARKING DEVICES

- A. Provide felt tip marking pens for recording information in the color red.

1.04 RECORDING (SEE ALSO SPECIAL CONDITIONS)

- A. Label each document "PROJECT RECORD" in neat large printed letters.
- B. Record information concurrently with construction progress. DO NOT conceal or backfill any work until required information is recorded.
- C. Drawings: Legibly mark to record actual construction:
 - 1. Depths of various elements of construction in relation to N.A.V.D. 1988.
 - 2. Horizontal and vertical locations of underground utility lines, fittings and appurtenances, referenced to permanent surface improvements.
 - 3. Location of internal utilities and appurtenances concealed in the construction, referenced to visible and accessible features of the structure.
 - 4. Field changes of dimension and detail
 - 5. Changes made by field order or by change order.
 - 6. Details not on original contract drawings.
 - 7. As-built elevations shall be provided for center line of road (100 ft. on center), swales, pipe inverts and structure grates.
 - 8. As-built elevations at all points of inflection of the top of bank, water line and bottom of pond as well as any slope breaks at an interval sufficient to calculate the volume of the lakes.
- D. Specifications and Addenda: Legibly mark each section to record:
 - 1. Manufacturer, trade name, catalog number and supplier of each product and item of equipment actually installed.
 - 2. Changes made by field order or by change order.

1.05 SUBMITTAL

- A. At Contract close-out, deliver Record Documents to Engineer for the Owner
- B. Accompany submittal with transmittal letter in duplicate, containing:
 - 1. Date
 - 2. Project title and number
 - 3. Contractor's name and address
 - 4. Title and number of each Record Document
 - 5. Signature of Contractor or his authorized representative

1.06 AS-BUILT SURVEYS**A. INFORMATION FOR AS-BUILT UTILITY SURVEY WORK**

1. All as-built drawings shall state in 1" lettering "AS-BUILT RECORD SURVEY" located in the bottom right hand side of the drawing original and/or copies, along with the as-built date.
2. All as-built surveys shall meet the minimum requirements of the Chapter 61G17, Florida Administrative Code Pursuant to Section 472 of the Florida Statutes. All surveys shall be based on a minimum horizontal control Third Order, "Class 2."
3. All state plane coordinates shall be based on the Florida State Plane Horizontal Data (East Zone); Florida High Precision Geodetic Network (Superstation) and NAD 83/1990 – final adjustment.
4. State plane coordinates shall be physically tied to a minimum of two known state plane coordinate benchmarks that utilize number 3 above. State plane coordinates shall be shown on survey at benchmarks used.
5. All elevations shown shall be based on 1988 NAVD.
6. All incoming as-built survey AUTOCADD drawing files shall be received on a CD-ROM and in state plane coordinates. (NOTE: Prior to submitting the CD-ROM AUTOCADD drawings, three (3) copies of each survey shall be submitted for review and approval, signed and sealed by a Florida registered surveyor.

PART 2 -- PRODUCTS

Not applicable

PART 3 -- EXECUTION

Not applicable

**** END OF SECTION ****

TECHNICAL SPECIFICATIONS

DIVISION 02

SECTION 02110**CLEARING AND GRUBBING****PART 1 - GENERAL****1.01 SCOPE**

The Contractor shall furnish all labor, materials, equipment, and all operations required to clear and grub the indicated portions of the site located within the Limits of Construction of the project.

PART 2 - PRODUCTS - None**PART 3 - EXECUTION****3.01 GENERAL**

- A. Clearing and grubbing shall consist of the complete removal and disposal of all trees, brush, logs, stumps, roots, weeds, rubbish, rocks, structures designated to be removed, concrete and other deleterious material and obstructions resting upon or protruding through the surface of the ground. Stumps, roots 3" and over and similar obstructions shall be removed to a minimum depth of 2 feet below the existing ground. All structural items shall be excavated to full depth, completely removed, and the excavation backfilled per these specifications.
- B. The Contractor shall clear and grub limited areas along the canal banks needed to access the limits of the project.

3.02 DISPOSAL

- A. Burning On Site
 - 1. Burning of cleared and grubbed materials shall not be permitted on site.
- B. Off Site Disposal
 - 1. On site burning is not permitted, all unusable vegetative material not processed and incorporated into the Work shall be hauled off site by the Contractor for disposal in an approved manner.
 - 2. The Contractor shall be responsible for obtaining and complying with the provisions of all necessary permits. All fees shall be paid by the Contractor.
 - 3. No rejected materials shall be buried on site without written authorization by Engineer and consent of Owner.

**** END OF SECTION ****

SECTION 02270
EROSION CONTROL

PART 1 - GENERAL

1.01 WORK INCLUDED

- A. The work of this section consists of furnishing all necessary labor, equipment, material and transportation necessary to provide temporary and permanent erosion and sediment control as required by appropriate government agency permits, the plans and as noted in this specification. The Contractor shall execute and provide all necessary BMP's, monitoring and maintenance. The Contractor shall file the FDEP Notice of Intent, create a Stormwater Pollution Prevention Plan and meet all state monitoring requirements.

PART 2 - PRODUCTS

N/A

PART 3 - EXECUTION

3.01 INSTALLATION

- A. Install temporary erosion and sediment control items prior to clearing and commencing earthwork or as soon as practical as site work progresses.

3.02 BEST MANAGEMENT PRACTICES (BMP's)

- A. Stabilization of Denuded Areas: No disturbed area may be denuded for more than thirty (30) calendar days (or 72 hours for sloped banks of 3:1 or greater), excluding travel ways, unless otherwise authorized by the Owner's Engineer. During construction, denuded areas shall be covered by mulches such as straw, hay, filter, seed and mulch, sod or some other permanent vegetation. Within sixty (60) calendar days after final grade is established on any portion of a project site, that portion of the site shall be provided with established permanent soil stabilization measures per the construction drawings, whether by impervious surface or landscaping.
- B. Protection and Stabilization of Stockpiles: Fill material stockpiles shall be protected at all times by on-site drainage controls which prevent erosion of the stockpiled material. Control of dust from such stockpiles may be required, depending upon their location and the expected length of time the stockpiles will be present. In no case shall an unstabilized stockpile remain after thirty (30) calendar days.
- C. Protection of Existing Storm Sewer Systems: During construction, all storm sewer inlets shall be protected by approved sediment traps such as secured hay bales, sod, stone, etc., which shall be maintained and modified as required by construction progress, and which must be approved by the Owner's Engineer.

- D. Sediment Trapping Measures: Sediment basins and traps, perimeter berms, filter fences, berms, sediment barriers (hay bales), vegetative buffers and other measures intended to trap sediment and/or prevent the transportation of sediment onto adjacent properties, or into existing water bodies, must be installed, constructed or, in case of vegetative buffers, protected from disturbance, as a first step in the land alteration process.
- E. Working in or Crossing Waterways or Water Bodies: Land alteration and construction shall be minimized in both permanent and intermittent waterways and the immediately adjacent buffer of 25 feet from top of bank of the waterways and the buffer area whenever possible, and barriers shall be used to prevent access. Where in channel work cannot be avoided, precautions must be taken to stabilize the work area during land alteration, development and/or construction to minimize erosion. If the channel and buffer area are disturbed during land alteration, they must be stabilized within three (3) calendar days after the in-channel work is completed.

Silt curtains or other filter/siltation reduction devices must be installed on the downstream side of the in-channel alteration activity to eliminate impacts due to increased turbidity. Whenever stream crossings are required, properly sized temporary culverts shall be provided by the Contractor and removed when construction completed. The area of the crossing shall be restored to a condition as nearly as possible equal to that which existed prior to any construction activity.

- F. Swales, Ditches and Channels: All swales, ditches and channel leading from the site shall be sodded within three (3) days of excavation. All other interior swales, etc., including detention areas will be sodded prior to substantial completion.
- G. Underground Utility Construction: The construction of underground utility lines and other structures shall be done in accordance with the following standards:
1. No more than 100 lineal feet of trench shall be open at any time;
 2. Wherever consistent with safety and space consideration, excavated material shall be cast to the uphill side of trenches. Trench material shall not be cast into or onto the slope of any stream, channel, road ditch or waterway.

3.03 PERFORMANCE

- A. Maintenance: All erosion and siltation control devices shall be checked regularly, especially after each rainfall and will be cleaned out and/or repaired as required.
- B. Compliance: Failure to comply with the aforementioned requirements may result in a fine and/or more stringent enforcement procedures such as, but not limited to, issuance of a "Stop Work Order".

**** END OF SECTION ****

SECTION 02300**SITE EARTHWORK****PART 1 - GENERAL****1.01 RELATED DOCUMENTS**

- A. Drawing and general provisions of Contract, including General and Supplementary Conditions and Division 1 General Requirements, apply to this Section.

1.02 SUMMARY

- A. This Section includes the following:
 - 1. Preparing of subgrade for building slabs, walks, pavements and landscaped areas.
 - 2. Excavating and backfilling for underground sewers, mechanical and electrical appurtenances.
 - 3. Excavating, backfilling and grading for ditches, berms and swales.
- B. Final Grading, together with placement and preparation of topsoil for lawns and planting, is specified elsewhere in Division 2.

1.03 DEFINITIONS

- A. Excavation consists of removal of material encountered to subgrade elevations indicated and subsequent disposal of materials removed.
- B. Unauthorized excavation consists of removal of materials beyond indicated subgrade elevations or dimensions without specific direction of the Project Architect/Engineer. Unauthorized excavation, as well as remedial work directed by the Project Architect/Engineer, shall be at the Contractor's expense.
 - 1. Under footings, foundation bases, or retaining walls, fill unauthorized excavation by extending indicated bottom of footing or base to excavation bottom, without altering required top elevation. Lean concrete fill may be used to bring elevations to proper position, when acceptable to the Project Architect/Engineer.
- C. In locations other than those above, backfill and compact unauthorized excavations as specified for authorized excavations as same classification, unless otherwise directed by the Project Architect/Engineer.
- D. Additional Excavation: When excavation has reached required subgrade elevations, notify the Project Architect/Engineer, who will make an inspection of conditions. If the Project Architect/Engineer determines that bearing materials at required subgrade elevations are unsuitable, continue excavation until suitable bearing materials are encountered and replace excavated material as directed by the Project Architect/Engineer. The Contract Sum may be adjusted by an appropriate Contract Modification.
 - 1. Removal of unsuitable material and its replacement as directed will be paid on a unit cost basis of Conditions of the Contract relative to changes in the

work.

- E. Subgrade: The undisturbed earth or the compacted soil layer immediately below granular sub-base (if required), base, drainage fill, or topsoil materials.
- F. Structure: Buildings, foundations, slabs, tanks, curbs, or other man-made stationary features occurring above or below ground surface.

