TECHNICAL SPECIFICATIONS

for

North Development Road

at



Bid Documents February 2024 FDOT (PTGA) Project No: FM 449858-1-94-01

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STANDARD GENERAL CONDITIONS FOR **NORTH DEVELOPMENT ROAD** AT OCALA AIRPORT

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ARTICLE 1 – DEFINITIONS AND TERMINOLOGY

1.1 Defined Terms

- A. Wherever used in the Bidding Requirements or Contract Documents, a term printed with initial capital letters, including the term's singular and plural forms, will have the meaning indicated in the definitions below. In addition to terms specifically defined, terms with initial capital letters in the Contract Documents include references to identified articles and paragraphs, and the titles of other documents or forms.
 - 1. *Addenda*—Written or graphic instruments issued prior to the opening of Bids which clarify, correct, or change the Bidding Requirements or the proposed Contract Documents.
 - 2. *Agreement*—The written instrument, executed by Owner and Contractor, that sets forth the Contract Price and Contract Times, identifies the parties and the Engineer, and designates the specific items that are Contract Documents.
 - 3. *Application for Payment*—The form acceptable to Engineer which is to be used by Contractor during the course of the Work in requesting progress or final payments and which is to be accompanied by such supporting documentation as is required by the Contract Documents.
 - 4. *As Approved*–The words "as approved", unless otherwise qualified, shall be understood to be followed by the words "by the Owner in conformance with the Contract Documents."
 - 5. *As Shown, As Indicated* The words "as shown" and "as indicated" shall be understood to be followed by the words "on the Drawings".
 - 6. *Bid*—The offer of a Bidder submitted on the prescribed form setting forth the prices for the Work to be performed.
 - 7. Bidder—An individual or entity that submits a Bid to Owner.
 - 8. *Bidding Documents*—The Bidding Requirements, the proposed Contract Documents, and all Addenda.
 - 9. *Bidding Requirements*—The advertisement or invitation to bid, Instructions to Bidders, Bid Bond, or other Bid security, if any, the Bid Form, and the Bid with any attachments.
 - 10. Bonds Performance and payment bonds and other instruments of security.
 - 11. Change Order—A document which is signed by Contractor and Owner and authorizes an addition, deletion, or revision in the Work or an adjustment in the Contract Price or the Contract Times, or other revision to the Contract, issued on or after the Effective Date of the Contract. If unsigned, a *Change Order* may also consist of a written request by Contractor, duly submitted in compliance with the procedural requirements set forth herein, seeking an adjustment in Contract Price or Contract Times, or both; contesting an initial decision by Engineer concerning the requirements of the Contract Documents or the acceptability of Work under the Contract Documents; challenging a set-off against payments due; or seeking other relief with respect to the terms of the Contract. A *Change Order* shall not be deemed effective unless and until approved by Engineer and executed pursuant to Section 11, below.
 - 12. *City* City of Ocala, Marion County, Florida. The term "City" and "Owner" are interchangeable and shall have the same meaning in the Contract Documents.
 - 13. *City Council* The governing body of the City of Ocala.
 - 14. *City Engineer* Florida registered professional engineer who is the head of the City of Ocala Engineering Department and is authorized to manage construction, execute bid

documents, and administer contract Work Change Directive to construction contracts.

