

TECHNICAL SPECIFICATIONS
FOR
39TH STREET STORMWATER IMPROVEMENT PROJECT

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SECTION 01270
MEASUREMENT AND PAYMENT

Part I GENERAL

1.01 Description

- A Payment for all Work done in compliance with the Contract Documents, inclusive of furnishing all manpower, equipment, materials, and performance of all operations relative to construction of this project, will be made under Pay Items listed herein. Work for which there is not a Pay Item will be considered incidental to the Contract and no additional compensation will be allowed.

- B The CONTRACTOR shall take no advantage of any apparent error or omission in the Drawings or Specifications, and the OWNER'S REPRESENTATIVE shall be permitted to make corrections and interpretations as may be deemed necessary, for fulfillment of the intent of the Contract Documents.

- C The OWNER'S REPRESENTATIVE will make measurements and determinations, as necessary, to classify the work within pay items and determine the quantities for pay purposes.

- D Where pay item numbers are shown on the bid form, they generally follow FDOT pay item number formatting; however, they are only provided in order to use them for pay application purposes. FDOT pay item descriptions do not apply; utilize the descriptions on the bid form and within this section to determine the work associated with each pay item.

Part II PAY ITEMS

2.01 Mobilization (PAY ITEM No. 1.01)

- A Mobilization/Demobilization includes preparatory work and operations in mobilizing for beginning work on the project, including, but not limited to those operations necessary for the movement of personnel, equipment, preconstruction video, supplies and incidentals to the project site and to remove all personnel, equipment, excess supplies and incidentals for the project site at the completion of the Work. Mobilization/Demobilization shall not exceed 5% of the total Bid. 80% of Mobilization may be claimed upon job startup once the requirements of Section 01505 – Mobilization are met. The remaining 20 % may be claimed at Substantial completion.

- B Unit of measure is Lump Sum

2.02 Bonds, Insurance, Taxes, etc. (PAY ITEM No. 1.02)

A Bonds, insurance and taxes as required by the General Conditions.

B Unit of measure is Lump Sum

2.03 Erosion Control/BMPs (PAY ITEM No. 1.03)

A Work includes preparation and implementation of all stormwater pollution prevention and erosion control measure as identified on the CONTRACT PLANS or as needed, including installation and maintenance of silt fence, inlet protection, and other Best Management Practices per FDOT Index No. 102, monitoring, inspecting, and reporting as applicable, preparing and filing EPA NPDES NOI and NOT forms, and providing required contractor certifications.

B Unit of measure is Lump Sum.

2.04 Core Existing Basins for 18” Pipe, Mud in Pipe and Finish Site Grading (PAY ITEM No. 2.01)

A Work includes necessary excavation around structure and modification as specified in the Contract Plans.

B Unit of measure is Each

2.05 Furnish & Install 18-inch RCP (PAY ITEM No. 2.02)

A Work includes excavation of trench, installation of pipe bedding, installation of pipe at grades specified in contract plans and connection/grouting to structures.

B Unit of measure is Linear Foot.

2.06 Furnish & Install FDOT Type “C” Catch Basin (PAY ITEM No. 2.03)

A Work includes procurement, transportation, preparation of base layers, installation of acceptable Type C basin, including approved grate, at the location shown on the Contract Plans, protection throughout construction, and care during establishment.

B Unit of measure is Each.

2.07 Furnish & Install 12-inch HDPE (N-12) Storm Pipe (with Fittings) (PAY ITEM No. 2.04)

A Work includes excavation of trench, installation of pipe bedding, installation of pipe at grades specified in contract plans and connection/grouting to structures.

B Unit of measure is Linear Foot.

2.08 Furnish & Install Pump Station Wet Well 10'x10'x11' (PAY ITEM No. 2.05)

A Work includes excavation of fill, placement of structure to grade specified, backfilling and compacting, electric connection and start-up.

B Unit of measure is Each.

2.09 Furnish & Install Pump Station Valve Box 10'x10'x7' (PAY ITEM No. 2.06)

A Work includes excavation of fill, placement of structure to grade specified, backfilling and compacting, and start-up.

B Unit of measure is Lump Sum.

2.10 Furnish & Install 2500 GPM Axial Flow Pumps (PAY ITEM No. 2.07)

A Work includes installation of axial flow pumps and accessory components into Pump Structure, installation of Pumps onto Rail Mounts, setting of floats at elevations specified in the contract plans, electric connection and start-up.

B Unit of measure is Each.

2.11 Furnish & Install 12-inch Check Valves in Valve Box (PAY ITEM No. 2.08)

A Work includes installation of valves

B Unit of measure is Each.

2.12 Furnish & Install 12-inch Plug Valves in Valve Box (PAY ITEM No. 2.09)

A Work includes installation of valves

B Unit of measure is Each.

2.13 Furnish & Install 4-inch Air Release Valve (PAY ITEM No. 2.10)

A Work includes installation of valve

B Unit of measure is Each.

2.14 Furnish & Install Interconnection (Ductile Iron) Pipe between Catch Basin & Well (PAY ITEM No. 2.11)

A Work includes excavation, installation, fittings and all connections from the Valve Box to the Cath Basin/Well Structure and from the Wet Well to the Valve Box.

B Unit of measure is Lump Sum.

2.15 Furnish & Install Electrical Service and Equipment (PAY ITEM No. 2.12)

A Work includes installation and connection of the Control Panel from the FKEC Electrical point of service as identified on the CONTRACT PLANS, and pulling and connection of wires. This includes trenching, backfilling, conduit, pull boxes, wiring, hand hole, control panel, mounting and testing of the control panel, meter, brackets, fittings, and all other appurtenances necessary to complete all electrical work as identified in the CONTRACT PLANS.

B Unit of measure is Lump Sum.

2.16 Install Well Pipe Tee, & Cap (PAY ITEM No. 2.13)

A Work includes excavation, installation, fittings and all connections of the 24-inch tee located inside the well control structure, as shown on the Contract Plans.

B Unit of measure is Lump Sum.

2.17 Furnish & Install 30F Snout to Well Box (PAY ITEM No. 2.14)

A Work includes installation of snouts at grades specified in contract plans and connection/grouting to structures.

B Unit of measure is Each.

2.18 Pavement Restoration (PAY ITEM No. 2.15)

A Work includes the restoration of pavement on all roadway cuts and for maintenance cuts in a driveable condition, includes all materials (i.e. asphalt, base, subbase, sod), and density testing (1 test per 12” max lift/ per travel lane/per crossing).

B Unit of measure is Square Yard

Part III EXECUTION - NOT USED

END OF SECTION 01270

SECTION 01300
SUBMITTALS

Part I GENERAL

1.01 Construction Schedules

- A The CONTRACTOR shall submit two copies of Progress Schedules indicating the starting and completion dates of the various stages of the work. The proposed Progress Schedules shall be submitted to the OWNER'S REPRESENTATIVE prior to the preconstruction meeting. The CONTRACTOR shall distribute copies of the Progress Schedules during the preconstruction meeting for discussion. The Progress Schedules shall be updated by the CONTRACTOR and submitted to the OWNER'S REPRESENTATIVE, as a part of applications for progress payments, through completion of the Work. Failure to update progress schedule may be the basis for rejection of applications for progress payments.

- B The CONTRACTOR, if applicable, shall submit two copies of Schedules of Value of the work to the OWNER'S REPRESENTATIVE. A preliminary Schedule of Values shall be submitted by the CONTRACTOR prior to the preconstruction meeting. A final Schedule of Values, presented in sufficient detail to serve as the basis for payments during construction, shall be submitted to the OWNER'S REPRESENTATIVE for approval at least ten (10) days prior to submitting the first Application for payment.

1.02 Applications For Payment

- A The CONTRACTOR shall submit Applications for payment to the OWNER'S REPRESENTATIVE in accordance with the provisions of the General Conditions and in accordance with OWNER requirements. Applications for Payment shall be made on forms provided by the OWNER.

1.03 Shop Drawings, Product Data and Samples

- A The CONTRACTOR shall submit shop drawings, product data and samples, as required by the individual Specification Sections, to the OWNER'S REPRESENTATIVE.

- B Shop drawings shall be presented in a clear and thorough manner. Details shall be identified by reference to Contract Drawing Number and Detail and Contract Specification Section and Page Number.

- C The product data shall be presented in a clear and thorough manner identified the same as the shop drawings. Included with the information shall be performance characteristics and capacities depicting dimensions and clearances required. The manufacturer's standard schematic drawings and diagrams shall be modified to delete information which is not applicable to the work. Manufacturer's standard information shall be supplemented to provide information specifically applicable to the work.

- D Samples shall be of sufficient size and quantity to clearly illustrate functional characteristics of the product with integrally related parts and attachment devices depicting full range of color, texture and pattern.
- E The CONTRACTOR shall make submittals in accordance with the approved schedule, and in such sequence as to cause no delay in the work or in the work of any CONTRACTOR. No damages will be awarded or extension of time granted due to the shop drawing and product data review process.
- F The CONTRACTOR shall submit an entire package of shop drawings and product data information for major items of work so that the OWNER'S REPRESENTATIVE can review the package as a unit.
- G The number of submittals required shall be six (6) copies of each shop drawing or product data information sheet. Submittals shall contain the following information:
- (i) Field dimensions, clearly identified as such.
 - (ii) Relation to adjacent or critical features of the work or materials.
 - (iii) Applicable standards, such as ASTM or Federal Specification Numbers.
 - (iv) Identification of deviations from Contract Documents.
 - (v) Identification of revisions on re-submittals.
 - (vi) CONTRACTOR'S stamp indicating as a minimum the Project Title, Date of Submission, Date of Previous Submission, and Contract Specification Section Reference which shall be initialed or signed, certifying the review and approval of submittal per General Conditions, 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.
- H The ENGINEER shall affix a stamp and initials or signature and indicate confirmation or requirements for re-submittal. The OWNER'S REPRESENTATIVE shall return to the CONTRACTOR three (3) copies of the product data information for distribution or for resubmission.
- I The CONTRACTOR shall make all corrections or changes in the submittals required by the OWNER'S REPRESENTATIVE and resubmit. The CONTRACTOR shall indicate any changes which have been made other than those requested by the OWNER'S REPRESENTATIVE.

1.04 Specification Section Requirements

- A Miscellaneous schedules, field reports, test reports, affidavits, certificates, permits, agreements and other items identified in the Technical Specification Sections, or as requested by the OWNER'S REPRESENTATIVE. As a minimum, these submittals should be identified with the Project File, Date of Submission, and Contract Specification Section Reference.

1.05 Manufacturer's Operation and Maintenance Data

- A The CONTRACTOR shall furnish seven (7) copies of all operation and maintenance data required by the various Technical Sections. Prior to 50 percent completion of the Project, the CONTRACTOR shall have submitted one (1) acceptable copy to the OWNER'S REPRESENTATIVE.
- B The operation and maintenance data shall be bound in a suitable three-ring binder(s). A Table of Contents shall be provided in the front of each binder to list the various sections of the Manual.
- C The information to be provided in each section for each piece of equipment and project component shall include but not be limited to: detailed equipment drawings; sections cut through all of the major equipment and sub-assemblies; installation and operational procedures; complete wiring and piping schematics; lubrication materials and procedures; maintenance procedures; and parts lists complete enough to permit identification of parts by nomenclature, number and use.
- D At the front of each section a maintenance schedule shall be provided for each piece of equipment in the section. The schedule shall display the daily, weekly, monthly, semi-annual, annual or fraction thereof, lubrication and preventative maintenance required in order to meet warranty conditions and the manufacturer's recommendations for optimum performance and life of the unit. A common schedule format is to be developed and used for all of the sections.

Part II PRODUCTS – NOT USED

Part III EXECUTION – NOT USED

END OF SECTION 01300

SECTION 01310
ADMINISTRATIVE REQUIREMENTS

Part I GENERAL

1.01 Section Includes

- A Meetings
- B Construction progress documentation
- C Submittals
- D Record documents

1.02 Preconstruction Meeting

- A The OWNER will schedule a preconstruction meeting prior to beginning the Work to review shop drawing procedures, submittal requirements, and construction administration requirements (project coordination and communication). The CONTRACTOR shall bring to the preconstruction meeting the proposed construction schedule, which will be reviewed with the OWNER during the meeting.

1.03 Progress Meetings

- A The frequency of progress meetings shall be determined during the preconstruction meeting. As a minimum, progress meetings shall be held once per week during construction.
- B The CONTRACTOR and OWNER shall attend the progress meetings.

1.04 Record Drawings

- A As the Work progresses, the CONTRACTOR shall be responsible for recording information on the approved Contract Documents concurrently with construction progress. This field copy shall be maintained in the field office in clean and legible condition. It shall be available for inspection by the OWNER or ENGINEER at any time and its completeness and accuracy will be used in evaluation of applications for payment.
- B Mark on the Contract Drawings all changes in direction and location of structure, piping, equipment, electrical, and mechanical work.
- C If requested, mark on the Specifications the manufacturer, trade name, catalog, and supplier of each product actually installed, and mark changes made by Change Order or Field Order.

- D All Record Drawings shall be prepared by CONTRACTOR in ACAD format using base drawings provided by the OWNER. As-built information shall be field verified, measured, certified, signed and sealed by the CONTRACTOR's licensed Surveyor who will be responsible for the accuracy of all dimensions and elevations.
- E The as-built information shown on the Record Drawings is to include, but not be limited to, the following:
- (i) Horizontal locations and vertical elevations for all installed utility lines and storm structures including but not limited to manholes, valves, inlets and cleanouts, etc.
 - (ii) Horizontal and vertical data for any construction that deviates from the approved Engineering drawings.
 - (iii) Where the plans contain specific horizontal location data, such as station and offset, the as-built drawings are to reflect the actual horizontal location.
 - (iv) Where the plans contain specific vertical elevation data, the as-built drawings are to reflect the actual measured vertical elevation.
 - (v) Deliver to OWNER'S REPRESENTATIVE two sets of Record Drawings signed and sealed by CONTRACTOR's surveyor plus one electronic copy (ACAD format) of the drawings. Also deliver the original red-line field copy to the OWNER'S REPRESENTATIVE.