1.04 SUBMITTALS

- A. Test Reports: Submit the following reports directly to the Project Architect/Engineer from the testing services, with copy to Contractor, and Owner:
 - 1. Test reports on borrow material.
 - 2. Verification of suitability of each footing subgrade material, in accordance with specified requirements.
 - 3. Field reports: in-place soil density tests.
 - 4. One optimum moisture-maximum density curve for each type of soil encountered.
 - 5. Report of actual unconfined compressive strength and/or results of bearing tests of each strata tested.

1.05 QUALITY ASSURANCE

- A. Codes and Standards: Perform excavation work in compliance with applicable requirements of authorities having jurisdiction.
- B. Trenching to comply with OSHA Standard 29CFR, Section 1926-650 subpart P. Contractor to provide written assurance of compliance.
- C. Testing and Inspection Service: The Contractor will employ and pay for a qualified independent geotechnical testing and inspection laboratory to perform soil testing and inspection service during earthwork operations.
- D. Degree of Compaction: Required compaction is expressed as a percentage of maximum density by test procedures of ASTM D1557.

1.06 PROJECT CONDITIONS

- A. Bidders shall inform themselves of location and nature of work, character of equipment and facilities needed for performance of work, general and local conditions prevailing at site, and other matters which may in any way affect work under this contract in accordance with DIVISION 1, GENERAL REQUIREMENTS.
- B. Site Information: Data in subsurface investigation reports was used for the basis of the design and are available to the Contractor for review and compliance with recommendations.

Conditions are not intended as representations or warranties of accuracy of continuity between soil borings. The Owner will not be responsible for interpretations or conclusions drawn from this data by the Contractor.

- 1. Additional test borings and other exploratory operations may be

- performed by Contractor, at the Contractor's option; however, no change in the Contract Sum will be authorized for such additional exploration.
2. The Soils Report shall be a part of these specifications and shall have the same force and effect as the specifications.
- C. Existing Utilities: Locate existing underground utilities in areas of excavation work. If utilities are indicated to remain in place, provide adequate means of support and protection during earthwork operations.
1. Should uncharted, or incorrectly charted, piping or other utilities be encountered during excavation, consult Project Architect/Engineer and utility owner immediately for directions. Cooperate with Owner and utility companies in keeping respective services and facilities in operation. Repair damaged utilities immediately to satisfaction of utility owners.
 2. Do not interrupt existing utilities serving facilities occupied by Owner or others, during occupied hours, except when permitted in writing by the Project Architect/Engineer and then only after acceptable temporary utility services have been provided.
 - a. Provide a minimum of 48-hour notice to the Project Architect/Engineer, and receive written notice to proceed before interrupting any utility.
 3. Demolish and completely remove from site existing underground utilities indicated to be removed. Coordinate with utility companies for shutoff of services if lines are active.
- D. Use of Explosives: Use of explosives is not permitted.
- E. Protection of Persons and Property: Barricade open excavations occurring as part of this work and post with warning lights.
1. Operate warning lights as recommended by authorities having jurisdiction.
 2. Protect structures, utilities, sidewalks, pavements, and other facilities from damage caused by settlement, lateral movement, undermining, washout, and other hazards created by earthwork operations.
 3. Perform excavation by hand within drip-line of large trees selected to remain. Protect root systems from damage or dry out to the greatest extent possible. Maintain moist condition for root system and cover exposed roots with moistened burlap.
- F. Maintain existing bench marks, monuments and other reference points, if disturbed or destroyed, replace as directed by the project Architect/Engineer.
- G. Condition of Premises: Accept site as found and excavate, fill and backfill site as indicated on the drawings and as specified in this Section.

PART 2 -- PRODUCTS

2.01 SOIL MATERIALS

- A. "Satisfactory Fill Materials" include materials classified in ASTM D2487 as GW, GP, SW and SP properly worked by Contractor to obtain optimum moisture and compaction. Within 2 feet of the surface of the indicated grade, limit rock size to 3 inches. Below 2 feet of the surface of indicated grade, limit rock size to 12 inches.
- B. "Unsatisfactory Materials" include materials other than "Satisfactory Fill Materials": however, materials of any classification that are determined by testing laboratory as too wet or too soft for providing a stable foundation for structure, paving and walks will be classified as "unsatisfactory".
- C. "Select Fill Material" Naturally or artificially graded mixture of crushed gravel, crushed stone, crushed slag, or uniform, clean, free draining sand or sand and shell containing less than 5% fines passing a No. 200 sieve.
- D. Drainage Fill: Washed, evenly graded mixture of crushed stone, or crushed or uncrushed gravel, with 100 percent passing a 1-1/2 inch sieve and not more than 5 percent passing a No. 4 sieve.
- E. Backfill and Fill Materials: Satisfactory soil materials free of clay, rock or gravel larger than 2 inches in any dimension, debris, waste, muck, vegetation and other deleterious matter.

PART 3 - EXECUTION

3.01 INSPECTION

- A. Do not proceed with the work of this section until conditions detrimental to the proper and timely completion of the work have been corrected in an acceptable manner.

3.02 GENERAL

- A. Public Safety: Accomplish work in a manner that provides for safety of the public and workers and provides for the protection of property.
- B. Construction: Do not close, obstruct or store material or equipment in streets, sidewalks, alleys or passageways without a permit in accordance with local ordinances, regulations, codes and Owner approval.
- C. Interference: Conduct operations with minimum interference with roads and other facilities.
- D. Debris Removal: Do not store or permit debris to accumulate on site.
 - 1. If Contractor fails to remove excess debris promptly, Owner reserves the right to cause same to be removed at Contractor's expense.
- E. Erosion Repair: Take every precaution and temporary measure to prevent damage from erosion of freshly graded areas.
 - 1. Repair and reestablish grades to required elevations and slopes where settlement/washing occurs prior to acceptance of work.

2. Temporary Structures: Remove temporary structures when no longer required.

3.03 LOCATIONS AND ELEVATIONS

- A. Be responsible for surveys, measurements and layouts required for proper execution of work.
 - 1. Lay out lines and grades from existing survey control system and as shown on the Drawings.
- B. Locate by stake and mark locations and elevations of the following:
 - 1. Elevations of existing earth cut and fill.
 - 2. Final grades for landscape contours.
 - 3. Other items as required to execute work under this Section of the specifications.

3.04 CLEARING AND GRUBBING

- A. Shall be in accordance with SECTION 02110 – CLEARING AND GRUBBING.

3.05 STRIPPING

- A. Strip turf, organic material, muck surface litter, rubble and overburden for entire depth of root system of grass or other vegetation and/or to bottom of muck layer within all areas of construction as indicated on Site Plan(s).
- B. Stockpile clean topsoil on site to be used in the final grading work as an underlayment for sod and landscaping proposed for the site.

3.06 EXCAVATION

- A. Shall be in accordance with SECTION 02302 – EXCAVATION AND FILL.
- B. Begin excavation after stripping, clearing and compaction where applicable, has been completed.
- C. Excavation is unclassified and includes excavation to subgrade elevations indicated, regardless of character of materials and obstructions encountered.
- D. Excavations for appurtenances and structures shall conform to dimensions and elevations and shall extend a sufficient distance from walls and footings to allow for placing and removal of forms and installation of services, except where the concrete for walls and footings is authorized to be deposited directly against excavation surfaces. All excavation below general machine excavation for footings and foundations shall be hand worked. Bottoms of all (footings and appurtenances) shall be on level planes.
- E. Remove “unsatisfactory materials” encountered from the building areas.
- F. Excavate in such a manner that quick and efficient drainage of stormwater will not be affected.
- G. Classify excavated materials and stockpile separately suitable soils for use as backfill materials. If sufficient quantities of excavated materials meeting requirements for

backfill are not available on site, provide materials meeting these requirements.

- H. Stockpile excavated material suitable for use as fill and backfill.

3.07 STABILITY OF EXCAVATIONS

- A. General: Comply with local codes, ordinances, and requirements of agencies having jurisdiction. Comply with OSHA Standard 29CFR, Section 1926-650 subpart P.
- B. Slope sides of excavations to comply with local codes, ordinances, and requirements of agencies having jurisdiction. Shore and brace where sloping is not possible because of space restrictions or stability of material excavated.
- C. Maintain sides and slopes of excavations in safe condition until completion of backfilling.
- D. Shoring and Bracing: Provide materials for shoring and bracing, such as sheet piling, uprights, stringers, and cross braces, in good serviceable condition for all trenches in excess of 5 feet deep. Maintain shoring and bracing in excavations regardless of time period that excavations will be open. Extend shoring and bracing as excavation progresses.

3.08 DEWATERING

- A. Prevent surface water and subsurface or ground water from flowing into excavations and from flooding project site and surrounding area.
 - 1. Do not allow water to accumulate in excavations, excluding proposed lake areas. Remove water to prevent softening of foundation bottoms, undercutting footings, and soil changes detrimental to stability of subgrades and foundations. Provide and maintain pumps, well points, sumps, suction and discharge lines, and other dewatering system components necessary to convey water away from excavations.
 - 2. Establish and maintain temporary drainage ditches and other diversions outside excavation limits to convey rain water and water removed from excavations to collecting or runoff areas. Do not use trench excavations as temporary drainage ditches.
- B. Dewater excavations for inspection and for construction so that no concrete or fill is placed in water and so that concrete less than 8 hours of age is not subjected to ground water pressure.
- C. Keep excavations free of water while backfilling and construction therein takes place.
- D. Dispose of water, resulting from dewatering operations in accordance with city, county, state and federal regulations.
- E. Conduct operations so that stormwater runoff sediment is not discharged to the adjacent lakes, waterways, sewers, streets and adjacent properties.

3.09 STORAGE OF EXCAVATED MATERIALS

- A. Stockpile excavated materials acceptable for backfill and fill where needed or as directed by the Owner's Representative. Place, grade, and shape stockpiles for proper drainage.
 - 1. Locate and retain soil materials away from edge of excavations. Do not store within drip line of trees indicated to remain.
 - 2. Materials not acceptable for use as backfill or fill shall be stockpiled and exchanged with over excavated material from the lake systems.
 - 3. Excavated materials may be moved off site to specified stockpile areas within 3 miles of site. Stockpile areas to be identified by Owner. No excavated materials shall be disposed of without previous written authorization by owner.

3.10 EXCAVATION FOR STRUCTURES

- A. Conform to elevations and dimensions shown within a tolerance of plus or minus 0.10 foot, and extending a sufficient distance from the footings and foundations to permit placing and removal of concrete form work, installation of services, and other construction for inspection.
 - 1. Excavations for footings and foundations:
 - a. In areas of approved compacted subgrades, do not disturb bottom of excavation. Excavate by hand to final grade just before concrete reinforcement is placed. Trim bottoms to required lines and grades to leave solid base to receive other work.
 - b. In areas requiring material exchange or densification prior to excavations, the Contractor shall comply with the recommendations of the Geotechnical Engineering Report for preparation of building subgrades prior to excavation.
 - 2. Excavation for Underground Tanks, Basins, and Mechanical or Electrical Structures: Conform to elevations and dimensions indicated within a tolerance of plus or minus 0.10 foot; plus a sufficient distance to permit placing and removal of concrete form work, installation of services, and other construction for inspection. Do not disturb bottom of excavations intended for bearing surfaces.