- 15. *Claim*—(a) A demand or assertion by Owner directly to Contractor, duly submitted in compliance with the procedural requirements set forth herein: seeking an adjustment of Contract Price or Contract Times, or both; contesting an initial decision by Engineer concerning the requirements of the Contract Documents or the acceptability of Work under the Contract Documents; contesting Engineer's decision regarding a Change Order; seeking resolution of a contractual issue that Engineer has declined to address; or seeking other relief with respect to the terms of the Contract; or (b) a demand or assertion by Contractor directly to Owner, duly submitted in compliance with the procedural requirements set forth herein, contesting Engineer's decision regarding a Change Order; or seeking resolution of a contractual issue that Engineer has declined to address. A demand for money or services by a third party is not a Claim.
- 16. Constituent of Concern—Asbestos, petroleum, radioactive materials, polychlorinated biphenyls (PCBs), hazardous waste, and any substance, product, waste, or other material of any nature whatsoever that is or becomes listed, regulated, or addressed pursuant to (a) the Comprehensive Environmental Response, Compensation and Liability Act, 42 U.S.C. §§9601 et seq. ("CERCLA"); (b) the Hazardous Materials Transportation Act, 49 U.S.C. §§5101 et seq.; (c) the Resource Conservation and Recovery Act, 42 U.S.C. §§6901 et seq. ("RCRA"); (d) the Toxic Substances Control Act, 15 U.S.C. §§2601 et seq.; (e) the Clean Water Act, 33 U.S.C. §§1251 et seq.; (f) the Clean Air Act, 42 U.S.C. §§7401 et seq.; or (g) any other federal, state, or local statute, law, rule, regulation, ordinance, resolution, code, order, or decree regulating, relating to, or imposing liability or standards of conduct concerning, any hazardous, toxic, or dangerous waste, substance, or material.
- 17. Consultant Construction Engineering Inspection (CCEI) Consulting firm under contract to the City of Ocala for administration of construction engineering and inspection services.
- 18. *Contract*—The entire and integrated written contract between the Owner and Contractor concerning the Work.
- 19. *Contract Completion* The date the City accepts the entire work as being in compliance with the Contract Documents, or formally waives non-conforming work to the extent of non-conformity, and issues the final payment in accordance with the requirements set forth.
- 20. *Contract Documents*—Those items so designated in the Agreement, and which together comprise the Contract.
- 21. *Contract Price*—The money that Owner has agreed to pay Contractor for completion of the Work in accordance with the Contract Documents.
- 22. *Contract Times*—The number of days or the dates by which Contractor shall: (a) achieve Milestones, if any; (b) achieve Substantial Completion; and (c) complete the Work.
- 23. *Contractor*—The individual or entity with which Owner has contracted for performance of the Work.
- 24. Cost of the Work—See Paragraph 13.01 for definition.
- 25. *Drawings*—The detailed construction plans and details of the Contract Documents that graphically show the scope, extent, and character of the Work to be performed by Contractor.
- 26. *Effective Date of the Contract*—The date, indicated in the Agreement, on which the Contract becomes effective.
- 27. Engineer—The City Engineer or his appointed representative, including City Staff Engineer, Project Manager, Project Inspector, or engineering consultant under contract

Exhibit D - Technical Specifications CONTRACT# AIR/240533

with the City to provide Resident Project Management Representative (RPR) services, or Consultant Construction Engineering Inspection (CCEI) services for the construction project. The City Engineer has been given authority to manage the construction projects and represents the Owner, City of Ocala. Therefore, the term Owner and Engineer are synonymous for the purposes of the Contract Documents.