Part II PRODUCTS - Not Used

Part III EXECUTION - Not Used

END OF SECTION 01310

SECTION 01400
GENERAL QUALITY CONTROL

Part I GENERAL

1.01 Description of Requirements

A Definitions

- (i) Specific quality control requirements for the work are indicated throughout the Contract Documents. In particular, quality control provisions for manufactured products are specified in individual work sections and in other related sections; and are not repeated in this section. The requirements of this section are primarily related to the performance of the work beyond the furnishing of manufactured products. The term "Quality Control" includes, but is not necessarily limited to, inspection and testing and associated requirements. This section does not specify or modify the OWNER'S REPRESENTATIVE's duties relating to Contract quality review and observation.

1.02 Quality Assurance

A General Workmanship Standards:

- (i) Except as more definitively specified in other sections, comply with the recognized workmanship quality standards within the industry as applicable to each unit of work, including ANSI standards where applicable. It is a requirement that each category of tradesman or installer performing the work be prequalified, to the extent of being familiar with the applicable and recognized quality standards for his category of work, and being capable of workmanship complying with those standards.

1.03 Submittals

A Refer to Section 01300 for the general submittal requirements applicable to inspection and test reports, project photographs, damage surveys, quality control samples, maintenance agreements, guaranties, warranties, and similar documentation of quality compliances as required.

B Copies and Distribution: Where inspection and test reports and certifications are required by governing authorities, provide additional copies as required, and, where required, send copies directly from inspection or testing agency to governing authority.

1.04 Product Delivery-Storage-Handling

A Materials, supplies, and equipment delivered to the site shall be inspected for damage, unloaded, and stored with a minimum of handling. Delivered items shall not be stored directly on the ground. Handle, store and protect materials and products, including

fabricated components, by methods and means recommended by the manufacturer which will prevent damage, deterioration and losses (and resulting delays), thereby ensuring highest quality results as the performance of the work progresses. Control delivery schedules so as to minimize unnecessary long-term storage at the project site prior to installation. Periodically exercise equipment stored in accordance with the manufacturer's recommendations.

- B The OWNER'S REPRESENTATIVE may refuse to accept, or sample for testing, materials, supplies, or equipment that have been improperly or unsuitably stored.
- C Materials, supplies or equipment found defective or unfit for use shall not be incorporated in the work and shall immediately be removed from the construction or storage site and replaced with new materials, supplies or equipment by the CONTRACTOR at no additional cost to the OWNER.
- D If, instead of requiring removal and replacement of defective items, the OWNER (and, prior to approval of final payment) prefers to accept the defective item(s), he may do so. In such case, if acceptance occurs prior to approval of final payment, a change order shall be issued incorporating the necessary revisions in the Contract Documents, including appropriate reduction in the Contract price; or if the acceptance occurs after approval of final payment, an appropriate amount shall be paid by the CONTRACTOR to the OWNER.

1.05 Responsibility for Inspections and Tests

A CONTRACTOR'S Responsibility:

- (i) It will be the CONTRACTOR's responsibility to employ and pay for the services of certified independent testing laboratories. In addition, the CONTRACTOR shall pay for all retests required due to failure to meet specifications.
 - 1) The certified independent testing laboratories qualifications, test procedures, forms and quality control program shall be submitted to the OWNER'S REPRESENTATIVE for review and approval.
 - 2) No failure of test agencies, whether engaged by the OWNER or CONTRACTOR, to perform adequate inspections or tests or to properly analyze or report results, shall relieve the CONTRACTOR of responsibility for the fulfillment of the requirements of the Contract Documents. It is recognized that the required inspection and testing program is intended to assist the CONTRACTOR, OWNER'S REPRESENTATIVE and governing authorities in the nominal determination of probable compliances with requirements for certain crucial elements of work. The program is not intended to limit the CONTRACTOR in his regular quality control program, as needed for general assurance of compliances.
- (ii) Coordination with OWNER's Agencies:

- (iii) Afford access and reasonable time in the construction sequence for OWNER's inspections and tests to be performed. Cooperate with agencies and provide incidental labor and services needed for the removal and delivery of test samples, and for inspections and taking measurements. Provide patching and restoration services where test samples have been removed.

B Test Agency Responsibilities:

- (i) Test agencies, regardless of whether engaged by the OWNER or CONTRACTOR, are not authorized to change or negate the requirements of the Contract Documents. Each agency shall coordinate its assigned work with the construction schedule as maintained by the CONTRACTOR, and shall perform its work promptly so as not to delay the work avoidably. Observations (by agencies) having a bearing on the work shall be reported to the OWNER'S REPRESENTATIVE, in the most expeditious way possible, and shall be recorded in writing by the agency. Agency personnel shall not interfere with or assume the duties of the CONTRACTOR.

C Quality Control Records:

- (i) CONTRACTOR shall keep a quality control report for each helical anchor that is installed. Copies of the reports shall be delivered to the ENGINEER and OWNER at each progress meeting and upon request. The record information shall at a minimum be as shown on the example Helical Anchor Installation Quality Control Report at the end of this Section.

Part II PRODUCTS

2.01 Equipment and Materials

- A All equipment and materials furnished under these specifications shall be new and unused.

Part III EXECUTION

3.01 Installation

A Pre-Installation Conferences:

- (i) Well in advance of the installation of every major unit of work which requires coordination with other work, meet at the project site with installers and representatives of manufacturers and fabricators who are involved in or affected by the unit of work, and in its coordination or integration with other work which has preceded or will follow. Advise OWNER'S REPRESENTATIVE of scheduled meeting dates. At each meeting, review the progress of other work and preparations for the particular work

under consideration including, but not limited to, the requirements of the Contract Documents, options, related change orders, purchases, deliveries, shop drawings, product data, quality control samples, possible conflicts, compatibility problems, time schedules, weather limitations, temporary facilities, space and access limitations, structural limitations, governing regulations, safety, inspection and testing requirements, required performance results, recording requirements, and protection. Record the significant discussions of each conference, and the agreements and disagreements, along with the final plan of action. Distribute record of meeting promptly to everyone concerned, including the OWNER'S REPRESENTATIVE.

- (ii) The CONTRACTOR shall not proceed with the work if the associated pre-installation conference cannot be concluded successfully. Instigate actions to resolve impediments to the performance of the work, and reconvene the conference at the earliest date feasible.

B Installer's Inspection of Conditions:

- (i) The CONTRACTOR shall require the Installer of each major unit of work to inspect the substrate to receive the work, and the conditions under which the work will be performed, and to report (in writing to the CONTRACTOR) unsatisfactory conditions. The CONTRACTOR shall not proceed with the work until unsatisfactory conditions have been corrected in a manner acceptable to the Installer.

3.02 Installation Quality Control

A Manufacturer's Instructions:

- (i) Where installations include manufactured products, the CONTRACTOR shall comply with the manufacturer's applicable instructions and recommendations for installation, to whatever extent these are more explicit or more stringent than applicable requirements indicated in the Contract Documents.

B The CONTRACTOR shall inspect each item of materials or equipment immediately prior to installation, and reject damaged and defective items.

- (i) The CONTRACTOR shall provide attachment and connection devices and methods for securing work properly as it is installed; true to line and level, and within recognized industry tolerances if not otherwise indicated. Allow for expansions and building movements. Provide uniform joint widths in exposed work, organized for best possible visual effect. Refer questionable visual effect choices to ENGINEER for final decision.
- (ii) The CONTRACTOR shall recheck measurements and dimensions of the work, as an integral step of starting each installation.
- (iii) The CONTRACTOR shall install work during conditions of temperature, humidity, exposure, forecasted weather, and status of project completion which will ensure the

best possible results for each unit of work, in coordination with the entire work. Isolate each unit of work from incompatible work, as required to prevent deterioration.

- (iv) The CONTRACTOR shall coordinate enclosure (closing-in) of work with required inspections and tests, so as to avoid the necessity of uncovering work for that purpose.

C Mounting Heights:

- (i) Except as otherwise indicated, the CONTRACTOR shall mount individual units of work at the industry-recognized standard mounting heights, for the applications indicated. Refer questionable mounting height choices to the OWNER'S REPRESENTATIVE for final decision.

- D Adjust, clean, lubricate, restore marred finishes, and protect newly installed work, to ensure that it will remain without damage or deterioration during the remainder of the construction period.

END OF SECTION 01400

SECTION 01500

CONSTRUCTION FACILITIES AND TEMPORARY CONTROLS

PART I. GENERAL

1.01 Land For Contractor's Use

- A. Site Access and Parking - The Contractor shall maintain driveways a minimum of 15 feet wide between and around combustible materials in storage and mobilization areas.
- B. The Contractor shall maintain traffic areas free as possible of excavated materials, construction equipment, products and debris.
- C. The Contractor shall not utilize existing parking facilities for construction personnel or for Contractor's vehicles or equipment, unless written permission from OWNER of parking facility is obtained.
- D. Private or Public Roads, Sidewalks and Parking Areas - The Contractor shall at all times provide emergency access to property in the vicinity of the construction for police and fire equipment, ambulances or other emergency vehicles to protect life, health and property.
- E. Contractor is responsible for constructing project in a sequence which will allow clear access to all businesses and residences within and in the vicinity of the Construction Area.
- F. Contractor is responsible for constructing project in a sequence which will allow the general public to utilize sections of park not actively being worked in.

1.02 Traffic Maintenance and Control

- A. Road Closing - No Street, road or section thereof shall be closed to through traffic unless otherwise provided for on the Plans, Specifications, or authorized by the agency with jurisdiction over the roads. Prior to the closing a street, road, or section thereof, the Contractor shall provide the ENGINEER with a copy of a detour Plan approved by the agency having jurisdiction over the roads.
- B. In the event roads or streets are to be closed, the Contractor shall notify the local fire department, police department, local road authority, ambulance and emergency services, and public school system daily as to what streets will be partly blocked or closed, the length of time the streets will be blocked or closed and when the streets will be reopened to traffic.
- C. Maintaining Traffic - The Contractor shall provide a Maintenance of Traffic for all area where construction will impede the normal flow of traffic in compliance with the Current FDOT Design Standards 600 Series.

- D. Existing Signs - No stop sign, traffic control or warning device shall be taken down until the agency having jurisdiction over the roads has been notified and arrangements for the immediate reinstallation has been made. The Contractor shall provide temporary signs, traffic control devices, warning devices, or watchmen continuously from the time the item is removed until it is reinstalled. All signs removed shall be replaced with signs meeting requirements of the agency having jurisdiction over the roads.

1.03 Temporary Utility Services

- A. Electricity and Lighting - The Contractor shall be responsible for and pay all costs for the installation and removal of circuit and branch wiring, with area distribution boxes located so that power and lighting is available throughout the construction by the use of construction-type power cords and shall pay all costs of electrical power used.
- B. Electrical wiring and distribution shall conform to the National Electrical Code and all applicable national, state and local codes.
- C. Use of Water - The Contractor shall acquire any and all permits, post any bonds and pay all fees required by the OWNER's Utility Department prior to using any hydrant, existing water meter or temporary water meter as the source of water, and pay the OWNER's Utility Department directly for any water used through out the construction and during the initial 90-day landscape establishment period. Upon completion of the 90-day landscape establishment period and final acceptance of the project by the Owner, the meter(s) will be transferred in the name of the OWNER. During the optional 9-month addition establishment period, the cost of water will be paid by the OWNER.
- D. Sanitary Provisions - The Contractor shall be responsible for installation, maintenance and removal of temporary sanitary facilities for use of construction personnel. All rules and regulations of the State and local health officials shall be observed, with precautions taken to avoid creating unsanitary conditions.

END OF SECTION 01500

SECTION 01505
MOBILIZATION

Part I. GENERAL

1.01 Mobilization

- A. Mobilization shall include the obtaining of all permits; moving onto the site of all equipment; temporary buildings and other construction facilities; essential personnel; and implementing security requirements; all as required for the proper performance and completion of the WORK. Mobilization shall include the following principal items:
1. Moving on to the site of all Contractor's equipment required for first month operation
 2. Installing temporary construction power, wiring, and lighting facilities if required for construction.
 3. Developing construction water supply.
 4. Providing all on-site communication facilities, including cellular phone for the Superintendent.
 5. Providing on-site sanitary facilities and potable water facilities.
 6. Arranging for and erection of Contractor's work, site access, and storage.
 7. Obtaining all required permits.
 8. Having all OSHA required notices and establishment of safety programs.
 9. Having the Contractor's Superintendent at the job site full time.
 10. Submitting initial submittals.
 12. Project identification and signs.
 14. Demobilization at the completion of construction.

Part II. PRODUCTS – Not Used

Part III. EXECUTION – Not Used

END OF SECTION 01505

SECTION 02110
SITE CLEARING & PREPARATION

PART I. GENERAL

1.01 Description of Work

- A. Installation of all Best Management Practices as shown in the project plans must be in place and inspected by the OWNER or OWNER'S REPRESENTATIVE prior to initiating site clearing activities.
- B. The extent of site clearing shall be limited to clearing those trees and brush necessary to provide access to the construction site. All trees, which will not interfere with construction, shall be protected from damage. Cost to protect trees, shrubs and etc. is incidental to the project cost. Site clearing work includes, but is not limited to, the following:
 - 1. Protection of Existing Trees
 - 2. Removal of trees and other vegetation.
 - 3. Muck.
 - 4. Asphalt and other pavement surfaces
 - 5. Existing site lighting
 - 6. Curb and Gutter.
 - 7. Culvert Pipes.
 - 8. General Pipes.
 - 9. Onsite Structures
 - 10. Other types of obstructions (direct or indirect) with the construction of the project.
This does not limit to only conflicts shown on the plans.

1.02 Job Conditions:

- A. The Contractor shall provide protection of existing improvements:
 - 1. Provide protection necessary to prevent damage to existing improvements indicated to remain in place.
 - 2. Protect improvements on adjoining properties and on the Owner's property.
 - 3. Restore damaged improvements to their original condition, as acceptable to parties having jurisdiction.