3.11 EXCAVATION FOR PAVEMENTS

- A. Cut surface under pavements to comply with cross-sections, elevations and grades as indicated.

3.12 TRENCH EXCAVATION FOR PIPES AND CONDUIT

- A. Shall be in accordance with SECTION 02302 – EXCAVATION AND FILL.

3.13 FILLING, BACKFILLING AND COMPACTION

- A. The work consists of compaction of existing earth surfaces, (excluding rock), after excavation, filling and compaction of said area to levels required with suitable backfill

material.

- B. Materials: "Satisfactory Fill Materials" shall be used in general fills and backfills. ALL fill used under sloped ramps to be paved and within the MSE wall structure shall be "Select Fill Material".
- C. Filling and Backfilling: Place "Satisfactory Fill Material" in horizontal layers not exceeding 12 inches in loose depth. Compact as specified herein. No material shall be placed on surfaces that are muddy.
- D. Compaction: Compaction shall be with equipment suited to soil being compacted. Moisten or aerate material, as necessary to provide moisture content that will readily facilitate obtaining specified compaction with equipment used. Compact each layer to not less than percentage of maximum density specified below, determined in accordance with ASTM D1557, Method D. Insure that the compaction of previously prepared fill areas has been maintained prior to placing new layers.

<u>AREA</u>	<u>PERCENTAGE</u>
Under pavements and sidewalk areas, top 12 inches, each layer.	98
Under pavements and sidewalk areas, below 12 inches, each layer.	98
Under landscaped areas, each layer	95

- E. Reconditioning of Subgrade: Where approved compacted subgrades are disturbed by the Contractor's subsequent operations or adverse weather, subgrade shall be scarified and compacted as specified herein before to required density prior to further construction thereon. Re-compaction over underground utilities shall be by power driven hand tampers.
- F. Backfilling: Backfilling shall not begin until construction below finish grade has been accepted, underground utilities systems have been inspected, tested, and accepted, forms removed, and excavation cleaned of trash and debris. Backfill shall be brought to indicated finish subgrade. Backfill shall not be placed in wet areas. Backfill materials and compaction shall be as specified herein. Heavy equipment for spreading and compacting backfill shall not be operated closer to foundation or retaining walls than a distance equal to height of backfill above top of footing; area remaining shall be compacted by power-driven hand tampers suitable for material being compacted. Backfill shall be placed carefully around pipes to avoid damage.
- G. Protection: Settlement or washing that occurs in backfilled areas prior to acceptance of work shall be repaired and grades re-established to required elevations and slope.
- H. Backfill trenches with concrete where trench excavations pass within 18 inches of column or wall footings and that are carried below bottom of such footings or that pass under wall footings. Place concrete to level of bottom of adjacent footing.
- I. Do not backfill trenches until tests and inspections have been made and backfilling is authorized by the Project Architect/Engineer. Use care in backfilling to avoid damage or displacement of pipe systems.
- J. Backfill excavations as promptly as work permits, but not until completion of the

following:

1. Inspection, testing and approval by Owner's Representative, and locations (horizontal and vertical) of underground utilities have been performed and recorded.
2. Removal of shoring and bracing, and backfilling of voids with satisfactory materials. Cut off temporary sheet piling driven below bottom of structures and remove in manner to prevent settlement of the structure of utilities, or leave in place if required.
3. Removal of trash and debris from excavation.

3.14 GRADING

- A. General: Uniformly grade areas within limits of grading under this section, including adjacent transition areas. Smooth finished surface within specified tolerances, compact with uniform levels or slopes between points where elevations are indicated or between such points and existing grades. Grading between indicated elevations and/or contours to be uniform, continuous and sloped as indicated on the drawings.
- B. Grading Outside Building Lines: Grade areas adjacent to building lines to drain away from structures and to prevent ponding. Finish surfaces free from irregular surface changes as follows:
 1. Lawn or Unpaved Areas: Finish areas to receive stockpiled topsoil to within not more than 0.10 foot above or below required subgrade elevations.
 2. Walks: Shape surface of areas under walks to line, grade, and cross-section, with finish surface not more than 0.10 foot above or below required subgrade elevation.
 3. Pavements: Shape surface of areas under pavement to line, grade and cross-section, with finish surface not more than ½ inch above or below required subgrade elevation.
- C. Grading Surface of Fill under Building Slabs: Grade smooth and even, free of voids, compacted as specified, and to required elevation. Provide final grades within a tolerance of ½ inch when tested with a 10-foot straightedge.
- D. Compaction: After grading, compact subgrade surfaces to the depth and indicated percentage of maximum or relative density for each classification.

3.15 PAVEMENT SUB-BASE COURSE

- A. General: Sub-base course consists of placing sub-base material, in layers of specified thickness, over subgrade surface to support a pavement base course.
 1. Refer to Drawings and other Division 2 Paving and Sub-base Sections for paving specifications.
- B. Grade Control: During construction, maintain lines and grades including crown and cross-slope of sub-base course.

- C. Shoulders: Place shoulders along edges of sub-base course to prevent lateral movement. Construct shoulders of acceptable soil materials, placed in such quantity to compact to thickness of each sub-base course layer. Compact and roll at least a 12-inch minimum width of shoulder simultaneous with the compaction and rolling of each layer of sub-base course.
- D. Placing: Place sub-base course material on prepared subgrade in layers of uniform thickness, conforming to indicated cross-section and thickness. Maintain optimum moisture content for compacting sub-base material during placement operations.
 - 1. When a compacted sub-base course is indicated to be 6 inches thick or less, place material in a single layer. When indicated to be more than 6 inches thick, place material in equal layers, except no single layer more than 6 inches or less than 3 inches in thickness when compacted.

3.16 FILL AND GRADING FOR GRASSED AREAS

- A. Fill Material under Grassed Areas: Clean, satisfactory fill, free from rock and debris and of such quality to not interfere with future installation of grass.
- B. Filling and Grading for Grassed Areas: Rough grade shall be 6 inches below finish grade and the 4 inches of base material shall be omitted.
 - 1. Topping: 6 inches of compacted topsoil as specified in SECTION 02302-EXCAVATION AND FILL.
- C. Filling and Grading for Landscaped Areas other than Grass: Similar, with variations per specific plant material, as defined , illustrated and specified on the Landscape Plans.

3.17 FIELD QUALITY CONTROL

- A. Specified Tests shall be performed by the Contractor's Testing Agency, at the Contractor's expense, with results forwarded to the Project Architect/Engineer for review.
- B. Quality Control Testing During Construction: Allow testing service to inspect and approve each subgrade and fill layer before further backfill or construction work is performed.
- C. Tests of Materials shall be as follows:
 - 1. Soil Classification:
 - a. One test from each type of material encountered and/or proposed to be used.
 - 2. Laboratory Tests for Moisture Content and Density:
 - a. According to ASTM D1557 one test for each material encountered and/or proposed.
 - b. Field Tests for Moisture Content and Density:

- c. According to ASTM D1556 one test per layer of fill per 10,000 square feet of area, plus one test per 10,000 square feet of subgrade in cut.
 3. Control: Fill and topsoil mixture may be inspected at any stage of operation to determine compaction characteristics, densities and freedom from organic and plastic materials.
- D. Perform field density tests in accordance with methods listed in Item C.
1. Footing Subgrade: For each strata of soil on which footings will be placed, perform at least one test to verify required design bearing capacities. Subsequent verification and approval of each footing subgrade may be used on a visual comparison of each subgrade with related tested strata when acceptable to the Project Architect/Engineer.
 2. Paved Areas and Building Slab Subgrade: Perform at least one field density test of subgrade for every 2,000 sq. ft. of paved area or building slab, but in no case fewer than three tests. In each compacted fill layer, perform one field density test for every 2,000 sq. ft. of overlaying building slab or paved area, but in no case fewer than three tests.
 3. Foundation Wall Backfill: Perform at least two field density tests at locations and elevations as directed.
 4. If in the opinion of the Project Architect/Engineer, and based on testing service reports and inspections, any subgrade or fills that have been placed which are below specified densities shall require additional compaction and testing until the specified density is obtained.
- E. Notification:
1. Give sufficient notification of placing orders for fill and topsoil with supplier to permit full inspection including testing for compaction characteristics at source of supply.
 2. Obtain approval from Project Architect/Engineer before placing topsoil mixture at project site, without exception.

3.18 EROSION CONTROL

- A. Provide erosion control methods in accordance with requirements of the project. Repair and re-establish grades to required elevations and slopes where erosion has occurred prior to Owners acceptance of the work.
- B. The Contractor shall install erosion control methods adjacent to any lakes, ditches and/or wetlands which are adjacent to the project site whereby the quality of such would be degraded by runoff, erosion and sedimentation in accordance with the plans, permits and the Stormwater Pollution Prevention Plan.

3.19 MAINTENANCE

- A. Protection of Graded Areas: Protect newly graded areas from traffic and erosion. Keep free of trash and debris.

- B. Repair and re-establish grades in settled, eroded, and rutted areas to specified tolerances.
- C. Reconditioning Compacted Areas: Where completed compacted areas are disturbed by subsequent construction operations or adverse weather, scarify surface, reshape, and compact to required density prior to further construction.
- D. Settling: Where settling is measurable or observable at excavated areas during general project warranty period in the opinion of the Project Architect/Engineer, the Contractor shall remove surface (pavement, lawn, or other finish), add backfill material, compact, and replace surface treatment. Restore appearance, quality, and condition of surface or finish to match adjacent work, and eliminate evidence of restoration to greatest extent possible.

3.20 DISPOSAL OF WASTE MATERIALS

- A. Excavated materials, including unsuitable materials, may be moved off site to specified stockpile areas within 3 miles of site. Stockpile areas to be identified by Owner. No excavated materials shall be disposed of without previous written authorization by owner.
- B. Materials authorized for removal from Owner's Property: Contractor shall remove waste materials, including trash, and debris, and dispose of it off of Owner's property at a landfill or equivalent site, approved by the local Government Authorities.

**** END OF SECTION ****

SECTION 02302**EXCAVATION AND FILL****PART 1 - GENERAL****1.01 REFERENCES**

The publications listed below form a part of this specification to the extent referenced. The publications are referred to in the text by the basic designation only.