- 28. *Final Completion* The time at which the Work, in the opinion of Engineer, is complete, in accordance with the Contract Documents, and there are no remaining Punch List items. At Final Completion, the Contractor is eligible for Final Payment including payment of all retainages.
- 29. *Final Payment* Final payment of all payments due to the Contractor for the project, including all retainage.
- 30. *Hazardous Environmental Condition*—The presence at the Site of Constituents of Concern in such quantities or circumstances that may present a danger to persons or property exposed thereto. The presence at the Site of materials that are necessary for the execution of the Work, or that are to be incorporated in the Work, and that are controlled and contained pursuant to industry practices, Laws and Regulations, and the requirements of the Contract, does not establish a Hazardous Environmental Condition.
- 31. *Laws and Regulations; Laws or Regulations*—Any and all applicable laws, statutes, rules, regulations, ordinances, codes, and orders of any and all governmental bodies, agencies, authorities, and courts having jurisdiction.
- 32. *Liens*—Charges, security interests, or encumbrances upon Contract-related funds, real property, or personal property.
- 33. *Milestone*—A principal event in the performance of the Work that the Contract requires Contractor to achieve by an intermediate completion date or by a time prior to Substantial Completion of all the Work.
- 34. Modification (a) A written amendment to the Contract Documents signed by both parties, (b) a Change Order or Work Change Directive, (c) a written clarification or interpretation issued by the Owner (d) a written order for a minor change or alteration in the work issued by the Owner. A modification may only be issued after execution of the Contract.
- 35. *Notice* The term "notice" or the requirement to notify, as used in the Contract Documents or applicable state or federal statutes, shall signify a written communication delivered by Certified or Registered Mail to the individual, or to a member of the firm, or to an officer of the corporation as indicated in the Contract Documents.
- 36. *Notice of Award*—The written notice by Owner to a Bidder of Owner's acceptance of the Bid.
- 37. *Notice to Proceed*—A written notice by Owner to Contractor fixing the date on which the ContractTimes will commence to run and on which Contractor shall start to perform the Work.
- 38. *Owner*—The City of Ocala, Marion County, Florida with which Contractor has contracted regarding the Work, and which has agreed to pay Contractor for the performance of the Work, pursuant to the terms of the Contract. The City Engineer or his appointee shall act on behalf and shall be synonymous with the Owner as used in this document.
- 39. *Partial Utilization* Use by the Owner of a substantially completed part of the Work for the purpose of which it is intended (or related purpose) prior to Substantial Completion of all the Work.
- 40. *Progress Schedule*—A schedule, prepared and maintained by Contractor, describing the sequence and duration of the activities comprising the Contractor's plan to accomplish

the Work within the Contract Times.

- 41. *Project*—The total undertaking to be accomplished for Owner by engineers, contractors, and others, including planning, study, design, construction, testing, commissioning, and start-up, and of which the Work to be performed under the Contract Documents is a part.
- 42. *Project Manual*—The written documents prepared for, or made available for, procuring, and constructing the Work, including but not limited to the Bidding Documents or other construction procurement documents, geotechnical and existing conditions information, the Agreement, bond forms, General Conditions, Supplementary Conditions, and Specifications. The contents of the Project Manual may be bound in one or more volumes.
- 43. *Proposal* The terms "Proposal" and "Bid" are interchangeable and shall have the same meaning in the Contract Documents.
- 44. *Punch List* Items requiring correction before Project is at Final Completion. Punch list items shall be completed prior to Contract completion date. Liquidated damages will apply to items not completed by Contract completion date.
- 45. *Resident Project Representative*—The authorized representative of Engineer assigned to assist Engineer at the Site. As used herein, the term Resident Project Representative or "RPR" includes any assistants or field staff of Resident Project Representative.
- 46. *Samples*—Physical examples of materials, equipment, or workmanship that are representative of some portion of the Work and that establish the standards by which such portion of the Work will be judged.
- 47. *Schedule of Submittals*—A schedule, prepared and maintained by Contractor, of required submittals and the time requirements for Engineer's review of the submittals and the performance of related construction activities.
- 48. *Schedule of Values*—A schedule, prepared and maintained by Contractor, allocating portions of the Contract Price to various portions of the Work, and used as the basis for reviewing Contractor's Applications for Payment.
- 49. *Shop Drawings*—All drawings, diagrams, illustrations, schedules, and other data or information that are specifically prepared or assembled by or for Contractor and submitted by Contractor to illustrate some portion of the Work. Shop Drawings, whether approved or not, are not Drawings and are not Contract Documents.
- 50. *Site*—Lands or areas indicated in the Contract Documents as being furnished by Owner upon which the Work is to be performed, including rights-of-way and easements, and such other lands furnished by Owner which are designated for the use of Contractor.
- 51. *Specifications*—The part of the Contract that consists of written requirements for materials, equipment, systems, standards, and workmanship as applied to the Work, and certain administrative requirements and procedural matters applicable to the Work.
- 52. *Subcontractor*—An individual or entity having a direct contract with Contractor or with any other Subcontractor for the performance of a part of the Work.