1.03 Protection of Existing Trees and Vegetation:

- A. Protect existing trees and other vegetation indicated to remain in place, against unnecessary cutting, breaking or skinning of roots, skinning and bruising of bark, smothering of trees by stockpiling construction materials or excavated materials within drip lines, excess foot or vehicular traffic, or parking of vehicles within drip line.

- B. Provide temporary guards to protect trees and vegetation to be left standing as shown in the Contract Plans.
- C. Water trees and other vegetation to remain within the limits of the Contract work as required maintaining their health during the course of construction operations.
- D. Provide protection for roots over ½-inch diameter cut during construction operations. Coat the cut faces with emulsified asphalt, or other acceptable coating, formulated for use on damaged plant tissues. Temporarily cover exposed roots with wet burlap to prevent roots from drying out; cover with earth as soon as possible.

Part II. PRODUCTS – NOT USED

PART III. SITE CLEARING

3.01 General

- A. The Contractor shall remove vegetation, improvements, or obstructions interfering with installation of new construction.
- B. The Contractor shall carefully and cleanly cut roots and branches of trees indicated to be left standing, where such roots and branches obstruct new construction.
- C. Refer to the Best Management Practices Plan in the Plan Set for more detailed instructions.

3.02 Removal of Improvements

- A. The Contractor shall remove above-grade and below-grade improvements necessary to permit construction, and other work as indicated.

3.03. Disposal of Waste Materials

- A. Burning on Owner's Property: Burning is not permitted on the Owner's property
- B. Removal from Owner's Property: The Contractor shall remove waste materials and unsuitable and excess topsoil from the Owner's property and dispose of legally
- C. All items removed from the project site are the property of the OWNER. If the OWNER chooses not to exercise their right of ownership for any or all items, the Contractor will be responsible for removing the item(s) from the project site and disposing of it in accordance with all applicable local, State and federal regulations at the expense of the Contractor.

END OF SECTION 02110

SECTION 02140
DEWATERING

PART I. GENERAL

1.01 Section Includes

- A. Dewatering design and operation requirements

1.02 General Requirements

- A. Obtain the services of a qualified dewatering specialist to provide a dewatering plan as required to complete the Work. Contractor shall be solely responsible for the design, installation, operation, maintenance, and any failure of any component of the system.
- B. All dewatering activities must be in accordance with the Southwest Florida Water Management District requirements, National Pollution Discharge Elimination System requirements and the Best Management Practices Plan in the Plan Set.
- C. Provide dewatering plan to ENGINEER for approval prior to commencement of any dewatering activities. Contractor shall also be responsible for obtaining a Water Use Permit from the Southwest Florida Water Management District.
- D. Design and provide a dewatering system using accepted and professional methods consistent with current industry practice to eliminate water entering the excavation under hydrostatic head from the bottom and/or sides. Design the system to prevent differential hydrostatic head, which would result in floating out soil particles in a manner termed as a “quick” or “boiling” condition. System shall not be dependent solely upon sumps and/or pumping water from within the excavation where differential head would result in a quick condition, which would continue to worsen the integrity of the excavation’s stability.
- E. Provide dewatering system of sufficient size and capacity to prevent ground and surface water flow into the excavation and to allow all Work to be installed in a dry condition.
- F. No additional payment will be made for any supplemental measures to control seepage, groundwater, or artesian head.
- G. Contractor shall be responsible for and shall repair without cost to the Owner any damage to work in place, or other contractor’s equipment, utilities, residences, highways, roads, railroads, private and municipal well systems, adjacent structures, natural resources, habitat, existing wells, and the excavation, including, damage to the bottom due to heave and including but not limited to, removal and pumping out of the excavated area that may result from Contractor’s negligence, inadequate or

improper design and operation of the dewatering system, and any mechanical or electrical failure of the dewatering system.

PART II. PRODUCTS - Not Used

PART III. EXECUTION

3.01 General Requirements

- A. Control, by acceptable means, all water regardless of source and be fully responsible for disposal of the water.
- B. Confine discharge piping and/or ditches to available easement or to additional easement obtained by Contractor.
- C. Control groundwater in a manner that preserves strength of foundation soils, does not cause instability or raveling of excavation slopes, and does not result in damage to existing structures. Where necessary to these purposes, lower water level in advance of excavation, utilizing wells, wellpoints, jet educators, or similar positive methods. Maintain the groundwater level to a minimum of 2 feet below excavations. Provide piezometers if directed by the Engineer to document the groundwater level is being maintained.
- D. Commence dewatering prior to any appearance of water in excavation and continue until Work is complete to the extent that no damage results from hydrostatic pressure, flotation, or other causes.
- E. Open pumping with sumps and ditches shall be allowed, provided it does not result in boils, loss of fines, softening of the ground, or instability of slopes.
- F. Install wells and/or wellpoints, if required, with suitable screens and filters, so that continuous pumping of fines does not occur. During normal pumping, and upon development of well(s), levels of fine sand or silt in the discharge water shall not exceed 5 ppm. Install sand tester on discharge of each pump during testing to verify that levels are not exceeded.
- G. Control grading around excavations to prevent surface water from flowing into excavation areas.
- H. Remove subgrade materials rendered unsuitable by excessive wetting and replace with approved backfill material at no additional cost to the Owner.
- I. Walls shall not be exposed to water pressure before structural work at the next higher level has properly cured and the cantilever action of walls is eliminated.
- J. Residential type muffles shall be used on piston drive pumps or generators

3.02 Maintaining Excavation in Dewatering Condition

- A. Dewatering shall be a continuous operation. Interruptions due to power outages, or any other reason will not be permitted.
- B. Continuously maintain excavation in a dry condition with positive dewatering methods during preparation of subgrade, installation of pipe, and construction of structures until the critical period of construction and/or backfill is completed to prevent damage of subgrade support, piping, structure, side slopes, or adjacent facilities from flotation or other hydrostatic pressure imbalance.
- C. Provide standby equipment on site, installed, wired, and available for immediate operation if required to maintain dewatering on a continuous basis in the event any part of the system becomes inadequate or fails. If dewatering requirements are not satisfied due to inadequacy or failure of dewatering system, perform such work as may be required to restore damaged structures and foundation soils at no additional cost to Owner.
- D. System maintenance shall include but not be limited to 24-hour supervision by personnel skilled in the operation, maintenance, and replacement of system components, and any other work required to maintain excavation in dewatered condition.

3.03 System Removal

- A. Remove all dewatering equipment from the site, including wells and related temporary electrical service.

END OF SECTION 02140

SECTION 02210 EARTHWORK AND GRADING

PART I - GENERAL

1.0 Scope

- 1.01 The work included under this specification shall include furnishing all labor, tools, material and equipment to form embankments and to excavate, remove, transport, store and satisfactorily dispose of all excavated material, regardless of nature, to grade the site to the lines and grade shown on the Plans. Included in this work is site preparation for depositing of excavated materials.

1.1 Basis of Measurement and Payment

- 1.11 See Section 01270, "Measurement and Payment".

1.2 Related Technical Specifications

- 1.21 Additional specifications for excavating, backfilling and compacting for structures is included in Section 02221.
- 1.21 Additional specifications for excavating, backfilling and compacting for utilities is included in Section 02222.

PART II - (NOT USED)

PART III - EXECUTION

3.0 Dewatering

- 3.11 The area within the vicinity of the new work shall be dewatered sufficiently to allow the work to proceed in a dry condition.

3.1 Excavation

- 3.21 All excavations shall be carried to the elevations shown on the Plans or as directed by the ENGINEER. Excavation shall include shaping, sloping and dressing necessary for construction of required cross sections as shown on the Plans; supplemental cross sections furnished or as directed by the ENGINEER. The CONTRACTOR shall be responsible for washouts or mishap to the work caused by his workmanship and shall again excavate, slope and reshape these portions of the work at his own expense before completion and acceptance of the work. Excavated material may be cast, carried or stockpiled and carried in an approved manner with suitable equipment to disposal areas at the CONTRACTOR expense.

3.2 Backfilling

- 3.21 In fill areas all debris shall be removed from the area to be filled. All material detrimental to site improvement shall be removed from the site and acceptably disposed of.

- 3.22 Fill material shall be free of debris or other detrimental material and shall have a reasonable moisture content when placed. Fill to be installed under the proposed structures or roadway base shall be compacted and placed as shown or specified herein. All other fill shall be compacted to 90% maximum density in accordance with AASHTO T-180 and placed in maximum of 12-inch lifts.

3.3 Rough Grading

- 3.31 The site shall be graded as necessary to comply with the Plans or as directed by the ENGINEER. The subgrade shall be roughly established by cut or fill, approximately parallel to proposed finished grades and to elevations which allow for thickness of topsoil and installation of site or roadway improvements.

3.5 Finish Grading

- 3.51 The subgrade shall be smoothed parallel to proposed finished grades and elevations specified on the Plans.
- 3.52 The topsoil shall be spread uniformly to provide a smooth, even surface at a finish grade specified on the Plans or acceptable to the ENGINEER. After spreading, the topsoil shall be compacted lightly as necessary to minimize settlement.

END OF SECTION 02210

SECTION 02221
EXCAVATING, BACKFILLING AND COMPACTING
FOR STRUCTURES

PART I - GENERAL

1.0 Scope

- 1.01 This Section includes excavation for structures, removal and disposal of excavated materials, backfilling, backfill materials and compaction.

1.1 Basis of Measurement and Payment

- 1.11 Work under this section shall be considered as incidental to construction and no additional payment shall be made for the work or materials specified herein.

1.2 Related Technical Specifications

- 1.21 Additional specifications for excavating, backfilling and compacting for utilities is included in Section 02222.

1.3 Submittals

- 1.31 The CONTRACTOR shall provide the ENGINEER with 2 certified copies of the test results of the compaction of the backfill as specified herein. The testing for compaction and the certification of the test results shall be performed by a testing laboratory approved by the ENGINEER.

PART II - (NOT USED)

PART III - EXECUTION

3.0 Dewatering

- 3.01 The area within the vicinity of the new Work shall be dewatered as required to allow the excavation to remain in a dry condition during the construction of the structure, including the excavation, backfilling and compacting operations.

3.1 Excavation

- 3.11 Excavation shall include the excavating and disposing of all materials encountered, regardless of nature, the supporting and protecting of all structures and/or utilities encountered above and below the ground surface, and the removal of water from the construction site. Excavation shall also include the removal of existing structures, as shown on the Plans or as directed by the ENGINEER.
- 3.12 The CONTRACTOR shall keep the limits of his excavation operations within a reasonable close conformity with the location and grade, of each structure.

- 3.13 The excavated materials shall be temporarily stored in a manner that will not cause damage to trees, shrubs, fences, improvements, utilities, private property or traffic. The excavated materials shall not be placed at such locations that will endanger the banks of the excavation by imposing loads thereon.
- 3.14 When concrete is to bear on or against an excavated surface other than rock, special care shall be taken not to disturb the surface. The final removal of the foundation material to grade shall not be made until just prior to the placing of the concrete.
- 3.15 Excavated material, determined by the ENGINEER as suitable for backfill may be used. All excess materials shall be disposed by the CONTRACTOR, at his expense.
- 3.16 The surface of all rock or other hard material upon which concrete is to be placed shall be free from all loose fragments, cleaned and cut to a firm surface. The surface shall be level, stepped or serrated, as shown on the Plans.
- 3.17 All unsound material underlying proposed structures shall be removed and replaced with material approved by the ENGINEER, or in layers not exceeding 6 inches in depth. Each layer shall be compacted to 98 percent density per AASHTO T-180 unless indicated otherwise on the Plans, or within these specifications.

3.2 Sheeting, Shoring and Bracing

- 3.21 The CONTRACTOR shall furnish, place and maintain at all times such sheeting, shoring and bracing of the excavated area as may be required for safety of the workmen and for protection of the new Work or adjacent structures, including pavement, curbs, sidewalks, pipelines and conduits next to, or crossing the excavated area, and for the protection and safety of pedestrian and vehicular traffic.
- 3.22 Sheeting, shoring and bracing shall conform to current federal or state regulations for safety.
- 3.23 Supports for pipes, conduits, etc., crossing the excavated area shall conform to the requirements of the OWNERS of such facilities and if necessary, shall be left in place.
- 3.24 The furnishing, placing, maintaining and removing of sheeting, shoring and bracing materials shall be at the CONTRACTOR's expense.
- 3.25 The CONTRACTOR shall not remove the sheeting, shoring or bracing until the structure has obtained sufficient strength to support the external loads. The sheeting, shoring and bracing material shall not come in contact with the structure, but shall be installed so that no concentrated loads or horizontal thrusts are transmitted to the structure.

3.3 Backfill

- 3.31 Backfill material shall be placed only after the new Work and backfill material have been inspected by the ENGINEER.
- 3.32 Backfill shall not be placed against any portion of the new Work until the required curing, surface finishing and waterproofing of such portions have been completed. Backfill which

will place an unequalized horizontal loading on the new Work shall not be placed until the concrete has attained at least 70 percent of its design strength. To equalize horizontal loadings, the required backfill around the new Work shall be placed on opposite sides at the same time.

- 3.33 Granular material shall be used for backfilling the new Work unless otherwise indicated on the Plans or within these specifications.
- 3.34 All spaces excavated and not occupied by the new Work or by the specified backfill material, shall be backfilled with suitable material from the excavation.
- 3.35 Large stones, boulders, broken rocks, concrete, and masonry shall not be used in the backfill.
- 3.36 The backfill shall be carried up to the surface of the adjacent ground or to the elevation of the proposed earth grade, and its top surface shall be neatly graded. Fills around all new Work shall be trimmed to the lines shown on the Plans or as directed by the ENGINEER.

3.4 Compacting Backfill

- 3.41 All backfill behind and around the new Work shall be placed in layers, not more than 9 inches in depth, and shall be compacted to not less than 98 percent density per AASHTO T-180.
- 3.42 Areas where the density does not affect the construction, as determined by the ENGINEER, shall be compacted to not less than 90 percent density per AASHTO T-180.

3.5 Cleanup

- 3.51 Immediately following the placing and compacting of the backfill, the excess material shall be removed and disposed of by the CONTRACTOR, at his expense.
- 3.52 The construction area shall be graded and left in a neat, workmanlike condition.