A. AMERICAN SOCIETY FOR TESTING AND MATERIALS (ASTM)

1. ASTM C 33(1999; Rev. A) Concrete Aggregates
2. ASTM C 136(1996; Rev. A) Sieve Analysis of Fine and Coarse Aggregates
3. ASTM D 698(1991; R 1998) Laboratory Compaction Characteristics of Soil Using Standard Effort (12,400 ft-lbf/ft (600 kN-m/m))
4. ASTM D 1140(1997) Amount of Material in Soils Finer Than the No. 200 (75-Micrometer) Sieve
5. ASTM D 1556(1990; R 1996) Density and Unit Weight of Soil in Place by the Sand-Cone Method
6. ASTM D 1557(1991; R 1998) Laboratory Compaction Characteristics of Soil Using Modified Effort (56,000 ft-lbf/ft (2,700 kN-m/m))
7. ASTM D 2321(1989; R 1995) Underground Installation of Thermoplastic Pipe for Sewers and Other Gravity-Flow Applications
8. ASTM D 2487(1998) Classification of Soils for Engineering Purposes (Unified Soil Classification System)
9. ASTM D 2922(1996) Density of Soil and Soil-Aggregate in Place by Nuclear Methods (Shallow Depth)
10. ASTM D 3017(1996) Water Content of Soil and Rock in Place by Nuclear Methods (Shallow Depth)
11. ASTM D 4318(1998) Liquid Limit, Plastic Limit, and Plasticity Index of Soils

B. AMERICAN WATER WORKS ASSOCIATION (AWWA)

1. AWWA C600(1999) Installation of Ductile-Iron Water Mains and their Appurtenances

1.02 DEFINITIONS**A. Hard Materials**

Weathered rock, dense consolidated deposits, or conglomerate materials which

are not included in the definition of "rock" but which usually require the use of heavy excavation equipment, ripper teeth, or jack hammers for removal.

B. Rock

Solid homogeneous interlocking crystalline material with firmly cemented, laminated, or foliated masses or conglomerate deposits, neither of which can be removed without systematic drilling and blasting, drilling and the use of expansion jacks or feather wedges, or the use of backhoe-mounted pneumatic hole punchers or rock breakers; also large boulders, buried masonry, or concrete other than pavement exceeding 1/2 cubic yard in volume. Removal of hard material will not be considered rock excavation because of intermittent drilling and blasting that is performed merely to increase production.

C. Cohesive Materials

Materials ASTM D 2487 classified as GC, SC, ML, CL, MH, and CH. Materials classified as GM and SM will be identified as cohesive only when the fines have a plasticity index greater than zero.

D. Cohesionless Materials

Materials ASTM D 2487 classified as GW, GP, SW, and SP. Materials classified as GM and SM will be identified as cohesionless only when the fines have a plasticity index of zero.

1.03 SUBMITTALS

A. Test Reports to be obtained and paid for by Contractor

Fill and backfill optimum density test where specified
Select material optimum density and gradation tests
Compaction density tests where specified
In-place density tests where specified

1.04 DELIVERY, STORAGE AND HANDLING

Perform in a manner to prevent contamination or segregation of materials.

1.05 CRITERIA FOR BIDDING

Base bids on the following criteria:

- A. Surface elevations are as indicated.
- B. Ground water elevations indicated by the boring log were those existing at the time subsurface investigations were made and do not necessarily represent ground water elevation at the time of construction.
- C. Material character is indicated by the boring logs.
- D. Blasting will not be permitted. Remove material in an approved manner.

PART 2 - PRODUCTS

2.01 SOIL MATERIALS

Free of debris, roots, wood, scrap material, vegetation, refuse, soft unsound particles, and deleterious or objectionable materials. Unless specified otherwise, the maximum particle diameter shall be one-half the lift thickness at the intended location.

A. Common Fill

Common shall consist of sandy-loam, sand, gravel, soft shale, or crushed stone. The Engineer shall be the sole judge of what constitutes suitable and unsuitable material for backfill from "on-site excavations."

B. Select Material

Select Fill shall consist of uniform, clean, free draining sand or sand and shell containing less than 5% fines passing a No. 200 sieve. Laboratory test results of this fill shall be submitted to the Engineer for his approval.

C. Topsoil

Natural, friable soil representative of productive, well-drained soils in the area, free of: subsoil; stumps; rocks larger than 1-inch diameter; brush; weeds; toxic substances; and other material detrimental to plant growth. Amend topsoil pH range to obtain a pH of 5.5 to 7.

PART 3 - EXECUTION OF WORK

3.01 SURFACE PREPARATION

A. Clearing and Grubbing

Unless indicated otherwise, remove trees, stumps, logs, shrubs, and brush within the clearing limits. Remove stumps entirely. Grub out matted roots and roots over 3 inches in diameter to at least 24 inches below existing surface.

B. Stripping

Strip existing topsoil to a minimum depth of 6 inches without contamination by subsoil material. Remove all existing topsoil with organic roots and materials. Stockpile topsoil separately from other excavated material and locate convenient to areas for soils exchange.

C. Unsuitable Material

All cleared, grubbed and demolished material deemed unsuitable shall be stockpiled on-site by the Contractor per the instructions in Specification 02300 – SITE EARTHWORK.

D. Disposal

In all areas where excavation is to be done, all earth, rock, muck and other materials shall be removed and separated as to suitable and unsuitable material for backfill as defined herein.

The Contractor shall stockpile all unsuitable fill and backfill material at a location of the owner's choice within three miles of the site. The stockpiled material shall be piled in an orderly manner so as not to endanger the work or obstruct roadways or drainage within the designated job site location. Waste, brush, refuse, stumps, roots, timber, etc. shall be removed from the site and disposed of in an approved manner.

3.02 PROTECTION

A. Sheeting and Bracing

1. Where excavations may endanger workmen, existing structures, utilities or other facilities, it shall be the Contractor's responsibility to immediately install and maintain adequate sheeting and bracing per OSHA specifications in order to protect said facility. No work shall proceed in such excavations until the sheeting and bracing has been properly and completely installed. The sheeting thus installed shall be removed as the work progresses or, at the discretion of the Engineer, be cut off below finished grade and left in place. Sheeting and bracing may be either steel or wood at the option of the Contractor.
2. Sheeting and bracing shall be installed in a manner that will allow for removal without injuring or endangering workmen, the work, adjacent structures, and the like. Voids caused by withdrawal of sheeting shall be promptly and completely filled with sand and compacted to a degree equal to the surrounding soil.

B. Drainage and Dewatering

Provide for the collection and disposal of surface and subsurface water encountered during construction.

1. Drainage

So that construction operations progress successfully, completely drain construction site during periods of construction to keep soil materials sufficiently dry. The Contractor shall establish/construct storm drainage features (ponds/basins) at the earliest stages of site development, and throughout construction grade the construction area to provide positive surface water runoff away from the construction activity and/or provide temporary ditches, swales, and other drainage features and equipment as required to maintain dry soils. When unsuitable working platforms for equipment operation and unsuitable soil support for subsequent construction features develop, remove unsuitable material and provide new soil material as specified herein. It is the responsibility of the Contractor to assess the soil and ground water conditions presented by the plans and specifications and to employ necessary measures to permit construction to proceed.

2. Dewatering

All water encountered during excavation shall be promptly and completely removed to a depth below the exposed excavation surface sufficient to provide a dry working surface. The excavation shall be kept dry until the work to be built or placed therein has been completed as specified. Dewatering shall be done in a manner that will not cause sloughing or caving of the excavation walls. Water from said dewatering shall be disposed of in a manner as will not result in violations of State water quality standards in receiving waters, nor cause injury to public health nor to public or private property, nor to the work completed or in progress. Any and all damage caused by dewatering shall be promptly repaired by the Contractor at no cost to the Owner. The receiving point for water from said operation shall be approved by the applicable regulatory agency and the Engineer. The Contractor is responsible for obtaining all required permits and any other approval necessary.

C. Underground Utilities

Location of the existing utilities indicated is approximate. The Contractor shall physically verify the location and elevation of the existing utilities indicated prior to starting construction. The Contractor shall contact Call Sunshine at 1-800-432-4770, 48 hours prior to commencement of excavation for assistance in locating existing utilities.

D. Machinery and Equipment

Movement of construction machinery and equipment over pipes during construction shall be at the Contractor's risk. Repair, or remove and provide new pipe for existing or newly installed pipe that has been displaced or damaged.

3.03 EXCAVATION

Excavate to contours, elevation, and dimensions indicated. Reuse excavated materials that meet the specified requirements for the material type required at the intended location. Keep excavations free from water. Excavate soil disturbed or weakened by Contractor's operations, soils softened or made unsuitable for subsequent construction due to exposure to weather. Refill with common fill and compact to 95 percent of ASTM D 1557 maximum density. Unless specified otherwise, refill excavations cut below indicated depth with common fill and compact to 95 percent of ASTM D 1557 maximum density.

A. Pipe Trenches

Excavate trenches to uniform width, sufficiently wide to provide ample working room and a minimum of 9 to 12 inches of clearance on both sides of the pipe or conduit. Grade bottom of trenches to provide uniform support for each section of pipe after pipe bedding placement.

B. Excavate trenches to depth indicated or required to establish indicated slope and invert elevations and to support bottom of pipe or conduit on undisturbed soil.

1. Where rock is encountered, carry excavation 6 inches below required elevation and backfill with a 6-inch layer of tamped sand or gravel prior to installation of pipe.

2. For pipes or conduit less than 6 inches in nominal size, and for flat-bottomed, multiple-duct conduit units, do not excavate beyond indicated depths. Hand-excavate bottom cut to accurate elevations and support pipe or conduit on undisturbed soil.
3. For pipes and equipment 6 inches or larger in nominal size, shape bottom of trench to fit bottom of pipe for 90 degrees (bottom 1/4 of the circumference). Fill depressions with tamped sand backfill. At each pipe joint, dig bell holes to relieve pipe bell of loads and to ensure continuous bearing of pipe barrel on bearing surface.

3.04 FILLING AND BACKFILLING

Fill and backfill to contours, elevations, and dimensions indicated. Compact each lift before placing overlaying lift.

A. Unsuitable Material Replacement

1. Fill material shall be placed and spread evenly in layers not to exceed twelve inches before compaction. All fill material shall be free from vegetable matter, wood, and other deleterious substances, and shall not contain rocks or clods having a diameter of more than three inches.

B. Pre-fill Compaction

1. Should the pre-fill surface elevation be below that required for the base of proposed building foundations or paving subgrade, the areas within road rights-of-ways, under parking areas, and the areas under and within five feet of proposed buildings shall be pre-compacted. This pre-compaction shall be performed equally on existing ground and on surfaces which have been excavated to remove unsuitable material. The top one foot of said areas shall be compacted to a minimum density of 95% of maximum as determined by AASHTO T-180. The maximum spacing between density tests shall be 150 feet.