- 53. Substantial Completion—The time at which the Work (or a specified part thereof) has progressed to the point where, in the opinion of Engineer, the Work (or a specified part thereof) is sufficiently complete, in accordance with the Contract Documents, so that the Work (or a specified part thereof) can be utilized for the purposes for which it is intended. The terms "substantially complete" and "substantially completed" as applied to all or part of the Work refer to Substantial Completion thereof.
- 54. *Successful Bidder*—The Bidder who's Bid the Owner accepts, and to which the Owner makes an award of contract, subject to stated conditions.
- 55. *Supplementary Conditions*—The part of the Contract that amends or supplements these General Conditions.
- 56. *Supplier*—A manufacturer, fabricator, supplier, distributor, materialman, or vendor having a direct contract with Contractor or with any Subcontractor to furnish materials or equipment to be incorporated in the Work by Contractor or a Subcontractor.
- 57. *Surety* Any person, firm, or corporation that has executed, as Surety, and of the Contractor's bonds securing the performance of the Contract.
- 58. *Technical Data*—Those items expressly identified as Technical Data in the Supplementary Conditions, with respect to either (a) subsurface conditions at the Site, or physical conditions relating to existing surface or subsurface structures at the Site (except Underground Facilities) or (b) Hazardous Environmental Conditions at the Site. If no such express identifications of Technical Data have been made with respect to conditions at the Site, then the data contained in boring logs, recorded measurements of subsurface water levels, laboratory test results, and other factual, objective information regarding conditions at the Site that are set forth in any geotechnical or environmental report prepared for the Project and made available to Contractor are hereby defined as Technical Data with respect to conditions at the Site under Paragraphs 5.03, 5.04, and 5.06.
- 59. Underground Facilities—All underground pipelines, conduits, ducts, cables, wires, manholes, vaults, tanks, tunnels, or other such facilities or attachments, and any encasements containing such facilities, including but not limited to those that convey electricity, gases, steam, liquid petroleum products, telephone or other communications, fiber optic transmissions, cable television, water, wastewater, storm water, other liquids or chemicals, or traffic or other control systems.
- 60. Unit Price Work—Work to be paid for on the basis of unit prices.
- 61. *Work*—The entire construction or the various separately identifiable parts thereof required to be provided under the Contract Documents. Work includes and is the result of performing or providing all labor, services, and documentation necessary to produce such construction; furnishing, installing, and incorporating all materials and equipment into such construction; and may include related services such as testing, start-up, and commissioning, all as required by the Contract Documents.
- 62. *Work Change Directive*—A written order to Contractor issued on or after the Effective Date of the Contract, issued by Engineer, which requires minor changes in the Work but does not change the Contract Price or the Contract Times.

1.2 Terminology

- A. The words and terms discussed in the following paragraphs are not defined but, when used in the Bidding Requirements or Contract Documents, have the indicated meaning.
- B. Intent of Certain Terms or Adjectives:
 - 1. The Contract Documents include the terms "as allowed," "as approved," "as ordered," "as directed" or terms of like effect or import to authorize an exercise of professional

judgment by Engineer. In addition, the adjectives "reasonable," "suitable," "acceptable," "proper," "satisfactory," or adjectives of like effect or import are used to describe an action or determination of Engineer as to the Work. It is intended that such exercise of professional judgment, action, or determination will be solely to evaluate, in general, the Work for compliance with the information in the Contract Documents and with the design concept of the Project as a functioning whole as shown or indicated in the Contract Documents (unless there is a specific statement indicating otherwise). The use of any such term or adjective is not intended to and shall not be effective to assign to Engineer any duty or authority to supervise or direct the performance of the Work, or any duty or authority to undertake responsibility contrary to the provisions of Article 10 or any other provision of the Contract Documents.