3.6 Testing

- 3.61 During the course of the Work, the ENGINEER may require testing for compaction or density on each lift of the backfill below structures at a minimum of 3 per building. A representative of the ENGINEER shall perform the taking of samples and the testing required. The cost for testing and sampling shall be at the expense of the Owner. Costs associated with any re-testing required will be at the expense of the CONTRACTOR.

3.7 Defective Work

- 3.71 Any portion of the backfill which is deficient in the specified density shall be corrected by the methods meeting the approval of the ENGINEER. Any extra testing or sampling required because of apparent deficiencies shall be at the CONTRACTOR's expense.

END OF SECTION 02221

SECTION 02222
EXCAVATING, BACKFILLING AND COMPACTING
FOR UTILITIES

PART I. GENERAL

1.01 Description

- A. This Section includes open trench construction, complete with trenching, sheeting, bracing, backfilling, backfill materials and compaction.

1.02 Basis of Measurement and Payment

- A. Work under this section shall be considered as incidental to construction and no additional payment shall be made for the work or materials specified herein.

1.03 Submittals

- A. The CONTRACTOR shall provide the ENGINEER with 2 certified copies of the test results of the compaction of the backfill as specified herein.

PART II. - NOT USED

PART III. - EXECUTION

3.01 Dewatering

- A. The area within the vicinity of the trenching operation shall be dewatered as necessary. The depth of the dewatering shall be sufficient to allow the trench excavating operation including backfilling and compacting to proceed in a dry condition.
- B. Where wet conditions are such that dewatering by normal methods would not be effective, the procedure outlined below may be used when specifically authorized by the ENGINEER in writing.
- C. Alternate to dewatering – installation of piping in wet conditions: piping may be installed in wet conditions and must be protected from the intrusion of dirt, rock, and other debris. This may be accomplished by placing a slotted cap or other ENGINEER approved covering over the ends of the piping. Once the properly bedded piping is in place, bedding material is to be used to extend the bedding to at least 12 inches above the mean high water level. This will provide a dry environment for the placement and compaction, in lifts, of the remaining backfill materials.

3.02 Trench Excavation

- A. Open cut trench excavation shall include the excavating of all materials encountered, regardless of nature, the supporting and protecting of all structures and/or utilities encountered above and below the ground surface, and the removal of water from the construction site.
- B. The trenching operation shall commence at the downstream or outlet end of the new Work and proceed upstream unless otherwise specified on the Plans or directed by the ENGINEER.
- C. The trench shall be excavated in reasonably close conformity with the lines and grades specified on the Plans or as established by the ENGINEER.
- D. The excavated materials shall be temporarily stored along the trench in a manner that will not cause damage to trees, shrubs, fences, improvements, utilities, private property, public property or traffic. The excavated materials shall not be placed at such locations that will endanger the trench banks by imposing loads thereon.
- E. The trench shall be of sufficient width to provide adequate working space to permit the installation of the pipe and the compaction of the bedding material under and around the pipe. However, the width of the trench from below the pipe bedding to 12 inches above the top of the pipe shall not exceed the following dimensions:

Under 6-inch	Outside diameter plus 12 inches
6-inch thru 12-inch pipe	30 inches wide
15-inch thru 36-inch pipe	Outside diameter plus 16 inches
42-inch thru 60-inch pipe	Outside diameter plus 20 inches
Over 60-inch pipe	Outside diameter plus 24 inches

- F. To support the additional load of the backfill when the maximum trench width as specified for rigid pipe is exceeded, the CONTRACTOR shall install, at his expense, concrete encasement which shall completely surround the pipe and shall have a minimum thickness at any point of one fourth of the outside diameter of the pipe or 4 inches, whichever is greater, or at his expense, install another type bedding, approved by the ENGINEER. The concrete encasement shall consist of 3000 psi strength concrete.
- G. To support the additional load of the backfill when the maximum trench width as specified for flexible or semi-rigid pipe is exceeded, the CONTRACTOR shall install, at his expense, standard pipe bedding to the full width between undisturbed trench walls or at least 2.5 pipe diameters on each side of the pipe.

- H. When, through the CONTRACTOR's construction procedure or because of unsuitable existing ground conditions, it becomes impossible to maintain alignment and grade properly, the CONTRACTOR, at his expense, shall excavate below the normal trench bottom grade and shall fill the void with course aggregate, FDOT size 4, crushed shell as defined by FDOT or 3000 psi concrete as approved by the ENGINEER to insure that the pipe when laid in the proper bedding will maintain correct alignment and proper grade.

3.03 Sheeting, Shoring and Bracing

- A. The CONTRACTOR shall furnish, place and maintain at all times such sheeting, shoring and bracing of the trench and/or shaft as may be required for safety of the workmen and for protection of the new Work or adjacent structures, including pavement, curbs, sidewalks, pipelines, conduits next to or crossing the trench, and the protection and safety of pedestrian and vehicular traffic.
- B. Sheeting, shoring and bracing shall conform to the current federal or state regulations for safety.
- C. Where indicated on the Plans and where necessary in the Work, install and leave sheeting, shoring and bracing in place. No extra compensation shall be paid to the CONTRACTOR for sheeting, shoring or bracing left in place.
- D. Supports for pipes, conduits, etc., crossing the trench shall conform to the requirements of the OWNER of such facilities, and if necessary, shall be left in place.
- E. The furnishing, placing, bracing, maintaining and removing of sheeting, shoring and trenching materials shall be at the CONTRACTOR's expense. The CONTRACTOR shall not remove the trench sheeting, shoring and bracing unless the pipe has been properly bedded, and the trench backfilled to sufficiently support the external loads. Also the sheeting, shoring and bracing material shall not come in contact with the pipe, and shall be installed so that no concentrated loads or horizontal thrusts are transmitted to the pipe.

3.04 Backfill

- A. Backfill material shall be placed on sections of bedded pipes only after such pipe bedding and backfill materials have been approved by the ENGINEER.
- B. The trench backfilling shall follow the pipe laying as closely as possible. However, at no time shall the pipe laying in any trench proceed backfilling of that trench by more than 100 feet, unless otherwise directed by the ENGINEER.
- C. All backfill shall be free of all organic, brush, debris or other harmful materials. Rocks or stones having a dimension of larger than 6-inches shall not be placed within three (3) feet of the top of the pipe.

- D. The initial backfill shall be carefully deposited on both sides of the pipe at the same time and thoroughly tamped and rammed around the barrel of the pipe until enough has been placed to provide a cover of one (1') foot above the crown of the pipe. In no case shall backfill material be placed in the trench in a manner that will cause shock to, or unequal pressure on, the pipe.
- E. All backfill material must be placed in maximum 12-inch lifts prior to compaction of each lift. Each maximum 12-inch maximum strata of similar material must be density tested including limerock/shell base and existing, compacted general backfill base.

3.05 Cleanup

- A. Immediately following the placing and compacting of the backfill, the excess material shall be removed and disposed of by the CONTRACTOR, at his expense. The construction area shall be leveled and left in a neat workmanlike condition.

3.06 Testing

- A. During the course of the Work, the ENGINEER will require testing for compaction or density of the backfill. A minimum of one set of tests shall be required for every 200 L.F. of trench or portion thereof at locations selected by the ENGINEER. Each set of tests shall consist of a test 12-inches above the top of pipe bedding and an additional test in every 12-inches of backfill up to finish grade. Refer to Section 02575, "Pavement Restoration", for testing requirements where the pipe is to be under pavement.
- B. In addition to the above, at the discretion of the Engineer, one set of density tests can be required at each of the project jack and bore pit locations and at each structure including, but limited to manholes, stormwater inlets, control structures, weirs and sewer main tap (if any).
- C. Density testing for compacted pipe trenches must demonstrate that all maximum 12-inch compacted layers of each type of backfill meets or exceeds 98% of the maximum dry density using the Modified Proctor test when the trench is under paved surfaces or surfaces intended for vehicular traffic and 90% of the maximum dry density using the Modified Proctor for surfaces not intended for vehicular traffic such as grass and landscape areas.
- D. The taking of samples and the testing required shall be performed by a testing laboratory approved by the ENGINEER and OWNER. The cost for density testing and sampling and Modified Proctor tests shall be at the expense of the CONTRACTOR.
- E. Refer to the project plans for further materials and compaction requirements for trench restoration.

3.07 Defective Work

- A. Any portion of the backfill which is deficient in the specified density shall be corrected by methods meeting the approval of the ENGINEER and density tests as previously described shall be repeated until the specified requirements are met.
- B. Any extra testing or sampling required because of deficiencies shall be at the CONTRACTOR's expense.

END OF SECTION 02222

SECTION 02230 LIMEROCK AND SHELL BASE

Part I General

1.01 Scope

- A. The work specified in this Section consists of construction of a base course composed of lime rock or shell. It shall be constructed on the prepared sub grade in accordance with these specifications and in conformity with the lines, grades, notes, and typical cross sections shown on the plans in accordance with Sections 200 and 250 of the Florida Department of Transportation Standard Specification for Road and Bridge Construction - latest edition or as amended hereinafter. Where base course thickness is greater than 6 inches, the base shall be constructed in two courses.

1.02 Basis of Measurement and Payment

- A. See Section 01270, Measurement and Payment

1.03 Submittals

- A. CONTRACTOR shall submit 2 certified copies of the subgrade density test results to the ENGINEER. Testing of the subgrade shall be performed by a testing lab acceptable to the ENGINEER. All testing shall be at the expenses of the CONTRACTOR.
- B. Compacted layers shall not exceed 12 inches.
- C. Each type of backfill material shall be compacted individually.

1.04 Testing frequency on base and sub-base:

- A. 1 test for every maximum 12 inch strata of placed backfill, base, and subgrade.
- B. 1 test per / lift for every 200 square yards of new asphalt area in locations determined by the OWNER representative.
- C. 1 test per every 100 linear feet of concrete walkway in locations determined by the OWNER representative.
- D. 1 test per every 100 linear feet of stormwater trench.
- E. 1 test per every quadrant of sport court surfaces in locations determined by the OWNER representative or as required by the OWNER, in accordance with Section 02590, Sport Court Surfaces.
- F. Nuclear gauge testing locations to be determined by OWNER'S representative.
- G. Density test including proctor shall be submitted to OWNER for approval prior to

placements of concrete or asphalt. Testing shall be certified by a geotechnical Engineer licensed in the state of Florida.

- H. Where required by the ENGINEER or OWNER representative, the CONTRACTOR is required to provide additional tests to demonstrate sufficient compaction in areas including, but not limited to the following: brick areas, shoulder areas, sidewalks, site amenities, etc...

Part II PRODUCTS

2.01 Materials

- A. Limerock: The material used shall conform with requirements as specified in the Florida Department of Transportation Specifications
- B. Shell: Shell material shall not contain silica sand in sufficient quantity to prevent proper bonding.
- C. Reclaimed asphalt will not be permitted to be used in the base material

2.02 Gradation Requirements

- A. At least ninety-seven (97%) percent of the material shall pass a three and one-half (3-1/2") inch sieve. Not more than twenty (20%) percent of the material shall pass the No. 200 sieve by washing.

2.03 Plasticity Requirements

- A. The portion of the material passing the No. 40 sieve shall be non-plastic.

2.04 Bearing Ratio Requirements

- A. Shell for base construction shall have an average LBR value of not less than one hundred (100). Each source of shell base material shall be specifically approved for usage.

2.05 Quality Assurance

- A. Each deposit of lime rock or shell proposed for use shall be inspected by ENGINEER prior to placement. Acceptance or rejection will be made on production of a uniform material consistently meeting this specification. ENGINEER may require a certified copy of current Florida D.O.T. quality assurance for each source.

Part III EXECUTION

3.01 Subgrade

- A. The Work shall consist of bringing the bottom of excavations and the top of embankments to a surface conforming to the grades, lines and cross sections shown on the plans.
- B. All soft and yielding material and other portions of the subgrade which will not compact readily shall be removed and replaced with suitable material and the whole subgrade brought to line and grade, allowing for subsequent compaction.
- C. All submerged stumps, roots or other organic matter encountered in the preparation of the subgrade shall be removed.
- D. The subgrade shall be stabilized to a minimum LBR (Limerock Bearing Ratio) of 40%. If the natural in-place soils do not meet the required stability, sufficient borrow material for stabilization shall be uniformly mixed with in-place soils to produce the minimum load Bearing Ratio.
- E. The stabilized subgrade shall be compacted to the density shown on the Plans. The subgrade shall be shaped prior to making the density tests. When load Bearing Ratio determinations are made by the Limerock Bearing Ratio Method, Test Method D. of A.A.S.H.T.O. T-180 as modified by the Florida Department of Transportation's Research Bulletin 22-B, revised April 1972, shall be used. The subgrade shall be firm and able to support the construction equipment without displacement. Soft or yielding subgrade shall be corrected and made stable before construction proceeds.
- F. Density tests shall be made before work proceeds.
- G. The required density shall be maintained until the base of pavement has been laid or until the aggregate materials for the base of pavement course have been spread in place.
- H. After the subgrade has been prepared, and immediately before any base of paving course is laid, the subgrade shall be tested for substantial compliance as to crown and elevation. Material shall be removed or added, as the condition necessitates, and again stabilized and compacted to bring all portions of the subgrade to the specified elevation, stability and density.

3.02 Transporting Limerock or Shell

- A. The limerock or shell shall be transported (over material previously spread) to the point where it is to be used. It shall then be dumped on the end of the preceding spread. In no case shall rock be dumped directly on the subgrade.

3.03 Shell

- A. The shell shall be spread uniformly. All segregated areas of fine or coarse material shall be removed and replaced with well-graded shell. For double-course base, the material shall be spread in two (2) courses. The thickness of the first course shall be approximately one-half (1/2) the total thickness of the finished base, or enough

additional to bear the weight of the construction equipment without disturbing the subgrade.