C. Compaction

1. Backfill material shall be compacted to 95% of maximum density per AASHTO T-180. Equipment suitable and adequate for uniform compaction to the specified density shall be used for backfill operations subject to the approval of the Engineer. All compaction equipment shall be in good working order and any worn or defective equipment shall be immediately replaced or repaired.

D. Soil Stability and Compaction Control

1. The Contractor shall arrange to have sufficient soil tests made by an independent testing laboratory selected by the Engineer to demonstrate conformance of his work with the stability and compaction levels required by these specifications. Compaction tests shall be taken at intervals listed herein or as deemed necessary by the Engineer.
2. Any proposed alternative test methods to those specified herein must be approved by the Engineer prior to testing. At the request of the Engineer, the

Contractor shall provide such documentation of a proposed alternative test method as the Engineer may require to evaluate the method for approval.

3. In no case shall the Contractor proceed with construction on compacted material until the tests prove satisfactory and approval is given by the Engineer.
4. In general, at least one test for maximum dry density/optimum moisture content shall be performed on a representative sample of each inherently different material to be used for compacted backfill or embankment fill. For material of uniform composition and textural class, a minimum of one test per 200 cu. yd. of material shall be performed at the point of use.
5. Tests for in-place density (percent compaction) shall be taken at locations designated by the Engineer. The Contractor shall have density tests taken in four (4) separate locations. Each location shall be tested in lifts not to exceed 12-inches in thickness.

E. Trench Backfilling

Backfill as rapidly as construction, testing, and acceptance of work permits. Place and compact backfill under structures and paved areas in 12-inch lifts to top of trench and in 6-inch lifts to one foot over pipe outside structures and paved areas.

1. Bedding Requirements

Except as specified otherwise in the individual piping section, provide bedding for buried piping in accordance with AWWA C600, Type 4, except as specified herein. Backfill to top of pipe shall be compacted to 95 percent of ASTM D 698 maximum density. Plastic piping shall have bedding to spring line of pipe. Provide ASTM D 2321 materials as follows:

Class I: Angular, 0.25 to 1.5 inches, graded stone, including a number of fill materials that have regional significance such as coral, slag, cinders, crushed stone, and crushed shells.

Class II: Coarse sands and gravels with maximum particle size of 1.5 inches, including various graded sands and gravels containing small percentages of fines, generally granular and non-cohesive, either wet or dry. Soil Types GW, GP, SW, and SP are included in this class as specified in ASTM D 2487.

3.05 COMPACTION

Expressed as a percentage of maximum density. Determine in-place density of existing subgrade; if required density exists, no compaction of existing subgrade will be required.

A. General Site

Compact underneath areas designated for vegetation and areas outside the 5-foot line of the structure to 95 percent of ASTM D 1557.

3.06 FINISH OPERATIONS**A. Grading**

Finish grades as indicated on the plans to within two inches. In areas where sodding is required, finished soil grade shall be set 3-inches below the plan elevation to compensate for sod thickness. For existing grades that will remain but which were disturbed by Contractor's operations, grade as directed.

B. Protection of Surfaces

Protect newly graded areas from traffic, erosion, and settlements that may occur. Repair or reestablish damaged grades, elevations, or slopes.

**** END OF SECTION ****

SECTION 02318**SWALE CONSTRUCTION****PART 1 - GENERAL****1.01 RELATED DOCUMENTS**

Drawing and general provisions of Contract, including General and Supplementary Conditions and Division 1 General Requirements, apply to this Section, as well as Section 02300 Site Earthwork, and Section 02302 Excavation and Fill.

PART 2 - PRODUCTS

N/A

PART 3 -EXECUTION OF WORK

- 3.01** Fine grading of swales shall be accomplished after the existing ground has been excavated and compacted to within 3-inches of the design elevations. Fine grading of the swale areas will be done by a motor grader unless otherwise approved or directed by the Engineer. Hand dressing will not be required except where shown on the Drawings or in confined areas where equipment operation is restricted.
- 3.02** The Contractor shall maintain and keep open and free from: rainfall runoff; leaves; sticks, rubble, and other debris, all graded swales shall be kept clean of debris and "fines" by the Contractor until final acceptance of the work. The swales should be constructed as late as possible in the work schedule to allow for immediate sodding. No sod shall be allowed to be placed on fines which have washed into the graded swale.
- 3.03** The finished grade shall be completed and shaped to a surface which varies no more than 2-inches above or below the Plan elevations except that, adjacent to pavement, catch basin, or sidewalk, the swale shall be graded to within 3-inches below the edge of the pavement, catch basin or sidewalk.
- 3.04** In areas where sodding is required, finished soil grade shall be set 3-inches below the plan elevation to compensate for sod thickness.
- 3.05** Compaction to a specific density will not be required unless so directed by the Engineer. However, swales shall be compacted to a firm, even surface true to grade and cross section. All swales must be rolled.
- 3.06** Fine grading of the swale areas shall preferably be done prior to paving the asphalt-bearing course. If the Contractor chooses to fine grade the swale areas subsequent to paving, he must exercise extreme care when dressing areas adjacent to pavement areas to avoid damage to the pavement. No handling of swale material shall be permitted on the pavement surface.
- 3.07** Immediately before seeding or sodding, all fines deposited in the swales from rainfall runoff or other construction debris shall be removed and the swales fine dressed by breaking the soil surface and providing a loose soil texture to place the seed or sod onto.

- 3.08** After final dressing of the swales, the Contractor shall seed or sod them as required by the Drawings.

**** END OF SECTION ****

SECTION 02630
STORM SEWERAGE

PART 1 - GENERAL

1.01 REFERENCES

The publications listed below form a part of this section to the extent referenced:

- A. American Association of State Highway and Transportation Officials (AASHTO).
 - 1. AASHTO M 288(Latest Edition)- Standard Specification for Interim Geotextile Specification for Highway Applications
 - 2. AASHTO T180 – Moisture-Density Relationship of Soils Using a 10lb. Rammer and an 18-inch Drop.
- B. American Concrete Pipe Association (ACPA)
 - 1. ACPA O1-103(Latest Edition)- Concrete Pipe Installation Manual
- C. ASTM International (ASTM)
 - 1. ASTM A 48(Latest Edition)– Standard Specification for Gray Iron Castings
 - 2. ASTM A 798(Latest Edition)- Standard Practice for Installing Factory-Made Corrugated Steel Pipe for Sewers and Other Applications
 - 3. ASTM A 849(Latest Edition)– Standard Specification for Post-Applied Coatings, Pavings and Linings for Corrugated Steel Pipe
 - 4. ASTM C 139(Latest Edition)- Standard Specification for Concrete Masonry Units for Construction of Catch Basins and Structures
 - 5. ASTM C 32(Latest Edition)- Standard Specification for Sewer and Manhole Brick (Made from Clay or Shale)
 - 6. ASTM C 76(Latest Edition)- Standard Specification for Reinforced Concrete Culvert, Storm Drain, and Sewer Pipe
 - 7. ASTM C 387(Latest Edition) - Standard Specification for Packaged, Dry, Combined Materials for Mortar and Concrete
 - 8. ASTM C 1450(Latest Edition)– Standard Specification for Non-Asbestos Fiber-Cement Storm Drainage Pipe
- D. Florida Department of Transportation – Standard Specifications for Road and Bridge Construction (Latest Edition)

1.02 SUBMITTALS

A. Shop Drawings

Coordination Drawings in accordance with paragraph entitled, "Drawings," of this section.

B. Product Data

Five (5) copies of Manufacturer's catalog data shall be submitted for the following:

- Piping
- Gaskets
- Compression Joints
- Frames, Covers and Gratings
- Precast Concrete Structures
- Precast Concrete Base Sections

A Work Plan shall be submitted in accordance with paragraph entitled, "Plans," of this section.

- Proposed Schedules
- Methods
- Materials
- Equipment

1.03 DRAWINGS

Contractor shall submit Coordination Drawings interferences for construction. Details of catch basins and Structures shall be shown with proper elevations.

1.04 PLANS

A Work Plan shall be submitted noting Proposed Schedules, Methods, Materials and Equipment.

PART 2 - PRODUCTS

2.01 BONDING AND SEALING MATERIALS

A. Bituminous Coating and Sealing

Coating shall be in accordance with ASTM A 849

Coating shall be in accordance with ASTM A 849, when using materials previously coal-tar coated and for each uncoated ferrous piece used underground.

Cold Bituminous Mastic Sealer shall be in accordance with ASTM A 849 trowel consistency.

B. Epoxy Bonding Compound

Epoxy adhesive material shall be in accordance with AWWA C210.

2.02 FILTER MATERIAL

A. Filter Fabric

Fabric shall be in accordance with AASHTO M 288, and be water pervious, made of polyester materials. Where required, fabric shall be Amoco Propex 4545, or equal, approved by Engineer prior to ordering.

B. Filter Aggregate

Aggregate shall be clean gravel free from organic materials, clay, or other deleterious materials.

2.03 MANHOLE AND CATCH-BASIN MATERIALS

Water, for use with concrete block and brick, shall be clean and potable.

A. Concrete Block and Mortar

Concrete block shall be in accordance with ASTM C 139.

Concrete Mortar shall be in accordance with ASTM C 387, Type M

B. Brick and Mortar

Brick shall conform to ASTM C 32, Grade MS

Brick Mortar shall conform to ASTM C 387

2.04 PRECAST CONCRETE STRUCTURES, RISERS AND PRECAST CONCRETE BASE SECTIONS

Concrete Structures, risers, base sections, and tops shall be pre-cast and conform to ASTM C 478.

Precast parts shall be as shown in the plans.

2.05 FRAMES, COVERS AND GRATINGS

Manhole, catch-basin, and sump frames, covers, and gratings shall be in accordance with F.D.O.T. - STANDARD SPECIFICATIONS FOR ROAD AND BRIDGE CONSTRUCTION (LATEST EDITION) - SECTION 425 - Inlets, Structures and Junction Boxes.

Cast iron materials shall be provided. Cast iron shall conform to ASTM A 48, Class 30, minimum.

Gratings shall be as specified in the plans.

2.06 CONDUIT PIPING, JOINTS, FITTINGS AND GASKETS**A. Corrugated Steel Pipe**

Where shown on the Drawings as "CMP", the drainage pipe and required coupling bands shall be corrugated galvanized steel and shall conform to the requirements of Section 943 of the FDOT Specifications.

B. Corrugated Aluminum Pipe

Where shown on the Drawings as "Aluminum CMP" or "CAP", the drainage pipe and required coupling bands shall be corrugated aluminum and shall conform to the requirements of Section 945 of the FDOT Specifications.

C. Concrete Pipe

Where shown on the Drawings as RCP, the drainage pipes shall be steel reinforced concrete pipe meeting the requirements of ASTM C76 (Class III) and Sections 942 of the FDOT Specifications, unless otherwise noted.