- C. Day:
 - 1. The word "day" means a calendar day of 24 hours measured from midnight to the next midnight.
- D. Defective:
 - 1. The word "defective," when modifying the word "Work," refers to Work that is unsatisfactory, faulty, or deficient in that it:
 - a. does not conform to the Contract Documents; or
 - b. does not meet the requirements of any applicable inspection, reference standard, test, or approval referred to in the Contract Documents; or
 - c. has been damaged prior to Engineer's recommendation of final payment (unless responsibility for the protection thereof has been assumed by Owner at Substantial Completion in accordance with Paragraph 15.03 or 15.04).
- E. Furnish, Install, Perform, Provide:
 - 1. The word "furnish," when used in connection with services, materials, or equipment, shall mean to supply and deliver said services, materials, or equipment to the Site (or some other specified location) ready for use or installation and in usable or operable condition.
 - 2. The word "install," when used in connection with services, materials, or equipment, shall mean to put into use or place in final position said services, materials, or equipment complete and ready for intended use.
 - 3. The words "perform" or "provide," when used in connection with services, materials, or equipment, shall mean to furnish and install said services, materials, or equipment complete and ready for intended use.
 - 4. If the Contract Documents establish an obligation of Contractor with respect to specific services, materials, or equipment, but do not expressly use any of the four words "furnish," "install," "perform," or "provide," then Contractor shall furnish and install said services, materials, or equipment complete and ready for intended use.
- F. Unless stated otherwise in the Contract Documents, words or phrases that have a well-known technical or construction industry or trade meaning are used in the Contract Documents in accordance with such recognized meaning.

ARTICLE 2 – PRELIMINARY MATTERS

- 2.1 Delivery of Bonds and Evidence of Insurance
 - A. *Bonds*: When Contractor delivers the executed counterparts of the Agreement to Owner, Contractor shall also deliver to Owner such bonds as Contractor may be required to furnish.
 - B. *Evidence of Contractor's Insurance*: When Contractor delivers the executed counterparts of the Agreement to Owner, Contractor shall also deliver to Owner, with copies to each named insured and additional insured (as identified in the Supplementary Conditions or elsewhere in the Contract), the certificates and other evidence of insurance required to be provided by Contractor in accordance with Article 6.
 - C. *Evidence of Owner's Insurance:* After receipt of the executed counterparts of the Agreement and all required bonds and insurance documentation, Owner shall promptly deliver to Contractor, with copies to each named insured and additional insured (as identified in the Supplementary Conditions or otherwise), the certificates and other evidence of insurance required to be provided by Owner under Article 6.
- 2.2 Copies of Documents
 - A. Owner shall furnish to Contractor one copy of the Contract Documents in electronic portable document format (PDF) or a website address, whereby the Contract Documents, in PDF format, can be viewed, printed, or downloaded by the Contractor.
- 2.3 Starting the Work
 - A. Contractor shall start to perform the work on the date when the Contract Times commence to run. Now Work shall be done at the Site prior to the date on which the Contract Times commence to run.
- 2.4 Before Starting Construction
 - A. *Preliminary Schedules*: Within 10 days after the Effective Date of the Contract (or as otherwise specifically required by the Contract Documents), Contractor shall submit to Engineer for timely review:
 - 1. a preliminary Progress Schedule indicating the times (numbers of days or dates) for starting and completing the various stages of the Work, including any Milestones specified in the Contract;
 - 2. a preliminary Schedule of Submittals; and
 - 3. a preliminary Schedule of Values for all of the Work which includes quantities and prices of items which when added together equal the Contract Price and subdivides the Work into component parts in sufficient detail to serve as the basis for progress payments during performance of the Work. Such prices will include an appropriate amount of overhead and profit applicable to each item of Work.
- 2.5 *Preconstruction Conference; Designation of Authorized Representatives*
 - A. Within 20 days, unless specified differently in the Special Provisions, after the Contract Times start to run, but before any Work at the Site is started, a conference attended by Contractor, Engineer, and others as appropriate will be held to establish a working understanding among the parties as to the Work and to discuss the schedules referred to in Paragraph 2.04.A, procedures for handling Shop Drawings, Samples, and other submittals, processing Applications for Payment, electronic or digital transmittals, and maintaining required records.
 - B. At this conference Contractor each shall designate, in writing, a specific individual to act as its authorized representative with respect to the services and responsibilities under the Contract. Such individuals shall have the authority to transmit and receive information, render decisions relative to the Contract, and otherwise act on behalf of each respectiveparty.