3.04 Compacting and Finishing Base

- A. For double-course base, the first course shall be bladed if necessary to secure a uniform surface and shall be compacted to the density specified below immediately prior to spreading the second course. No other finishing of this course is required.
- B. After spreading is completed, the entire surface shall be scarified and shaped so as to produce the exact grade and cross section after compaction. For double-course bases, this scarifying shall extend to a depth sufficient to penetrate slightly the surface of the first course.
- C. As soon as proper conditions of moisture are attained, the material shall be compacted to the density shown on the Plans. Where the base is being constructed in one course, the density specified above shall be obtained in both the bottom half and the top half of the base.
- D. During final compacting operations, if blading of any areas is necessary to obtain the true grade and cross section, the compacting operations for such areas shall be completed prior to making the density determinations on the finished base.
- E. The surface shall be "hard-planed" with a blade grader immediately prior to the application of the prime coat to remove the thin-glazed or cemented surface, leaving a granular or porous condition that will allow free penetration of the prime material. The materials planed from the base shall be removed from the base area.
- F. If, at any time, the subgrade material becomes mixed with the base course material, the CONTRACTOR shall excavate and remove the mixture. He shall reshape and compact the subgrade, and replace the materials removed with clean base material. The clean base material shall then be shaped and compacted as specified above.

3.05 Testing Surface

- A. The finished surface of the base course shall be checked with a template cut to the required cross section and with a fifteen (15') foot straight edge laid parallel to the centerline of the road or other approved testing devices. All irregularities greater than one-fourth (1/4") inch shall be corrected by scarifying and removing or adding rock, as may be required, after which the entire areas shall be recompacted as specified herein. On every project at least one of each of the
 - (i) MODIFIED PROCTOR MAXIMUM DENSITY DETERMINATION TESTS
 - (ii) FIELD IN-PLACE DENSITY TESTS USING STANDARD NUCLEAR GAGE DENSITY TESTING.

3.06 Thickness

- A. As specified in the contract plans or as directed by the ENGINEER.

END OF SECTION 02230

SECTION 02240
PRIME AND TACK COATS FOR BASE COURSES

PART I. GENERAL

1.01 Scope

- A. This section includes applying bituminous material on a previously prepared base in accordance with these specifications and in conformity with the lines, grades, dimensions, and notes shown on the plans and in accordance with Section 300 of the Florida Department of Transportation Standard Specification for Road and Bridge Construction - 1986, or as amended hereinafter.

1.02 Basis of Measurement and Payment

- A. Work under this Section shall be considered as incidental to construction and no additional payment shall be made for the work or materials specified herein.

1.03 Related Technical Specifications

- A. Additional construction methods for asphaltic concrete surface course are included in Section 02511, Asphaltic Concrete Surface Course.

PART II. PRODUCTS

2.01 Materials

- A. For the prime and tack cost, any one of the following types or grades or prime and tack materials may be used at the option of the CONTRACTOR unless a particular type and grade are called for on the CONTRACT PLANS:

1. PRIME COAT.

a. Cutback Asphalt, Grade RC-70 or RC-250.

b. Emulsified Asphalt, Grade RS-2, SS-1, SS-1H or Special MS.

2. TACK COAT.

a. Emulsified Asphalt, Grade S, RS-2, AE-90, SS-1, SS-1H or Special MS.

PART III. EXECUTION

3.01 Equipment

- A. This Work may be performed with any machines, combination of machines, or

equipment that will produce the specified results.

3.02 Cleaning the Base

- A. Before any bituminous material is applied, all loose material, dust, caked clay, and foreign materials which might prevent proper bond with existing surface shall be removed. Particular care shall be taken to clean the outer edges of the strip to be treated in order to insure that the tack coat will adhere. Where the prime tack coat is applied adjacent to curb and gutter or valley gutter, such concrete surfaces are to be protected and kept free of bituminous material.

3.03 Weather Limitations

- A. No bituminous material shall be applied when the temperature of the air is less than forty (40 F) degrees Fahrenheit in the shade, or when the weather conditions or the condition of the existing surface is unsuitable.
- B. No bituminous material or concrete is to be placed during inclement weather such as rain.

3.04 Application of Prime Coat

- A. The surface to be primed shall be clean and contain optimum moisture. For limerock bases, the glazed finish shall have been removed as specified. The temperature of the prime material shall be between one hundred (100 F.) degrees Fahrenheit and one hundred and fifty (150 F.) degrees Fahrenheit. The exact temperature shall be such as will ensure uniform distribution. The material shall be applied by means of a pressure distributor. The amount of bituminous material applied shall be at the rate of approximately 0.10 to 0.25 gallons per square yard, dependent upon the type of base material. The rate of application shall be sufficient so as to coat the surface thoroughly and uniformly without having any excess to form pools or to flow off the base. A light, uniform application of clean sand shall be applied prior to opening the primed base to traffic. To cure the prime coat in such cases, the sand shall be rolled with a traffic roller in conjunction with traffic. If warranted by traffic conditions, the application shall be made only on one-half (½) of the width of the base at one time, care being taken to secure the correct amount of bituminous material at the joint. The base shall be sufficiently moist in order to obtain maximum penetration of the asphalt.

3.05 Application of Tack Coat

- A. Where a bituminous surface is to be laid and a tack coat is required, both shall be applied as herein specified. On newly constructed base courses, the application of the tack coat (when one is required by ENGINEER) shall follow the application of the prime coat, immediately before the wearing surface is applied. In general, a tack coat will not be required on primed bases, except in areas which have become excessively dirty and cannot be cleaned, or in areas where the prime has cured and lost bonding effect. The tack coat shall be applied with a pressure distributor. The bituminous

material shall be heated to a suitable consistency as designated. The bituminous material shall be applied only in the amount necessary to bond the wearing surface to the base. The rate of application shall be between 0.02 and 0.08 gallons per square yard. The exact rate shall be designated by the ENGINEER. The tack coat shall be applied sufficiently in advance of the wearing surface to permit drying. However, it shall not be applied so far in advance or over such an area as to lose its adhesiveness as a result of being covered with dust or other foreign material. The tack coat shall be kept free from traffic until the wearing surface is laid.

END OF SECTION 02240

SECTION 02511 ASPHALTIC CONCRETE SURFACE COURSE

PART I. GENERAL

1.01 Scope

- A. The Work consists of the application of asphaltic concrete surface course which shall be composed of a mixture of (1) aggregate, (2) mineral filler, if necessary to produce the desired stability hereinafter described, and (3) asphalt cement. The surface course shall be properly laid upon a prepared base in accordance with these specifications and Sections 331, 332 and 333 of the FDOT Specifications, and in conformity with the lines, grades, thickness and typical cross section shown on the plans. This Work shall include the conditioning of the existing surface or base.

1.02 Basis of Measurement and Payment.

- A. See Section 01270, Measurement and Payment.

1.03 Related Technical Specifications

- A. FDOT Specifications shall mean the Florida Department of Transportation Standard Specifications for Road and Bridge Construction current edition unless specifically noted otherwise. For Type S Asphalt the 2004 Edition is hereby specifically referenced.
- B. Additional specifications for prime and tack coats as stated in Section 02240, Prime and Tack Coats for Base Courses.
- C. Additional specifications for excavating, backfilling and compacting for structures as stated in Section 02221, Excavating, Backfilling, and Compacting for Structures.

1.04 Quality Assurance

- A. Field compaction density, stability, and thickness testing frequencies of sub-base, base, and asphalt shall be tested at the frequency shown in Section 02230, Limerock and Shell Base. All testing costs are incidental to the project and shall be at the contractors expense.
- B. Asphalt extraction gradation shall be tested from grab samples collected once every 1800 square yards of asphalt delivered to the site, or a minimum of once per day.

PART II. PRODUCTS

2.01 Asphalt Mixes

- A. Asphalt types shall be as specified in the plans and specifications. Only Types S-I, II, III

and approved skid resistant types as described in Section 334, FDOT specifications 2004 Edition, shall be acceptable. For type II, however, the minimum stability shall be seven hundred and fifty (750) psi as determined by the Marshall Design Method. The flow shall be between 0.08 and 0.15 inches.

PART III. EXECUTION

3.01 General

- A. The CONTRACTOR shall be responsible for temporary restoration of all roadway cuts and for maintaining all cuts in a drivable condition prior to final restoration. All settled areas shall be immediately refilled by the CONTRACTOR.
- B. The CONTRACTOR shall be responsible for timely restoration, as determined by the ENGINEER. At no time shall more than 1,200 linear feet of ditch be open without permanent trench restoration.
- C. The CONTRACTOR shall give a written notice to the ENGINEER at least 72 hours prior to commencement of resurfacing. If resurfacing will not be accomplished as a single operation, then individual notices shall be given for each section to be resurfaced.
- D. The CONTRACTOR shall be responsible for the integrity of the Pavement Restoration for a minimum period of one year following the acceptance of the project

3.02 Compaction and Testing

- A. Compaction and Testing for Pavement Restoration shall be in accordance with Section 02575, Pavement Restoration.
- B. Compaction and Testing for Backfill below the road base material shall be in accordance with the CONTRACT PLANS or as specified by the ENGINEER.
- C. Compaction and Testing for Road Base and Subgrade shall be in accordance with Section 02230 Limerock and Shell Base.
- D. The CONTRACTOR shall obtain a testing company to perform the required compaction density tests. The testing firm shall have the approval of the ENGINEER prior to the commencement of construction.
- E. If any tested work fails to meet the specified compaction requirements, the testing company shall determine the extent of the faulty work, and all faulty work shall be re-excavated and replaced in accordance with this section, and the tests shall be repeated until specified requirements are met. Test data shall be submitted to the ENGINEER and approved by the ENGINEER prior to resurfacing of asphalt concrete roads. All testing expenses shall be incidental the Work.

3.03 Approvals

- A. The work under this specification shall not be considered complete or satisfactory until approved by the ENGINEER as well as the applicable governmental agency.

3.04 Construction Methods

- A. The mixture shall be spread only when the surface previously prepared is intact, firm properly cured and dried. Unless otherwise directed the following requirements shall also apply:
- B. The spread shall occur only when the air temperature in the shade and away from artificial heat is above forty (40 F.) degrees Fahrenheit and rising. When the temperature in the shade and away from artificial heat is between forty (40 F.) degrees and sixty (60 F.) degrees Fahrenheit, the mixture shall be spread only when conditions are suitable.
- C. The mixture shall be delivered on the road in ample time to permit the spreading, rolling and surface testing during daylight hours. The mixture shall be compacted to a minimum of ninety-five (95%) percent of the ENGINEER'S required compacted density.
- D. The temperature of the mixture at the time of spreading shall be within thirty (30 F.) degrees Fahrenheit of the temperature set by the ENGINEER for this stage of the operation. Temperatures thus set by the ENGINEER shall be between two hundred fifty (250 F.) degrees Fahrenheit and three hundred and forty (340 F.).
- E. Depressions which may develop after the initial rolling shall be remedied by loosening or removing the mixture laid and by adding new material to bring such depressions to a true surface. Such portions of the completed course that are defective in surface, compression or composition, or that do not comply with the requirements of these specifications, shall be taken up and replaced with suitable mixture properly laid in accordance with these specifications. All replacement work due to unsatisfactory surface course shall be performed at the CONTRACTOR'S expense.
- F. Joints to existing driveways, side streets, sidewalks, curbs and other permanent surfaces shall be made in a manner that results in a smooth transition to the existing surface while maintaining the minimum required thickness of asphalt. This is to be accomplished by milling or saw cutting as required, or in an alternative manner approved by the ENGINEER.
- G. Refer to the Florida Department of Transportation Standard Specifications for Road and Bridge Construction current edition unless specifically noted otherwise.

3.05 Finished Surface Requirements

- A. For the purpose of testing the finished surface, the CONTRACTOR shall provide a fifteen (15') foot straight edge and a standard template cut to the true cross section of the road. These shall be available at all times during construction so that the ENGINEER may check the finished surface. Vertical measurements from a string line between curbs to determine crown may be accepted as an alternate. The finished surface shall be such that it will not vary more than one-fourth (1/4") inch from the fifteen (15') foot straight edge applied parallel to the centerline of the pavement. Any irregularity of the surface exceeding the above limits shall be corrected.

3.06 Skid Resistant Surfaces

- A. Asphaltic concrete friction courses shall comply with the provisions of Section 337, FDOT Specifications.

3.07 Tests

- A. Any or all of the following tests may be required by the ENGINEER or OWNER:

1. Determination of the job-mix formula.
2. Tests of the asphalt cement.
3. Sieve analysis of the aggregate.
4. Determination of the bitumen content of the asphaltic concrete.
5. Determination of density of finished asphaltic concrete pavement.
6. Determination of stability of finished asphaltic concrete pavement.
7. Plant inspection and verification of aggregate mix.

- B. Any of the above tests as required by the ENGINEER or OWNER shall be paid for by the CONTRACTOR, including any retests.

END OF SECTION 02511

SECTION 02575 PAVEMENT RESTORATION

Part I. GENERAL

1.01 Scope

- A. The Work included under this specification shall include the furnishing of all labor, material, and equipment necessary to satisfactorily restore road surfaces which have been damaged or destroyed during the performance of work under this Contract.

1.02 Referenced Specifications

- A. Section 02221, Excavating, Backfilling and Compacting for Structures.
- B. Section 02230, Limerock and Shell Base.
- C. Section 02240, Prime and Tack Coats for Base Courses.
- D. Section 02511, Asphalt Concrete Surface Course.

a. Submittals

- A. CONTRACTOR shall submit two (2) certified copies of all compaction tests specified below.

b. Payment

- A. Cost of pavement restoration is considered incidental to pipe construction

PART II. PRODUCTS

- 2.01 Pavement material shall be in accordance with the latest Florida Department of Transportation Specifications.

PART III. EXECUTION

3.01 General

- A. The CONTRACTOR shall be responsible for temporary restoration of all roadway cuts and for maintaining all cuts in a drivable condition prior to final restoration. All settled areas shall be immediately refilled by the CONTRACTOR.
- B. The CONTRACTOR shall be responsible for timely restoration, as determined by the ENGINEER.
- C. The CONTRACTOR shall give a written notice to the ENGINEER at least 72 hours prior to commencement of resurfacing. If resurfacing will not be accomplished as a single operation, then individual notices shall be given for each section to be

resurfaced.