D. PVC Pipe

Where shown on the Drawings as PVC, the drainage pipe and fittings shall be Sch. 40, Polyvinyl Chloride, and shall conform to the requirements of Section 948-4 of the FDOT Specifications, unless otherwise noted.

E. High Density Polyethylene (HDPE) Under Drain Pipe

Where shown on the Drawings as HDPE Under Drain Pipe, the pipe and fittings shall be double wall, perforated polyethylene. The pipe shall have a protective, polyester sock, and O-ring, gasketed, bell and spigot joints. Pipe shall be type N-12, as manufactured by Advanced Drainage Systems, Inc. (or approved equal).

F. Bituminous Pipe Coating

Where shown on the Drawings as Asphalt Coated, metal pipe, "ACCMP", the pipe and fittings shall be bituminous coated inside and out in conformance with Section 943 of the FDOT Specifications.

G. Mitered End Sections

Mitered end sections shall be constructed in accordance with the applicable D.O.T. Road Design Standard Index (No. 272, 273 or 274) called for on the Drawings.

PART 3 - EXECUTION OF WORK

3.01 EXCAVATION AND BACKFILL

- A. Type 2 material shall be used for initial backfill and subsequent backfill with the following conditions: Initial backfill shall be predominately sandy material free from rock or stone greater than 1 1/2 inches diameter. The maximum allowable dimension of a stone or rock fragment for subsequent backfill shall be 6 inches. If in the opinion of the Engineer the Type 2 material will not provide adequate and uniform support for load distribution to the pipe, the Contractor shall obtain and place either Type 1 or Type 3 backfill as determined by the Engineer.
- B. All excavated material not suitable for backfill shall be placed on site at a location acceptable to Owner, or hauled off the job at the price set forth in the accepted Bid Documents. All material that is brought in from other sources for backfill shall be at the price set forth in the Contract.
- C. Excavated material to be used for backfill shall be neatly deposited at the sides of the trenches where space is available to protect against caving or sloughing into the trench. Where stockpiling of excavated material is required, the Contractor shall coordinate the site location with the Engineer and shall maintain his operations to provide for natural drainage and not present an unsightly appearance. No excavated material shall be placed on private property without the consent of the property owner.

3.02 GRADING

Grading shall be performed in accordance with Section 02302 EXCAVATION AND FILL.

3.03 PIPE INSTALLATION

All pipe and structures shall be installed on dry, firm bedding. The free-water surface shall be lowered to at least 12 inches below the bedding surface prior to placing pipe or structures and shall be maintained at that depth throughout bedding, haunching, and initial backfilling of the work. During subsequent backfilling, the water level shall be kept sufficiently below the working surface to allow compaction of backfill to the required density, and until required density tests have been performed.

A. Pipe Installation

Excavations shall be trimmed to required elevations. Objects which impair backfilling or compaction shall be removed. Over-excavation shall be corrected with fill material of coarse aggregate.

Pipe and fittings shall be inspected for defects before installing. Defective materials shall be removed from site.

Pipe interior shall be cleaned before installation. Pipe ends shall be sealed when work is not in progress.

Pipe shall be laid to line and grade, with bell end upstream.

Maximum deviation from design elevation shall not exceed 0.1 feet at any point in the system.

1. Unless otherwise specified herein or directed by the Engineer, all pipe and fittings shall be laid and joined in accordance with the appropriate manufacturer's directions with regard to allowable barrel and joint deflection, spigot seating depth, gasket placement, lubrication, bolt torque, field cutting/trimming, and pushing/pulling methods for joint assembly.
2. Prior to placing in the trench, each pipe section, joint, and fitting shall be checked for damage or defects such as cracks, blisters, coating/lining separation, gouges, and the like. Any damage or defective materials found shall not be installed unless approved by the Engineer, and shall be marked "REJECTED" and immediately removed from the work site.
3. Prior to installation, the interior of all pipe and fittings shall be inspected for debris, sediment accumulation, sand, and the like, and shall be cleaned as required to remove such foreign matter. Joint surfaces such as gaskets, gasket grooves, spigots, and bells shall be cleaned of sand and grit prior to joining.
4. Gasket lubricants shall be stored and applied in a manner that will prevent significant contamination or pick-up of sand and grit.
5. The pipe spigot shall be centered in and aligned with its mating bell prior to insertion and forced evenly in a straight line to seating depth, taking care not to over-bell the joint. Where required, deflections shall be made after the joint is seated.
6. Joining shall generally be done by hand or by push-bar with a cushion block whenever pipe size and weight permit. When a mechanical pushing/pulling device such as chain-puller, come-along, and the like is required, the device shall be used in a manner that will not deform gouge, chip, or otherwise damage the pipe or cause significant disturbance of the prepared bedding. In no case shall joints be made by "popping-on" or swinging the spigot into the bell to seat the joint.
7. Fittings and appurtenances shall be fully, independently supported on the bedding or on a permanent foundation so as not to bear on the pipe upon completion of the installation.
8. The installed piping system shall be kept free of dirt, trench water, and other foreign matter during the progress of the work, and all open ends of the line shall be sealed with watertight plugs whenever work is not in progress.
9. Empty installed pipe shall be secured against flotation due to potential trench flooding by timely placement of sufficient backfill or approved anchoring devices sufficient to resist pipe buoyancy.

B. Corrugated Metal Pipe Installation

Corrugated pipe with fittings shall be installed in accordance with manufacturer's instructions, and in accordance with ASTM A 798.

C. Reinforced Concrete Pipe Installation

Reinforced concrete pipe and fittings shall be installed in accordance with manufacturer's instructions, and ACPA O1-103.

3.04 PIPE BEDDING

A. Class A (Concrete Cradle or Concrete Arch Bedding)

1. This class of bedding shall be used only where specifically shown in the Drawings or directed by the Engineer. If the use of a concrete cradle is required the pipe shall be bedded in a monolithic cradle of a 1,500 PSI concrete with a minimum thickness equal to $1/4$ the outside pipe diameter or to a minimum of four inches under the barrel, whichever is greatest, and extending up to the sides of the pipe to a height equal to $1/2$ of the outside pipe diameter. The cradle shall have an overall width equal to $1-1/4$ of the outside diameter of the pipe or a minimum width equal to the outside diameter of the pipe plus eight inches, whichever is greater.
2. If a concrete arch is required, the pipe shall be embedded in carefully compacted Type 1 material having a minimum thickness equal to $1/4$ the outside pipe diameter or to a minimum of four inches under the barrel, whichever is greater, and extending up the sides for a height equal to $1/2$ of the outside pipe diameter. The top half of the pipe shall be covered with a monolithic Class C concrete arch having a minimum thickness equal to $1/4$ the outside diameter of the pipe or a minimum of four inches over the crown of the pipe, whichever is greater, and extending down the sides for a depth equal to $1/2$ of the outside pipe diameter. The arch shall have an over all width equal to $1\ 1/4$ of the outside diameter of the pipe or a minimum width equal to the outside diameter of the pipe plus eight inches, whichever is greater.

B. Class B (First-Class Bedding)

1. Where Class B Bedding is required, the trench shall be excavated below the planned bottom of the pipe to a depth equal to $1/4$ the nominal diameter of the pipe, or 6 inches, whichever is greater. The over excavated depth shall be backfilled using either Type 1 or Type 3 materials carefully compacted and shaped using hand tools so as to provide a uniform support for the lower portion of the pipe barrel. Shaping under the pipe bells shall be so that the bell does not support the pipe and joints can be made without bedding material interference.
2. At the option of the Contractor, Class B Bedding may be used in place of Class C (Ordinary Bedding) provided that the exercise of this option shall create no additional expense to the Owner. The Contractor shall notify the Engineer in writing of those portions of the project on which he proposes to exercise this option.

C. Class C (Ordinary Bedding)

1. The bottom of the trench shall be hand shaped to provide a firm bedding for

the utility pipe. The utility shall be firmly bedded in undisturbed firm soil. The bedding shall be shaped so that the pipe will be in continuous contact therewith for its full length and shall provide a minimum bottom segment for the pipe equal to 0.6 of the outside diameter of the barrel. Excavation under the bell shall be sufficient so that the bell does not support the pipe and the joint can be made without interference.

D. Unsuitable Bedding Material

1. Class C Bedding shall be used for all pipeline construction unless otherwise shown on the Drawings or unless unsuitable material is encountered at the bedding surface. In the event that the materials encountered at normal bottom of trench excavation are, in the judgment of the Engineer, unsuitable to act as foundation for the pipe, such material shall be excavated for the full width of the trench to the depth necessary to obtain a suitable foundation. The Engineer will notify the Contractor, in writing, of the necessity for and extent of the material to be removed and the Contractor shall remove such unsuitable material as soon as possible and backfill in accordance with the requirements for Class B Bedding. All unsuitable material shall be disposed of by the Contractor.

3.05 PIPE TRENCH BACKFILL

A. Initial Backfill

1. Initial backfill shall be placed as soon as possible after laying the pipe and shall maintain a pace with the pipe laying so that no more than five pipe joints separate laying and backfilling operations. Initial back fill shall include all haunching and backfill from the top of the bedding to a compacted depth of twelve inches over the pipe. All haunching and backfilling shall be done in the dry.
2. Initial backfill shall be done as specified below:
 - a. Haunching of the pipe shall be by hand placement and compaction of material in maximum 4-inch layers from the bottom of the trench to the springline of the pipe, taking care to fill all voids below and around the pipe. Backfilling shall be carefully continued in layers not exceeding 6 inches in thickness for the full trench width until the compacted fill is 12 inches above the top of the pipe.
 - b. During initial backfilling the fill shall be deposited evenly along both sides of the pipe from a height not to exceed 2 feet above the top of pipe, and fill shall not be dropped directly on the unprotected pipe surface.
 - c. Where thrust blocks, encasement, or other cast-in-place concrete items are below grade, no backfilling shall start until the specific items have been inspected and approved by the Engineer or his authorized representative.
 - d. The backfill to one foot above the top of the utility shall be thoroughly compacted with curved end tamping bars under and on each side of the

pipe and flat tamped between the pipe and trench wall and shall be completed before the remainder of the trench is backfilled. Initial backfill shall be compacted to 100 percent of maximum density as determined by AASHTO T-180. No subsequent backfill will be permitted until the initial backfill has been accepted by the Engineer or his authorized representative.