2.6 Initial Acceptance of Schedules

A. At least 10 days before submission of the first Application for Payment a conference, attended by Contractor, Engineer, and others as appropriate, will be held to review for acceptability to Engineer as provided below the schedules submitted in accordance with Paragraph 2.04.A.

Contractor shall have an additional 10 days to make corrections and adjustments and to complete and resubmit the schedules. No progress payment shall be made to Contractor until acceptable schedules are submitted to Engineer.

- 1. The Progress Schedule will be acceptable to Engineer if it provides an orderly progression of the Work to completion within the Contract Times. Such acceptance will not impose on Engineer responsibility for the Progress Schedule, for sequencing, scheduling, or progress of the Work, nor interfere with or relieve Contractor from Contractor's full responsibility therefor.
- 2. Contractor's Schedule of Submittals will be acceptable to Engineer if it provides a workable arrangement for reviewing and processing the required submittals.
- 3. Contractor's Schedule of Values will be acceptable to Engineer as to form and substance if it provides a reasonable allocation of the Contract Price to the component parts of the Work.

2.7 Electronic Transmittals

- A. Except as otherwise stated elsewhere in the Contract, the Owner, Engineer, and Contractor may transmit, and shall accept, Project-related correspondence, text, data, documents, drawings, information, and graphics, including but not limited to Shop Drawings and other submittals, in electronic media or digital format, either directly, or through access to a secure Project website.
- B. If the Contract does not establish protocols for electronic or digital transmittals, then Owner, Engineer, and Contractor shall jointly develop such protocols.
- C. When transmitting items in electronic media or digital format, the transmitting party makes no representations as to long term compatibility, usability, or readability of the items resulting from the recipient's use of software application packages, operating systems, or computer hardware differing from those used in the drafting or transmittal of the items, or from those established in applicable transmittal protocols.

ARTICLE 3 – DOCUMENTS: INTENT, REQUIREMENTS, REUSE

- 3.1 Intent
 - A. The Contract Documents are complementary; what is required by one is as binding as if required by all.
 - B. It is the intent of the Contract Documents to describe a functionally complete project (or part thereof) to be constructed in accordance with the Contract Documents.
 - C. The Contract supersedes prior negotiations, representations, and agreements, whether written or oral.
 - D. Engineer will issue clarifications and interpretations of the Contract Documents as provided herein.
- 3.2 Reference Standards
 - A. Standards Specifications, Codes, Laws, and Regulations
 - 1. Reference in the Contract Documents to standard specifications, manuals, reference standards, or codes of any technical society, organization, or association, or to Laws or Regulations, whether such reference be specific or by implication, shall mean the standard specification, manual, reference standard, code, or Laws or Regulations in effect at the time of opening of Bids (or on the Effective Date of the Contract if there were no Bids), except as may be otherwise specifically stated in the ContractDocuments.
 - 2. No provision of any such standard specification, manual, reference standard, or code, or any instruction of a Supplier, shall be effective to change the duties or responsibilities of Owner, Contractor, or Engineer, or any of their subcontractors, consultants, agents, or employees, from those set forth in the part of the Contract Documents prepared by or for Engineer. No such provision or instruction shall be effective to assign to Owner, Engineer, or any of their officers, directors, members, partners, employees, agents, consultants, or subcontractors, any duty or authority to supervise or direct the performance of the Work or any duty or authority to undertake responsibility inconsistent with the provisions of the part of the Contract Documents prepared by or forEngineer.