- D. The CONTRACTOR shall be responsible for the integrity of the Pavement Restoration for a minimum period of one year following the acceptance of the project.

3.02 Compaction and Testing

- A. All asphaltic surfaces which are open cut shall be compacted and tested per the CONTRACT PLANS.
- B. Backfill below the road base material shall be compacted as shown on the CONTRACT PLANS.
- C. The CONTRACTOR shall obtain a testing company to perform the required compaction density tests. The testing firm shall have the approval of the ENGINEER prior to the commencement of construction. If any tested work fails to meet the specified compaction requirements, the testing company shall determine the extent of the faulty work, and all faulty work shall be re-excavated and replaced in accordance with this section, and the tests shall be repeated until specified requirements are met. Test data shall be submitted to the ENGINEER and approved by the ENGINEER prior to resurfacing of asphalt concrete roads.

3.03 Approvals

- A. The Work under this specification shall not be considered complete nor satisfactory until approved by the ENGINEER as well as the applicable governmental agency.

END OF SECTION 02575

SECTION 02610 FITTINGS

PART I. GENERAL

1.01 Description

- A. The Contractor shall furnish and install fittings as shown on the Drawings or as directed by the Engineer.

1.02 Quality Assurance

- A. The Contractor shall install fittings to meet the latest revision of the AWWA specification for the pipe material specified.

1.03 Submittals

- A. Submit manufacturer's certificate of conformance.
- B. Shop Drawings: Submit manufacturer's drawings and data sheets for material to be supplied under this Section. Indicate sizes and types to be installed.

1.04 Product Delivery, Storage and Handling

- A. Upon delivery and before unloading, the Contractor must inspect the fittings for any damage occurred in transit and note such damage on the delivery ticket.
- B. The means by which the fittings are unloaded is the decision and responsibility of the Contractor. The Contractor shall follow recommendations of the manufacturer.
- C. The Contractor shall follow manufacturer's recommendations for storage of fittings in order to minimize damage prior to installation.
- D. The Contractor shall adhere to the standard procedures given by the manufacturer for handling the fittings.

PART II. PRODUCTS

2.01 Bends, Reducers and Tees

- A. Non-Pressure Pipe: All bends, reducers and tees required shall conform to the same standards as the pipe.
- B. Pressure Pipe: All bends, reducers and tees required shall conform to the following requirement:

1. Ductile Iron Fittings: Shall be used for all pressure pipe. They shall conform with the latest revision of AWWA C110 "Gray-Iron and Ductile-Iron Fittings, Three Inches Through Forty Eight Inches for Water and Other Liquids". They shall be mechanical joint ends with a pressure rating of 350 psi. Compact fittings, three inches through sixteen inches (3"-16") will be acceptable. The compact fitting shall conform to the latest revision of AWWA C153 "Ductile Iron Compact Fitting, Three Inches Through Sixteen Inches for Water and Other Liquids". All joints materials, including rubber gaskets, glands, tee-head bolts, and hex-head nuts, shall conform to the latest revisions of AWWA C111, "Rubber-Gasket Joints for Ductile-Iron and Gray-Iron Pressure Pipe and Fittings".

2.02 Joint Restraint System

- A. All yard piping shall be restrained. Restraint system for fittings shall be "MEGA LUG 1100 Series" Joint Restraint System as manufactured by EBAA Iron, Inc. or approved equal. Length and location of restraining shall be determined by the Engineer. All fittings four inches (4") in diameter and larger shall be restrained as shown on the plans. The Contractor shall submit a pipe laying schedule.
- B. Connection of existing pressure mains to the new mains will be accomplished with solid repair sleeve, as approved by the Engineer. Repair clamps will not be allowed.

PART III. EXECUTION

1.01 General

- A. Installation of ductile iron (DIP) fittings shall be in accordance with the latest revision of AWWA C600, "Installation of Gray and Ductile Cast Iron Water Mains and Appurtenances" for ductile iron. For PVC fittings, installations shall be in accordance with manufacturer's recommendations.
- B. Concrete thrust blocks or "kickers" shall be installed at all fittings (fourteen-inch (14") and smaller as shown on the detail or unless otherwise directed by the Engineer. The Contractor shall install a poly barrier between all concrete thrust blocks and fittings. Where in the opinion of the Engineer, conditions prevent installing a concrete thrust block behind a fitting, a joint restraint system shall be used in lieu of the concrete thrust block. Joint restraint system shall be installed in accordance with manufacturer's instructions so as to prevent joint separation under operating conditions on all fittings sixteen inches (16") and larger. All concrete thrust block shall be inspected prior to backfill by the Engineer. NOTE: Concrete thrust blocks shall not be installed in a "wet" condition.

END OF SECTION 02610

SECTION 02616
POLYVINYL CHLORIDE (PVC) PIPE

Part I. GENERAL

1.01 Description of Work

- A. The extent of PVC pipe is shown on the drawings.
- B. Reference to standard specifications herein shall be construed as to be in reference to the latest revision or edition.

1.02 Submittals

- A. One original certified test report and two copies of all required test reports shall be submitted to the Engineer with each shipment of pipe. Certification shall include all test results required by AWWA. Also the Contractor shall include the following data:
 - B. Quick Burst Test, ASTM D1599.
 - C. Drop Impact Test, ASTM D2444.

1.03 Delivery and Storage

- A. In storing pipe, units shall be protected by dunnage in the same way they were protected while loaded on the truck. Pipe shall be stored flat to protect against bending.
- B. In storing pipe, units shall be protected by dunnage in the same way they were protected while loaded on the truck. If pipe is to be stored outside longer than 15-days the pipe shall be covered with canvas or other opaque material to protect it from prolonged exposure to the sun.

Part II. PRODUCTS

2.01 PVC Pipe (Smaller than 4 Inches)

- A. Unless otherwise specified, all PVC pipe smaller than four-inch (4") nominal diameter shall be Schedule 80 PVC in accordance with ASTM D1785. Schedule 80 pipe shall have either solvent welded or threaded joints. PVC pressure pipe shall bear the approved seal of the National Sanitary Foundation (NSF). PVC pipe that is exposed to sunlight shall be manufactured with additives to provide resistance to ultraviolet deterioration.

- B. **FITTINGS;** Socket type, solvent welded fittings for schedule 80 PVC pipe shall be in conformance with ASTM D2467. Threaded type fittings for Schedule 80 PVC pipe shall be in conformance with ASTM D2464. All solvent welded or threaded joints shall be watertight.
- C. **FLANGES;** Flanges for Schedule 80 PVC pipe shall be rated for a 150 psi working pressure with ANSI B16.1 dimensions and bolting pattern. Flanges shall be connected to PVC piping with either solvent welded or threaded joints in accordance with ASTM D2467 or ASTM 2464, respectively. Gasket shall be neoprene, full faced type with a minimum thickness of 1/8-inch. Nuts and bolts shall be hexagonal with machine threads, manufactured of Type 316 stainless steel in accordance with ASTM A320, Class 2. Type 316 stainless steel flat washer shall be used against PVC flanges.
- D. **SOLVENT CEMENT;** PVC solvent cement shall be in compliance with ASTM D2564 and in accordance with the pipe manufacturer's recommendations.
- E. **THREAD LUBRICANT;** Lubricant for Schedule 80 threaded joints shall be Teflon tape only.

2.02 High Density Polyethylene (HDPE) Pipe

- A. Pipe shall be a PE3408 high density, extra high molecular weight polyethylene manufactured from first-quality high density polyethylene resin containing no additives, fillers, or extenders. The HDPE pipe shall have an ASTM D3350 cell classification of PE 345434C, and shall meet or exceed the properties listed in the following table. The HDPE pipe shall be SDR-11 Phillips Drisco pipe Series 1000, or approved equal, and shall bear the seal of approval of the National Sanitation Foundation (NSF).

Property	Specification	Unit	Nominal Value
Material Designation	PPI/ASTM		PE 3408
Material Classification	ASTM D-1248		II C 5 P34
Cell Classification	ASTM D-3350		345434C
Density	ASTM D-1505	gm/cm ³	0.955
Melt Index	ASTM D-1238	gm/10 min.	0.11
Flex Modulus	ASTM D-790	psi	135,000
Tensile Strength	ASTM D-638	psi	3,200
HDB @ 73°F	ASTM D-2837	psi	1,600
U-C Stabilizer	ASTM D-1603	% C**	2.5
Hardness	ASTM D-2240	Shore “D”	65
Compressive Strength (yield)	ASTM D-695	psi	1,600

Property	Specification	Unit	Nominal Value
Tensile Strength @ Yield (Type VI Spec)	ASTM D-638 (2"min)	psi	3,200
Elongation @ Yield	ASTM D-638 %	Minimum	8
Tensile Strength @ Break (Type VI Spec)	ASTM D-638	psi	5,000
Elongation @ Break	ASTM D-638%	Minimum	750
Modulus of Elasticity	ASTM D-638	psi	130,000
Linear Expansion Coef.	ASTM D-696	in./in./°F	1.2 x 10 ⁻⁴
Brittle Temperature	ASTM D-746	°F	<-180
Vicat Softening Temp.	ASTM D-1525	°F	257

B. Fittings shall be butt fusion type, meeting the requirements of ASTM D-3261, and shall be pressure rated to match the system piping to which they are fused. At the point of fusion, the outside diameter and minimum wall thickness shall meet the requirements of ASTM F-714 for the same size pipe. Fitting shall be supplied by the pipe manufacturer. Connection to dissimilar materials shall be joined by flanges, compression couplings, or other mechanical means as approved by the Engineer.

END OF SECTION 02616

SECTION 02660
PIPING – GENERAL

Part I. GENERAL

1.01 Description of Work

- A. The work covered by this section and the related sections following consists of providing all labor, equipment, material and supplies and performing all operations required to install the various piping, valves, accessories, as specified and shown on the drawings.
- B. Related Work Specified Elsewhere:
 - 1. Section 02222 - Trenching, Backfilling and Compacting.

1.02 Submittals

- A. Submittals for the various types of pipe and fittings are specified in the individual sections.
- B. Shop drawings or catalog cuts shall be submitted for all valves, boxes and restrained joints.
- C. Record drawings shall be submitted in accordance with the requirements of Section 01300 – Submittals. The type of pipe used shall also be noted on the drawings.
- D. Pipe elevations shall be submitted as specified under "Installation", in this Section.
- E. The manufacturer shall furnish a sworn affidavit that the pipe, fittings and lining furnished under the Contract or Agreement comply with all applicable provisions of the ANSI and/or AWWA Standards.
- F. Reports on pressure and leakage tests shall be submitted by the Contractor.
- G. Reports on bacteriological tests shall be submitted by the Contractor.

1.03 Job Conditions

- A. Interruptions to utility service shall be minimized. The Contractor shall submit plans and schedules to the Engineer for approval by the proper authority before any shutdown or any interruption in service takes place.

Part II. PRODUCTS – NOT USED

Part III. EXECUTION

3.01 Inspection

- A. All pipes shall be subject to inspection at the factory by the Engineer or Owner. The Contractor shall provide a production schedule in sufficient time so plans can be made for in-plant inspection of the pipe or fittings during production, should it be required.
- B. Special markings shall be plainly marked on the applicable pipe indicating the weight, proper location of the pipe or fitting in the line by reference to layout drawings and schedules, class of pipe, casting period, manufacturer's mark and year pipe was produced.

3.02 Tests

- A. All tests shall be made in the presence of the Owner or Engineer unless waived in writing. The Contractor shall notify the Engineer in sufficient time when tests are being conducted to allow for travel time to the manufacturer's plant.

3.03 Installation of Underground Piping

- A. Excavation, trenching and backfilling for the installation of underground piping system shall be as specified in Section 02222 - Trenching, Backfilling and Compacting. Pipe shall be laid in a level trench. Irregularities shall be smoothed out or filled in with sand and tamped. Holes shall be scooped out where the bells occur leaving the entire barrel of the pipe bearing on the pipe bed. Locate tape shall be installed 18" below finished grade. It shall state "Caution, buried potable main below" for water, "Caution, buried force main below" for force main, and "Caution, buried gravity main below" for sewer.
- B. Laying of the pipe shall be commenced immediately after the excavation is started, and every means must be used to keep pipe laying closely behind the trenching. The Engineer may stop trenching when, in his opinion, the trench is open too far in advance of the pipe laying operation. Pipe may be laid in the best manner adapted to securing speed and good results. It shall, however, be in accordance with the manufacturer's instructions and recommendations. Damaged or unsound pipe or fittings will be removed and replaced by the Contractor at no additional cost to the Owner. Before jointing of the pipe, all lumps, blisters, excess coating material or oil shall be removed from the bell and spigot ends of the pipe. Waterlines shall be thrust-blocked or restrained to prevent movement of lines under pressure. Restraints or concrete thrust-blocking shall be furnished by the Contractor. Concrete shall be a minimum 2,500 psi. For ductile iron pipe, thrust or anchor blocks or restrained joints shall be installed at all bends, tees, crosses, wyes, plugs, and reducers as shown in details of typical thrust and anchor block placements on the drawings. The number of feet of pipe with restrained joints necessary for each size pipe shall be as shown on the

Standard Detail drawings.