3.06 UNDERGROUND STRUCTURES

- A. Excavation for drainage structures shall be of sufficient size to permit construction of the structure to progress without hindrance from the walls of the excavation or from sloughed materials. No less than 12 inches clearance shall be provided between excavation walls and walls of the structure. If soil conditions encountered at the bottom of the excavation would in the sole opinion of the Engineer be unsuitable for foundation, the Contractor shall remove and dispose of the unsuitable material to the depth where suitable bearing can be obtained. The determination of the necessity for and the extent of additional excavation shall be made by the Engineer, who shall inform the Contractor in writing regarding such necessity and the extent. This excavation shall then be backfilled to the appropriate grade with Type 1 or Type 3 backfill material, placed in 12- inch layers and compacted to a density equal to 100 percent of the maximum density as determined by AASHTO T-180.
- B. Installation of drainage structures shall conform to the details as shown on the Drawings and, unless otherwise specified, shall conform with Section 425 of the Florida D.O.T. Standard Specifications for Road and Bridge Construction. Backfill shall be placed in lifts not to exceed 12 inches loose depth and compacted to 95 percent of maximum density per AASHTO T-180 in unpaved areas and to required subgrade density in areas of paving or curbing.

Backfill shall not be placed against cast-in-place concrete structures until the concrete has attained sufficient strength to resist the load without damage, and in no case, less than seven days after the concrete was placed.

3.07 SUBSEQUENT BACKFILL

- A. Subsequent backfill is that backfill between the initial backfill and the finished ground level or bottom of sub base.
- B. Subsequent backfill material shall be placed full trench width in horizontal layers not exceeding 12 inches loose depth and compacted by power-operated tampers, rollers, or vibratory equipment to a density equal to 98 percent of the maximum density as determined by AASHTO T-180 for pipe placed under and adjacent to roadways or paved surfaces, and 95 percent under areas where no pavement is to be constructed and vehicular traffic is not to pass over the pipe. Each layer shall be compacted to the specified density prior to placing subsequent layers. The thickness of the loose layer may be increased when in-place density tests show that the specified density can be obtained.

3.08 BACKFILL MATERIAL

- A. Type 2 material shall be used for initial backfill and subsequent backfill with the following conditions: Initial backfill shall be predominately sandy material free from rock or stone greater than 1 1/2 inches diameter, and the maximum allowable dimension of a stone or rock fragment for subsequent backfill shall be 6 inches. If in the opinion of the Engineer the Type 2 material will not provide adequate and uniform support for load distribution to the pipe, the Contractor shall obtain and place either Type 1 or Type 3 backfill as determined by the Engineer.
- B. All excavated material not suitable for backfill shall be placed on site at an acceptable location, by Owner, or hauled off the job at the price set forth in the accepted Bid Documents. All material that is brought in from other sources for backfill shall be at the price set forth in the Contract.
- C. Excavated material to be used for backfill shall be neatly deposited at the sides of the trenches where space is available to protect against caving or sloughing into the trench. Where stockpiling of excavated material is required, the Contractor shall coordinate the site location with the Engineer and shall maintain his operations to provide for natural drainage and not present an unsightly appearance. No excavated material shall be placed on private property without the consent of the property owner.

3.09 COMPACTION

Puddling or jetting shall not be permitted when compacting bedding materials.

3.10 DENSITY TESTS

- A. The Contractor shall arrange to have sufficient soil tests made by an independent testing laboratory selected by the Engineer to demonstrate conformance of his work with the stability and compaction levels required by these specifications. Compaction tests shall be taken at intervals listed herein or as deemed necessary by the Engineer.
- B. Any proposed alternative test methods to those specified herein must be approved by the Engineer prior to testing. At the request of the Engineer, the Contractor shall provide such documentation of a proposed alternative test method as the Engineer may require to evaluate the method for approval.
- C. In no case shall the Contractor proceed with construction on compacted material until the tests prove satisfactory and approval is given by the Engineer.
- D. In general, at least one test for maximum dry density/optimum moisture content shall be performed on a representative sample of each inherently different material to be used for compacted backfill or embankment fill. For material of uniform composition and textural class, a minimum of one test per 5000 cu. yd. of material shall be performed at the point of use.
- E. Generally, in-place density tests shall be performed at each structure and at approximately 50-foot intervals along pipe installations for each lift, or; at a minimum, one test near each end of individual pipe installations for each 12-inch

lift. Additional density tests may be required by the Engineer. If any tests results are unsatisfactory, the Contractor shall re-excavate and recompact the backfill at his expense until the required compaction is obtained.

3.11 FIELD QUALITY CONTROL

Installed pipe shall be inspected by Engineer. Displaced or misaligned pipe, infiltration, accumulation of debris, or other defects shall be corrected by the Contractor at no additional cost to the Owner.

3.12 AS-BUILT DRAWINGS

During the installation of Drainage Pipe and Structures the Contractor shall keep accurate Record Drawings of the construction showing the location of all changes in alignment, services, utility crossings, and similar data. Items shall be located from permanent objects such as centerline of street, manholes, valves, etc. Upon completion of the project the Contractor shall deliver to the Engineer an As-Built Drawing showing the above information.

**** END OF SECTION ****

SECTION 02714
STABILIZED SUBGRADE

PART 1 - GENERAL

1.01 SCOPE

Under this item, the Contractor shall furnish all equipment, labor, materials, and transportation necessary to construct a stabilized subgrade course upon the completed stabilized subgrade.

1.02 REFERENCES

Standards applicable in this Specification shall be:

- A. Florida Department of Transportation - Standard Specifications for Road and Bridge Construction (latest edition)
- B. American Association of State Highway and Transportation Officials (AASHTO)
 - 1. AASHTO T-180 - Test for Moisture-Density Relations of Soils using a 10 lb. Rammer and an 18-inch Drop.
- C. ASTM International (ASTM)
 - 1. ASTM D 1557 - Test Method for Laboratory Compaction Characteristics of Soil Using Modified Effort
 - 2. ASTM D 2167 - Density and unit weight of soil in place by the rubber balloon method
 - 3. ASTM D 2922 (2001) - Standard Test Methods for Density of Soil and Soil-Aggregate in Place by Nuclear Methods (Shallow Depth)

1.03 DESCRIPTION

The subgrade will be constructed such that after being compacted it will conform to the lines and grades as shown on the Drawings. The subgrade shall be Type-B (LBR), stabilized and constructed in accordance with the latest edition of the Florida D.O.T. Specifications, Section 160.

PART 2 - MATERIALS

- 2.01** The subgrade shall have a minimum Florida Bearing Value of 50 as determined by the Florida Soil Bearing Test. In an area where the bearing value is less than 50, stabilizing material approved by the Engineer shall be furnished by the Contractor, spread and mixed in accordance with Section 160-5.3 "Mixing" of the Latest Edition of the Florida D.O.T. Specifications.

PART 3 - EXECUTION OF WORK

- 3.01** The subgrade shall be shaped, graded, and rolled to conform to the lines and grades as

shown on the Drawings. Fine grading of the subgrade to its final profile shall be accomplished after the existing ground has been excavated as close as possible to the design elevations. In fill areas, fine grading of the subgrade shall be accomplished after fill is spread and compacted in accordance with Section 5 of these Specifications.

- 3.02 Record Drawing elevations shall be confirmed to meet design drawing grades prior to placement of base material.
- 3.03 The top of the subgrade in both cuts and fills shall be compacted to a minimum of 98 percent of the maximum dry density to the depth specified on the Plans. The required density shall be maintained until the base course has been constructed. The subgrade shall be compacted with an approved self-propelled steel drum or pneumatic tired roller weighing not less than 8 tons. All hollows and depressions which develop under rolling shall be filled in with suitable material. The process of grading and rolling shall be repeated until no depressions develop. After compaction, the top surface of the fine grade shall be true to line and grade at all locations. If the fine grade becomes rutted or displaced due to any cause whatsoever, the Contractor shall regrade it and recompact it. Ditches, drains, and swales shall be maintained along the completed subgrade section after their construction.
- 3.04 In no case shall the Contractor proceed to construct the base course on the subgrade until the subgrade has been tested for Florida Bearing Values, compaction, checked for line and grade, and approval given by the Engineer.
- 3.05 Material and Compaction Testing
- A. Florida Bearing Value tests on the subgrade shall be taken at a minimum of four (4) test locations per 10,000 sf of area to be paved, where designated by the Engineer.
 - B. The maximum density and optimum moisture shall be determined in accordance with the Modified Proctor Test procedures of AASHTO T180 (Method D as modified by the F.D.O.T.). The percentage compaction and in place density shall be determined according to procedures of ASTM D2167 "Test for Density of Soil In Place by the Rubber Balloon Method" or the nuclear method ASTM D2922.
 - C. Each material which is inherently different in composition from other subgrade material and which is used over a widespread area of the project, will necessitate an additional Modified Proctor Test.

END OF SECTION

SECTION 02770**CONCRETE PAVEMENT****PART 1 -- SCOPE**

- 1.01 The work covered under this section shall include concrete sidewalks and driveways. It shall include all materials, equipment, labor, finishing, form work and curing.
- 1.02 All driveways shall be poured 6-inches thick, 3,000 psi concrete to the widths required. Concrete driveways shall have a thickened edge on the sides, and where it meets pavement.

PART 2 -- GENERAL

- 2.01 The concrete shall be a workable plastic mix composed of Portland cement, fine aggregate, coarse aggregate, air and water proportioned and mixed to provide the strength of concrete called for upon the Plans. The water-cement ratio shall be kept to the minimum necessary to achieve proper placing and finishing. Any item relative to concrete or reinforcing under this item that is not covered herein, shall be in accordance with the ACI 318-71 Building Code and the Design and Control of Concrete Mixtures by Portland Cement Association.
- 2.02 Concrete mixing may be done in a portable mixer, a transit-mix truck, or if less than five cubic feet, in a mortar box; provided all ingredients including water are accurately measured by weight or volume.
- 2.03 Transit mix trucks shall not wash out their trucks on the site without the specific permission of the Engineer and any waste concrete shall be removed to a public dump.

PART 3 -- CEMENT

- 3.01 Cement shall be Portland cement conforming to ASTM C150 types I, IA, III and /or IIIA. Cement, if delivered to site, shall be in unbroken paper bags plainly marked with the manufactures name, the brand name, the type of cement, and the weight of cement in the bag. All cement shall be properly protected against dampness. Bags containing caked cement shall be rejected. Cement shall be used in the same order as received; that is first in, first out.

PART 4 -- AGGREGATES

- 4.01 Aggregates shall conform to Florida Department of Transportation Specifications for Road and Bridge Construction (Latest Edition). Stockpiling of aggregates shall be done in such a manner as to prevent segregation or contamination.

PART 5 -- AIR ENTRAINMENT

- 5.01 Air entrainment is required and shall be maintained between 3 and 6 percent considered as an optimum. Concrete showing more than 6 percent may be rejected.

PART 6 -- ADMIXTURES

6.01 Admixtures other than for air entrainment shall not be used without the specific written approval of the Engineer.

PART 7 -- FORMS

7.01 Forms shall be built to provide a neat and workmanlike finished job. The forms shall be mortar-tight and of sufficient strength material to prevent any bulging or sagging from true line and grade and to withstand vibrating. Form ties shall not be used.

PART 8 -- REINFORCING

8.01 Reinforcing for concrete sidewalks and driveways shall be "Fibermesh" fibers incorporated into the concrete mix.

PART 9 -- PLACEMENT AND INSPECTION

9.01 The Contractor shall give the Engineer sufficient advance notice of his intent to pour concrete to permit inspection of the forms, placement of reinforcing steel, and equipment for mixing, transporting and placing of the concrete. No concrete will be placed prior to completion of the form work and placing of the reinforcing to the Engineer's satisfaction. No concrete shall be placed unless an adequate vibrator and adequate provisions for curing are on hand. Concrete test cylinders will be made by the Engineer's representative at random and at any time there is doubt about the quality of the concrete. Failure of the concrete to come up to design strength will be cause for rejection and replacement of the structure.

9.02 Every effort shall be made to obtain a water tight and durable concrete free from voids, rock pockets and the like. Should defects occur, they will be called to the Engineer's attention and repaired in accordance with his directive or, if extensive replaced.

9.03 Concrete finish on exposed surfaces shall be as designated by the Engineer.

PART 10 -- CONSTRUCTION JOINTS

10.1 Control, expansion and construction joints shall be spaced and completed in accordance with the details shown on the Drawings.

PART 11 -- CURING**11.1 GENERAL**

The concrete shall be continuously cured for a period of at least 7 days. 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. Any curing material removed or damaged during the 7 day period shall be replaced immediately.

After forms are removed, the surfaces exposed shall be cured by placing a berm of moist earth against them or by any of the methods described below, for the remainder of the 7 day curing period.

- A. Wet Burlap Method: Burlap shall be placed over the entire exposed surface of the concrete with sufficient extension beyond each side to insure complete coverage. Adjacent strips shall be overlapped a minimum of six inches. The burlap shall be held securely in place such that it will be in continuous contact with the concrete at all times and no earth shall be permitted between the burlap surfaces at laps or between the burlap and the concrete. The burlap shall be kept thoroughly wet throughout the curing period.
- B. Membrane Curing Method: Clear membrane curing compound or white-pigmented curing compound shall be applied by hand sprayer in a single-coat continuous film at a uniform coverage of at least one gallon to each 200 square feet. Any cracks, checks or other defects appearing in the coating shall be recoated immediately. The curing compound shall be thoroughly agitated in the drum prior to application, and during application as necessary to prevent settlement of the pigment.
- C. Polyethylene Sheeting Method: Polyethylene sheeting shall be placed over the entire exposed surface of the concrete, with sufficient extension beyond each side to insure complete coverage. Adjacent strips shall be overlapped a minimum of six inches. The sheeting shall be held securely in place such that it will be in continuous contact with the concrete at all times.

END OF SECTION

SECTION 02800**SODDING, SEEDING AND MULCHING****1. GENERAL****A. Description**

- 1) This section specifies requirements for sodding, seeding and mulching of road shoulder, ditches, embankments, and other areas left barren by construction or as indicated on the drawings, to establish a dense stand of grass. Restoration of sod, or seed and mulch shall follow completion of acceptable testing results within 14 calendar days. However, in no case shall the area of construction be allowed to remain unrestored more than 30 days after pipeline installation, or for more than 2000 linear feet of area disturbed by construction, whichever is less.

B. Quality Assurance

- 1) The Contractor shall be required to install and maintain the sodded or seeded area until a dense stand of grass has been obtained.

2. MATERIALS**A. Seed**

- 1) Grass seed shall be a mixture of Bermuda seed and Pensacola bahia seed. In addition, brown top millet will be included during summer months and annual rye in the winter months.

B. Sod

- 1) Where sodding will adjoin, or be in close proximity to private lawns, sod shall be of the type currently in place, otherwise sod shall be of centipede or bahia grass. Where St. Augustine sod is in place, restoration of sod shall be with the "Floritam" variety only.

C. Mulch

- 1) Dry mulch shall be straw or hay, consisting of oat, rye, or wheat straw, or of pangola, peanut, coastal Bermuda or bahia grass hay.

D. Fertilizers

- 1) Commercial fertilizers shall comply with the State of Florida fertilizer laws. The chemical designation of the fertilizer shall be 8-0-8, indicating the minimum percentages (respectively) of (1) total nitrogen, (2) available phosphoric acid, and (3) water-soluble potash, contained in the fertilizer.

E. Tackifier

- 1) Clay-based hydrophilic colloid, "RMB Plus", or an approved equal

F. Hydroseeding Paper Fiber Mulch

- 1) Regenerated or recycled paper fiber by Central Fiber Corporation, or an approved equal.

3. EXECUTION

A. Tilling

- 1) After the grades have been restored to the original elevations or established as shown on the drawings, the soil shall be tilled to a depth of at least 4 inches until the condition of the soil is acceptable to the Resident Project Inspector. When drought, excessive moisture, or other unsatisfactory conditions prevail, the work shall be stopped when directed. On areas where the ground is sufficiently loose, particularly on road shoulders, the Resident Project Inspector, at his discretion, may authorize the elimination of tilling.

B. Fertilizing

- 1) An initial application of fertilizer shall be applied at a rate of 1,000 pounds per acre. Fertilizer shall be spread using a mechanical device capable of uniformly distributing the material at the specified rate.
- 2) A second application of fertilizer shall be applied at a rate of 400-500 pounds per acre within 90 calendar days after the initial application on projects that have not been accepted prior to this time.

C. Sodding

- 1) Sodding shall be installed along all pavement edges for a minimum 4 foot width where the shoulder has been disturbed by construction, and at the locations indicated on the drawings or where required to restore existing stands of sod damaged or destroyed during construction of this project. Sod shall also be placed over all embankments and ditch banks disturbed by construction where the slope exceeds a one (1) foot rise over a six (6) foot run.
- 2) Sodding shall be incorporated into the project at the earliest practical time in the life of the contract. No sod, which has been cut for more than 72 hours, shall be used unless specifically authorized by the Engineer after his careful inspection thereof. Any sod, which is not planted within 24 hours after cutting, shall be stacked in an approved manner and maintained properly moistened.
- 3) The sod shall be placed on the prepared surface, with edges in close contact, and shall be firmly and smoothly embedded by light tamping with appropriate tools.
- 4) Where sodding is used in drainage ditches, the setting of the pieces shall be staggered, such as to avoid a continuous seam along the line of flow. Along the edges of such staggered areas the offsets of individual strips shall not exceed six inches. In order to prevent erosion caused by vertical edges at

the outer limits, the outer pieces of sod shall be tamped so as to produce a feathered edge effect.

- 5) On areas where the sod may slide, due to height and slope, the Engineer may direct that the sod be pegged, with pegs driven through the sod blocks into firm earth, at suitable intervals.
- 6) Any pieces of sod which, after placing, show an appearance of extreme dryness shall be removed from the work and replaced by the Contractor at no additional expense to the Owner.

D. Seeding

- 1) Except as specified above for sodding locations, all disturbed, non-surface course areas shall be seeded immediately after completion of the regrading work.
- 2) Seeding shall be installed using a five (5) separate step method:

Step 1: Sow seed using a spreader or seeding machine. Do not seed when wind velocity exceeds 5 mph. Distribute seed evenly over entire area by sowing equal quantity in two directions at right angles to each other.

Seed mix is indicated in item 4 below. Sow not less than the specified amount on the schedule. Do not use seed that is wet, damp, moldy, or otherwise damaged in transit, storage or through handling.

Mix the specified 8-0-8 slow release formula fertilizers in with the seed at the rate of 1,000 pounds per acre of seedbed.

Step 2: Rake seed lightly into top ¼" of soil, roll lightly and water with a fine spray.

Step 3: Spray seedbeds with a fine mist until soil is damp.

Step 4: Protect seeded beds from drying out and against wind or storm water erosion.

Spread a straw seeding mulch with a straw blowing machine within 24 hours of completion of the seeding operation. Spread uniformly to form a continuous blanket not less than 1" thick, loose measurement. Straw pieces shall be 3" – 6" in length

Step 5: Anchor mulch by spraying with a seeding mulch with tackifier as specified, Spread 80 lbs. of tackifier (2 lbs. per 1,000 sq.ft.) mixed with a slurry of 600 gallons of water and 2 bales of green paper fiber mulch per acre.

If millet or rye grass does not appear within 6 weeks, reseed with seasonally specified seed species. Use hydroseed machine and mix seed into a slurry at a rate of 1lb. per 1,000 sq.ft. Add 4 bales of paper fiber mulch and 2 lbs. of tackifier per 1,000 sq.ft. Add 1 gallon of specified liquid fertilizer every 10,000 sq.ft.

- 3) The Contractor shall use the grass seed mixture shown below and sow evenly with an approved mechanical seeder. The grass seed mixture shall be sown at the rates indicated below. Extreme care shall be taken during seeding and raking to insure that no change shall occur in the finished grades, and that the seed is not raked from one spot to another.
- 4) Seed will be applied at not less than the following rate:

Bermuda	30 lb. per acre
Bahia	120 lb. per acre
Annual Rye	40 lb. per acre (Oct-March)
Brown-Top Millet	40 lb. per acre (Apr-Sept)

E. Watering

- 1) The restored areas shall be watered so as to provide optimum growth conditions for the establishment of the grass. In no case, however, shall the period of maintaining such moisture be less than two weeks after planting.
- 2) Water shall be delivered and evenly dispersed at a specified rate and in a manner to prevent waste and erosion. Watering equipment shall be of a type that prevents damage to the finished surface.

F. Maintenance

- 1) The Contractor shall maintain the sodded or seeded areas until final acceptance by the Owner. Maintenance shall include, but not be limited to, reseeding or sodding of any bare areas, proper watering, and refilling of rutted areas. The Contractor shall maintain the desired level of moisture necessary to maintain vigorous, healthy growth. The surface layer of soil must be kept damp by frequent light watering with a fine spray during the germination period after seeding. After the grass is established, and during periods of drought, water shall be applied once a week and shall be in sufficient quantity to penetrate the soil to a depth of 6 inches.
- 2) Maintenance of grass areas shall consist of watering, repair of all erosion, resodding, and reseeding, as necessary, to establish a uniform stand of grass, and shall continue until acceptance. After the grass has started, all of the areas greater than 8 inch square which fail to show a uniform stand of grass for any reason whatsoever shall be resodded or reseeded repeatedly until all areas are covered with a satisfactory growth of grass.
- 3) Grassed areas shall be accepted only after the restored area has achieved an 80 percent minimum coverage of a healthy, green stand of grass.

NOTE:

Final project payment (retainage) shall not be approved until within thirty (30) days after the last sodding has been placed or until all sodded and seeded areas are growing with a dense stand of healthy, green grass (not weed), whichever occurs last.

END OF SECTION