- C. Where there is no adequate natural foundation upon which to construct a pipe bed, the pipe shall be constructed on a prepared stabilized subgrade or rock bedding of Class I materials as defined in ASTM D2321. Unsuitable subgrade materials shall be replaced or stabilized as described in Section 02222. Gravel or graded limerock used for pipe bedding, when ordered in writing, shall be paid for under bid item for such material. Where dewatering is required, Class I materials shall be used as described in ASTM D2321.
- D. Pipe and fittings shall be strung out for 1 day's construction along the route of construction with the spigots pointing in the direction of the flow. Pipe shall be placed where it will cause least interference with traffic. Pipe shall be handled by mechanical equipment. Before the pipe is lowered into the trench, it shall be swabbed or brushed out to insure that no dirt or foreign material gets into the finished line. Trench waters shall be kept out of the pipe and the pipe kept closed by means of a test plug whenever work is not in progress. The Contractor shall provide the means for dewatering the trench and the cost thereof shall be included in the price for installing the pipe.
- E. Deflections from a straight line or grade made necessary by vertical curves or horizontal curves or offsets shall not exceed the manufacturer's recommendations. If the specified or required alignment requires deflection in excess of those recommended, the Contractor shall either provide special bends as approved by the Engineer or a sufficient number of shorter lengths of pipe to provide angular deflections within the required limit.
- F. All joints shall be watertight and any leaks or defects discovered shall be immediately repaired to the satisfaction of the Engineer. Any pipe which has been disturbed after being laid shall be taken up, the joints cleaned and the pipes properly re-laid. Any superfluous material inside the pipe shall be flushed or removed by means of an approved follower or scraper after joints are made. Installation of fittings and pipe joints shall be in strict accordance with the manufacturer's recommendations.
- G. Before backfilling gravity pipes, the Contractor shall take elevations on the top of the pipe barrel at 100-foot intervals along the pipe line and at any change in grade. These elevations shall be submitted to the Engineer.
- H. Plastic pipe shall be installed in strict accordance with the provisions of ASTM D2321-74, including those provisions in respect to compaction of bedding and haunching material. Class IV or Class V materials as defined in ASTM D2321 shall not be used for bedding, haunching or initial backfill.

3.04 Connections to Existing Mains

- A. Where connections are required between new work and existing utility mains, the

connection shall be made in a thorough and first class manner, using proper specials and fittings to suit the actual conditions. In case a connection is made to an existing fitting in the line, the Contractor shall schedule his work so that digging and locating the existing fittings can be completed prior to starting trench work on the line. Cut-ins into lines shall be done at a time approved by the Utilities Engineer. The Contractor shall not make any connections or service taps into existing utility mains until their work has been tested and accepted by the Utilities Engineer.

3.05 Testing Piping System - Flushing

- A. After the mains have been laid and pressure tested, each run of pipe shall be thoroughly flushed so as to remove all debris and foreign matter from the lines. Flushing will ordinarily be done by opening fire hydrants or blowoffs along the pipe line. Where fire hydrants or blowoffs are not available or are of insufficient capacity to permit adequate flushing, the pipe line shall be opened and flumes or piping shall be provided by the Contractor to waste the water to the nearest approved disposal point. Sufficient flushing water shall be introduced into the mains to produce a velocity of not less than 2-1/2-feet per second, and this rate of flow shall be continued until the discharge is clear and no evidence of silt or foreign matter is visible.

END OF SECTION 02660

SECTION 02935 SODDING

Part I. GENERAL

1.01 Scope

- A. The work to be performed under this section includes furnishing and installing all sod, fertilizer, and other required materials as shown on the plans and as specified.

1.02 Basis of Measurement and Payment

- A. Payment will be based on actual S.F. placed for the unit price shown on the Bid Form.

1.03 Referenced Standards

- A. FDOT Specifications shall mean the Florida Department of Transportation "Standards Specifications for Road and Bridge Construction" most recent edition unless specifically noted otherwise.

Part II. PRODUCTS

2.01 Materials

- A. Sod shall meet the requirements of Section 981-2 of the current FDOT Specifications and shall consist of bahia grass unless shown otherwise on the drawings, or unless adjacent lawns are of a different type.
- B. Fertilizer shall be as specified in Section 982 of current FDOT Specifications.

Part III. EXECUTION

3.01 Installation

- A. Sod shall be placed in accordance with Section 575 of the current FDOT Specifications and perpendicular to the angle of sloped areas with edges in close contact, with the rows staggered to minimize erosion. All sod will be placed within 72 hours of cutting unless authorized by the ENGINEER. Sod will be pegged in place on slopes steeper than 3 horizontal to 1 vertical.
- B. All areas within the construction limits which are not hardscape or other landscape improvements as specified in the plan set are to be sodded with bahia sod.
- C. All sodded areas shall be watered and maintained by the CONTRACTOR until final acceptance of the project by the OWNER. Any washouts or other areas where sod has been damaged will be repaired by the CONTRACTOR prior to final acceptance.

- D. Through-out the 90-day and 9 month optional maintenance / establishment periods the contractor shall follow the Minimum Level of Maintenance Matrix included in the Construction Plans. In addition, for all sod (existing and proposed) within the project limits, the Contractor is required to:
- a. Remove all visible trash prior to the mowing operations.
 - b. Edge / trim around all hardscape surfaces including, but not limited to: edge of roadways, edges of driveways, light poles, fencing, signage and utility appurtenances.
 - c. All hardscape surfaces including, but not limited to: edge of roadways, edges of driveways, light poles, fencing, signage shall be spot sprayed with herbicide around their bases.
 - d. Weekly inspection of sod is to be made to insure prompt attention to any diseases or pests. Fire ants, as well as any other damaging pests, shall be treated promptly so they do not present a hazard.
 - e. Fertilization: bahia grass should have limited fertilization. Application of fertilizer should be based on an evaluation of the sod quality performed by an experienced landscaper and should take place when a need has identified.

END OF SECTION 02935

SECTION 03330
FLOWABLE GROUT AND FILL

Part I. GENERAL

1.01 Related Documents

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

1.02 Work Included

- A. This section specifies the requirements for flowable fill used to fill abandoned water sewer and stormwater lines, and where compacted fill is used as an option for pipe cover. All reference to sections shall be to section of the Florida Department of Transportation’s “Standard Specifications for Road and Bridge Construction,” latest edition.

Part II. PRODUCTS

2.01 Materials

- A. Type Portland Cement – Section 921
- B. Fly Ash, Slag and other Pozzolanic Materials for Portland Cement Concrete – Section 929
- C. Fine Aggregate (Sand)* - Section 902
- D. Water – Section 923
- E. Any clean sand with 100% passing 3/8” sieve and not more than 10% passing the 200 mesh may be used.

2.02 Mix Proportions

- A. The Contractor shall be responsible for producing a flowable mixture using these guidelines and adjusting his mixture design as called for by circumstances or as may be directed by the Engineer.
- B. Flowable fill material shall be proportioned to produce a 28-day compressive strength of approximately 50-150 psi.
- C. General mix quantities are as follows:

Components	Pounds per Cubic Yard
Cement	50-100*
Fly Ash or Granulated Blast Furnace Slag	0-600
Fine Sand	2,750 (adjust to yield one cubic yard of flowable fill)
Water	500 (maximum)

*The percentage of cement may be increased above these limits only when early strength is required and future removal is very unlikely.

- D. Weights for fine aggregate and water shall be adjusted according to cementitious content. The mix proportions shall be adjusted for removability, pumpability and flowability. If required, strength test data shall be provided prior to batching.

PART III. EXECUTION

3.01 Tests

- A. If required by the Engineer, the flowability can be measured by afflux time determined in accordance with ASTM C 939 and shall be 30 seconds + or - 5 seconds as measured on mortar passing the No. 4 sieve. The Contractor shall provide the equipment required to perform this test.
- B. The fill shall be left undisturbed until material obtains sufficient strength. Sufficient strength is 250-psi penetration resistance as measured using a hand held penetrometer. The Contractor shall provide the penetrometer.

3.02 Production and Placing

- A. Flowable fill shall be produced and delivered using concrete construction equipment. Placing flowable fill shall be by pumping or other methods approved by the Engineer.

3.03 Construction Requirements

- A. The pipes or trenches shall be completely filled without vibration or other means of compaction. Placement shall be avoided during inclement weather, e.g. rain or ambient temperatures below 40 degrees F. The Contractor shall take all necessary precautions to prevent any damages caused by the hydraulic pressure of the fill during placement prior to hardening.
- B. No curing protection is required.

3.05 Fill Points

- A. When applying to abandoned pipes, the existing mains shall be exposed and double strap tapping saddles installed with 2" Schedule 40 PVC to form vents and/or fill holes. The spacing of these vents shall be a maximum distance of 600 feet for 4" and 6" mains and 300 feet for 12" and 14" mains. If the fill begins to set before it is in place the spacing will need to be reduced.

3.06 Measurement and Payment

- A. Measurement and payment will incidental to other line items.

END OF SECTION 03330

SECTION 04550

DRAINAGE PIPE INSTALLATION

Part I. GENERAL

1.01 Scope

- A. The work covered by this section consists of all excavation, bedding, laying pipe, jointing and coupling pipe sections, and backfilling necessary to install the various types of pipe and fittings required to complete the project.
- B. The work shall be performed in accordance with the requirements of these specifications, plans and in accordance with the requirements of the manufacture.
- C. The work covered by this section also includes furnishing all required piping, piping appurtenances and other related piping material such as nuts, bolts, gaskets, sleeves, joint compounds, etc. as needed to meet the requirements of the plans.

1.02 Unloading and Handling

- A. All pipes shall be unloaded and handled with reasonable care. Pipe shall not be rolled or dragged over gravel or rock during handling. When any joint or section of pipe is damaged during unloading or handling, the undamaged portions of the joint or section may be used where partial lengths are needed, or if damaged sufficiently, the Engineer will reject the joint or section as being unfit for installation and the Contractor shall remove such rejected pipe from the project.
- B. Minor damage to pipe may be repaired by the Contractor when permitted by the Engineer.

Part II. PRODUCTS

2.01 Culverts

- A. Reinforced concrete pipe conforming to requirements of ASTM C 14, ASTM C 76, ASTM C 118, and ASTM C 316

Part III. EXECUTION

3.01 Preparation of Pipe Foundation

- A. Lines and Grades: The pipe foundation shall be prepared to be uniformly firm and shall be true to the lines and grades as shown on the plans. Any deviation or field adjustments will require the approval of the Engineer. When an Inspector is present on the work and is so requested by the Contractor, he shall check the position of grades and lines; but the Contractor shall be responsible for the finished drain line being laid to exact and proper line and grade.

- B. **Pipe Foundation:** Whenever the nature of the ground will permit, the excavation at the bottom of the trench shall have the shape and dimensions of the outside lower third of the circumference of the pipe, care being taken to secure a firm bearing support uniformly throughout the length of the pipe. A space shall be excavated under and around each bell to sufficient depth to relieve it of any load and to allow ample space for filling and finishing the joint. The pipe, when thus bedded firmly, shall be on the exact grade. In case the bed shaped in the bottom of the trench is too low, the pipe shall be completely removed from position, and earth of suitable quality shall be placed and thoroughly tamped to prepare a new foundation for the pipe.
- C. In no case shall the pipe be brought to grade by blocking up under the barrel or bell of same, but a new and uniform support must be provided for the full length of the pipe. Where rock or boulders are encountered in the bottom of the trench, the same shall be removed to such depth that no part of the pipe, when laid to grade, will be closer to the rock or boulders than six (6) inches. A suitably tamped and shaped foundation of suitable earth shall be placed to bring the bottom of the trench to proper subgrade over rock or boulders.
- D. Where the foundation material is found to be of poor supporting value, the Engineer may make minor adjustment in the location of the pipe to provide a more suitable foundation. Where this is not practical, the foundation shall be conditioned by removing the existing foundation material by undercutting to the depth as directed by the Engineer, within the limits established on the plans, and backfilling with either a suitable local material secured from unclassified excavation or borrow excavation at the nearest accessible location along the project, or foundation conditioning material consisting of crushed stone or gravel or a combination of sand and crushed stone or gravel approved by the Engineer as being suitable for the purpose intended. The selection of the type of backfill material to be used for foundation conditioning will be made by the Engineer.
- E. **Water in Trenches:** The Contractor shall remove all water which may be encountered or which may accumulate in the trenches by pumping or bailing; and no pipes shall be laid until the water has been removed from the trench. The Contractor will not be permitted to drain water through the storm drain within a period of twenty-four (24) hours after the pipe has been laid, and the open end of the pipe in the trench shall be kept closed with a tight fitting plug to prevent washing of dirt or debris into the line. Water so removed from the trench must be disposed of in such manner as not to cause injury to work completed or in progress.
- F. **Special Foundations:** Whenever the bottom of the trench shall be of such nature as to provide unsatisfactory foundation for the pipe, the Engineer will require the pipe to be laid on timber or concrete cradle foundations. Such foundations whether of single plank, plank cradle, plank cradle supported on piles, or poured concrete cradle, shall be placed by the Contractor; and compensation will be allowed the Contractor for the materials so used.

3.02 Storm Drain

- A. Pipe shall be laid with the groove or bell end up grade, and with the spigot or tongue fully inserted. Where mortar joints are used, the mortar should be composed of one part Portland cement, and two parts of clean, sharp sand with 15% hydrated lime by volume, added to the mixture. The pipe shall be thoroughly cleaned and slightly moist when the mortar is applied. The lower portion of the bell or groove shall be filled with mortar sufficient to bring the inner surface flush, and even when the next joint is fitted into place. The remainder of the joint shall then be filled with mortar and a bead or ring of mortar formed around the outside of the joint. The application of mortar to the inside joints may be delayed until fill is completed when the pipe is in excess of 30" diameter. The inside of all mortar joints will be clean and smooth upon completion of the work. Completed mortar joints should be cured and protected by permanently wrapping the exposed outside portion of the mortar joint with a layer of roofing felt.
- B. When coupling bands for annular or helical corrugated metal pipe are used, the pipe sections shall be joined and fully bolted so that the circumferential and longitudinal strength will be sufficient to preserve the alignment, prevent separation of the sections, and to prevent infiltration of backfill material.
- C. Jointing for concrete and reinforced concrete shall be of the Bell and Spigot type and installed according to manufacturer's recommendations using Portland cement mortar. Corrugated metal pipe joints shall be made by riveting or by means of connecting bands with bolted couplings in accordance with the manufacturer's recommendations.

3.03 Alignment

- A. Elliptical concrete pipe with circular reinforcing and circular concrete pipe with elliptical reinforcing shall be so placed that the reference lines designating the top of the pipes will be not more than 5 degrees from the vertical plane through the longitudinal axis of the pipe. In all backfilling operations the Contractor shall be responsible for preventing damage to or misalignment of the pipe.

3.04 Backfilling

- A. Storm Drain
 - 1. The backfill around the pipe shall be placed in layers not to exceed six (6) inches loose and compacted to 95% Standard Proctor test for all areas directly beneath subgrade. From the bottom of the trench to the centerline of the pipe the backfill material shall be compacted by approved hand tamps. From the centerline of the pipe to the top of the trench other mechanical tamps as approved by the Engineer may be used. All backfill material shall have been approved by the Engineer. Select backfill material shall be used when called for on the plans.
 - 2. Care shall be taken during backfill and compaction operations to maintain alignment and prevent damage to the joints. The backfill shall be kept free from stones, frozen lumps, chunks of highly plastic clay, or other objectionable

materials.

3. All pipe backfill areas shall be graded and maintained in such a condition that erosion or saturation will not damage the pipe bed or backfill.
4. Heavy equipment shall not be operated over any pipe until it has been properly backfilled and has a minimum cover as required by the plans. Where any part of the required cover is above the proposed finish grade, the Contractor shall place, maintain, and finally remove such material at no cost to the Owner. Pipe which becomes misaligned, shows excessive settlement, or has been otherwise damaged by the Contractor's operations shall be removed and replaced by the Contractor at no cost to the Owner.

3.05 Testing

- A. Upon completion, installed lines shall show a full circle of light when "Lamped" between catch basins. This test shall be performed by the Engineer.
- B. Other tests may be required by the Engineer, such as exfiltration. In this event the results shall meet the minimum standards that the manufacturer states are obtainable.

END OF SECTION 04550

SECTION 16050 ELECTRICAL GENERAL PROVISIONS

Part I. GENERAL

1.01 Work Included

- A. The work covered by this section of the Specifications consists of furnishing all labor, material and equipment, and in performing all operations necessary for the construction of the electrical work, complete and ready for use. The work shall include, but shall not be limited to the furnishing and installing of materials and equipment to provide a complete electrical system in strict accordance with the specifications, as shown on the drawings, and as is necessary and incidental to the proper operation of the electrical equipment described for the project. Omission of a special electrical item obviously necessary for the proper functioning of equipment shall not relieve the Contractor of the responsibility of furnishing the item as a part of the work.
- B. The Work shall include complete testing of all equipment and wiring at the completion of the Work and making any minor connection changes or adjustments necessary for the proper functioning of the systems and equipment. All workmanship shall be of the highest quality; substandard work will be rejected.
- C. It is the intent of these Specifications that the electrical system shall be suitable in every way for the service required. All material and all work, which may be reasonably implied as being incidental to the Work of this Section, shall be furnished within the Scope of the Contract.
- D. Like items provided hereunder shall be the end products of one manufacturer in order to achieve standardization for appearance, operation and maintenance.

1.02 Reference Specifications, Codes and Standards

- A. All work shall be in accordance with the latest edition of the National Electrical Code and all applicable national, local and state codes.
- B. All materials and installations shall comply with the applicable standards of the National Electrical Manufacturers Association (NEMA).
- C. It shall be the responsibility of the Contractor to install all work in conformance with all applicable codes to requirements of all authorities having jurisdiction and to the regulations of related utility companies.
- D. Any changes to the design to comply with these codes shall be included in the Bid.
- E. When a change is required, the Contractor shall send a copy of the change to the Engineer/Owner and indicate the reasons. In no case shall any change be made if the design exceeds the minimum requirements of these codes.

1.03 Interpretation of Drawings

- A. The Drawings are not intended to show exact locations of conduit runs.
- A. Unless otherwise directed by the ENGINEER, conduit shown exposed shall be installed exposed; conduit shown concealed shall be installed concealed.
- B. Where circuits are shown as “home-runs” all necessary fittings and boxes shall be provided for a complete raceway installation.
- D. Harmonize the Work of the different trades so that interferences between conduits, piping, equipment and structural work will be avoided. All necessary offsets shall be furnished so as to take up a minimum space and all such offsets and fittings, required to accomplish this shall be furnished and installed within the Scope of the Contract. In case conflict develops, the ENGINEER’s and/or OWNER’s authorized representative will decide which equipment or piping, must be relocated, regardless of which was installed first.
- E. The locations of electrical equipment and similar devices shown on the Drawings are approximate only. Exact locations shall be as accepted by the ENGINEER during construction. Vendor’s approved shop drawings shall be used for dimensions of equipment. Obtain in the field all information relevant to the placing of electrical work and in case of any interference with other work, proceed as directed by the ENGINEER and furnish all labor and materials necessary to complete the Work in a workmanlike manner.
- F. Furnish all labor and materials necessary to install and place in satisfactory operation all power and other electrical systems. Additional circuits shall be installed wherever needed to conform to the specific requirements of the equipment.
- G. All connections to equipment shall be made in accordance with the approved shop and setting drawings.

1.04 Submittals

- A. Submittals shall be made in accordance with Section 01300 - Submittals.
- B. Submittals shall be made for all specified equipment and materials. Submittal data shall include but not be limited to catalog data, cut sheets, manufacturer s name and model number.
- C. No material or equipment shall be ordered or shop work started until the ENGINEER’s review of submittals has been completed.

1.05 Quality Assurance

- A. Work under this Section shall be accomplished by persons skilled in performance of the required work. All work shall be done in a first class manner in keeping with conventions of the trade. Work under this Section shall be closely coordinated with

work of other trades to avoid conflict and interference.

- B. The electrical subcontractor shall have experience in similar projects and shall employ a qualified supervisor with responsible experience in similar work who shall be in direct charge at all times.

1.06 Delivery, Storage and Handling

- A. The Contractor shall use all means necessary to protect the materials and equipment of this Section before, during and after installation and to protect the installed work and material of all other trades. In the event of damage, immediately make all repairs and replacements necessary for the approval of the Engineer/Owner at no additional cost to the Owner.
- B. Electrical equipment shall at all times during construction be adequately protected against mechanical injury or damage by water. Electrical equipment shall not be stored out-of-doors. Electrical equipment shall be stored in dry permanent shelters. If any apparatus has been damaged, the CONTRACTOR at his own cost and expense shall repair such damage. If any apparatus has been subject to possible injury by water, it shall be thoroughly dried out and put through such special tests as directed by the ENGINEER, at the cost and expense of the CONTRACTOR, or shall be replaced by the CONTRACTOR within the Scope of the Contract.

1.07 Warranty

- A. Provide warranties for all the electrical and instrumentation equipment for period of two (2) years after the date of Substantial Completion as defined in the General Conditions.

Part II. PRODUCTS

2.01 Materials

- A. The materials used in all systems shall be new, unused and as hereinafter specified. All materials where not specified shall be of the very best of their respective kinds. Samples of materials or manufacturer's specifications shall be submitted for review as required by the ENGINEER.
- B. Materials and equipment used shall be labeled and listed by UL or FM wherever standards have been established and label service is regularly furnished. All products shall conform with the applicable standards of NEMA and ANSI.

2.02 Grounding Materials

- A. All ground rods shall be 10 foot 5/8" copper clad, unless otherwise indicated.
- B. Ground wires shall be soft drawn copper sized per National Electrical Code, unless otherwise indicated.

2.03 Conduit

- A. PVC conduit shall be rigid Schedule 80 or 40 for underground installation and rigid Schedule 80 for above ground installation. The conduit shall be sunlight resistant and used as per locations noted within these specifications unless otherwise noted, and shall be U.L. approved and comply with Federal Spec WC-1094 and NEMATC-1.
- B. Liquid tight flexible metal conduit (Flex) shall be galvanized steel inside and outside with moisture and oil proof PVC jacket extruded over the outside with a continuous copper ground under the jacket.
- C. PVC Coated RGS
 - 1. PVC coated rigid galvanized steel conduit system shall be coated interior (minimum 2 mils) and exterior (minimum 40 mils) provided by Pearmacoat or Robroy or equal.

2.04 Conduit Ends

- A. Conduit *EIP* seal fitting.
 - 1. Conduit seal fittings shall be Killark EYS - copper free aluminum bodies, with Chico A sealing compound.
- B. Conduit End (Strain Relief)
 - 1. Shall be nonmetallic, liquid tight, strain relief connectors - straight, as manufactured by Thomas & Betts (T&B) or equal.

2.05 CABLE, WIRE AND CONNECTORS -600 Volt Power Wiring

- A. Cable shall be rated for 600 volts and shall meet the requirements below:
 - 1. Conductors shall be stranded.
 - 2. All wire shall be brought to the job in unbroken packages and shall bear the date of manufacturing; not older than 12 months.
 - 3. Type of wire shall be THWN except where required otherwise by the contract drawings.
 - 4. No wire smaller than No. 12 gauge shall be used unless specifically indicated.
 - 5. Conductor metal shall be copper.
 - 6. All conductors shall be meggered after installation and insulation must be in compliance with the National Electrical Code.

2.06 Outlets and Boxes

- A. Outlets, junction boxes, conduits and pull boxes shall be of adequate size for the number of wires run into them. Pull boxes shall be installed where necessary and shall be placed in accessible location. All junction boxes and conduit fittings shall be cast of cadmium finished malleable iron.
- B. PVC and F.R.P. fiberglass reinforced plastic shall be permitted in protected location.

2.07 Safety Disconnect Switch

- A. Fusible and non-fusible disconnect switches shall be heavy-duty, NEMA type H, quick-make, quick-break, visible blades, 600 volt, with full cover interlock. Outside switches shall have copper Lugs.
- B. Where disconnects are installed outside, provide a 600V, non-fusible switch in a NEMA 4X, stainless steel enclosure.
- C. Switches shall be horsepower rated and as manufactured by the Square D Co., or equal.
- D. Auxiliary contacts shall be provided where required on plans.

2.08 Terminations and Splices (600 Volts and Less)

- A. Terminations of power cable shall be by means of U.L. approved connectors. All connectors shall meet U.L. 486B and shall be compatible with the conductor material.
- B. Terminate all control and instrumentation cable with fork type compression lugs.
- C. Splicing of power, control, or instrumentation wiring will not be allowed except by written approval of the Engineer. Where splicing is allowed, splices shall be made with approved compression connectors, and splices shall be made waterproof at outdoor locations.

2.09 Boxes

- A. Boxes for wiring devices (switches and receptacles) installed outdoors shall be weatherproof fiberglass with polycarbonate cover plates. Junction boxes shall be fiberglass with gasketed covers. All boxes shall be securely mounted plumb and level in readily accessible locations. Indoor boxes shall have stainless steel cover plates.
- B. Unless otherwise indicated, all outdoor junction boxes and pull boxes shall be NEMA 4X stainless steel or fiberglass.

2.10 Mounting and Supporting Electrical Equipment

- A. Furnish and install all supports, hangers, and inserts required to mount fixtures,

conduits, cables, pull boxes, and other equipment furnished under this section or furnished for installation under this section.

- B. Perforated straps and wire are not permitted for supporting electrical devices. Anchors shall be of approved types.
- C. Framing channels for mounting disconnect switch, FKEC meter, electrical equipment and the like shall be minimum 1-5/8-inch width type 316 stainless steel channels as manufactured by Unistrut, or equal.
- D. Pipe clamps, nuts, bolts, washers and other miscellaneous installation hardware shall be type 316 stainless steel.

Part III. EXECUTION

3.01 General

- A. Prior to all work of Section, carefully inspect the installed work of all other trades and verify that all such work is complete to the point where this installation may properly commence. Install all electrical work to conform to job site conditions and all Drawings and Specifications.
- B. All “tight” conditions shall be worked out in advance by the Contractor with all involved trades. In the event of any discrepancy, immediately notify the Engineer/Owner. Do not proceed with any installation in the area of the discrepancy until it has been fully resolved. No additional cost will be considered for work which must be relocated due to the conflicts with the work of other trades.
- C. Install all equipment, systems and materials in strict accordance with manufacturers’ recommendations and NEMA standards for installation. If this in any way causes conflicts, immediately notify the Engineer/Owner.
- D. Provide all mounting supports and accessories as required to install all equipment and all system components. Correlate the Shop Drawings as applicable.

3.02 Excavation for Electrical Work

- A. The work of this article is defined to include whatever excavating and backfilling is necessary to install the electrical work. Coordinate the work with other excavating and backfilling in the same area, including dewatering, flood protection provisions and other temporary facilities. Coordinate the work with other work in the same area, including other underground services (existing and new), landscape development, paving and floor slabs on grade. Coordinate with weather conditions and provide temporary facilities needed for protection and proper performance of excavation and backfilling.

3.03 Concrete for Electrical Work

- A. The work of this article is defined to include whatever concrete work is necessary or

shown specifically to install the electrical work.

3.04 Waterproofing

- A. Use watertight fittings on panel or other equipment to keep out water.
- B. Where support holes are drilled in panel or boxes, seal with butyl rubber or other approved sealing compound inside and out.

3.05 Conduit Uses Per Locations

- A. Conduits shall be used as follows:
 - 1. PVC schedule 80 or 40 shall be used underground in all areas that are not hazardous designations. PVC schedule 80 is required above ground.
 - 2. Flex shall be used for all connections to vibrating equipment or where flexibility is required for servicing of equipment.

3.06 Conduit Installation

- A. Conduits entering panelboards, pull boxes, or outlet boxes shall be secured in place by locknuts and bushings, one (1) locknut outside and one (1) locknut inside of box with busing on conduit end. The locknuts shall be tightened against the box without deforming the box. Bushings shall be of the insulating type.
- B. Field conduit bends shall be made with standard tools and equipment manufactured especially for conduit bending.
- C. Pull line shall be installed in all empty conduits. Pull line shall be nylon cord. All pull lines shall be identified with conduit number at each end.
- D. Wire shall not be installed until all work of any nature that may cause damage is completed, including pouring of concrete. Mechanical means shall not be used in pulling in wires No. 8 or smaller.
- E. Underground conduits not under concrete slabs are to be buried at least two (2) feet below finished grade for circuits rated 600 volts or less, except under traffic areas where motor vehicles may cross. Under traffic areas, conduits are to be buried at least three (3) feet below finished grade. Six-inch wide yellow “Electrical Warning Tape” shall be installed 12 inches below final grade directly above all yard conduit runs.
- F. All conduits shall be cleaned by pulling a brush swab through before installing cables.
- G. All conduits shall be sealed at each end with electrical putty. Special care shall be taken at all equipment where entrance of moisture could be detrimental to equipment.

END OF SECTION 16050