3.3 Reporting and Resolving Discrepancies

- A. *Reporting Discrepancies*:
 - 1. Contractor's Verification of Figures and Field Measurements: Before undertaking each part of the Work, Contractor shall carefully study the Contract Documents, and check and verify pertinent figures and dimensions therein, particularly with respect to applicable field measurements. Contractor shall promptly report in writing to Engineer any conflict, error, ambiguity, or discrepancy that Contractor discovers, or has actual knowledge of, and shall not proceed with any Work affected thereby until the conflict, error, ambiguity, or discrepancy is resolved, by a clarification or interpretation by Engineer, or by an amendment or supplement to the Contract Documents issued pursuant to Paragraph 11.01.
 - 2. Contractor's Review of Contract Documents: If, before or during the performance of the Work, Contractor discovers any conflict, error, ambiguity, or discrepancy within the Contract Documents, or between the Contract Documents and (a) any applicable Law or Regulation, (b) actual field conditions, (c) any standard specification, manual, reference standard, or code, or (d) any instruction of any Supplier, then Contractor shall promptly report it to Engineer in writing. Contractor shall not proceed with the Work affected thereby (except in an emergency as required by Paragraph 7.15) until the conflict, error, ambiguity, or discrepancy is resolved, by a clarification or interpretation by Engineer, or by an amendment or supplement to the Contract Documents issued pursuant to Paragraph 11.01.

- 3. Contractor shall not be liable to Owner or Engineer for failure to report any conflict, error, ambiguity, or discrepancy in the Contract Documents unless Contractor had actual or constructive knowledge thereof.
- B. *Resolving Discrepancies*:
 - 1. Except as may be otherwise specifically stated in the Contract Documents, the provisions of the part of the Contract Documents prepared by or for Engineer shall take precedence in resolving any conflict, error, ambiguity, or discrepancy between such provisions of the Contract Documents and:
 - a. the provisions of any standard specification, manual, reference standard, or code, or the instruction of any Supplier (whether or not specifically incorporated by reference as a Contract Document); or
 - b. the provisions of any Laws or Regulations applicable to the performance of the Work (unless such an interpretation of the provisions of the Contract Documents would result in violation of such Law or Regulation).

3.4 Requirements of the Contract Documents

- A. During the performance of the Work and until final payment, Contractor and Owner shall submit to the Engineer all matters in question concerning the requirements of the Contract Documents (sometimes referred to as requests for information or interpretation—RFIs), orrelating to the acceptability of the Work under the Contract Documents, as soon as possible after such matters arise. Engineer will be the initial interpreter of the requirements of the Contract Documents, and judge of the acceptability of the Work thereunder.
- B. Engineer will, with reasonable promptness, render a written clarification, interpretation, or decision on the issue submitted, or initiate an amendment or supplement to the Contract Documents. Engineer's written clarification, interpretation, or decision will be final and binding on Contractor, unless it appeals by submitting a Change Order, or by filing a Claim.

3.5 Amending and Supplementing Contract Documents

- A. The Contract Documents may be amended to provide for additions, deletions, and revisions in the Work or to modify the terms and conditions thereof in one or more of the following ways:
 (i) a Written Amendment; (ii) a Work Change Directive; or (iii) a Change Order.
- B. The requirements of the Contract Documents may be supplemented and minor variations and deviations in the Work may be authorized, by one or more of the following ways: (i) a Work Change Directive; (ii) Engineer's approval of a shop drawing or sample; or (iii) Engineer's written interpretation or clarification.
- 3.6 *Reuse of Documents*
 - A. Contractor and its Subcontractors and Suppliers shall not:
 - 1. have or acquire any title to or ownership rights in any of the Drawings, Specifications, or other documents (or copies of any thereof) prepared by or bearing the seal of Engineer or its consultants, including electronic media editions, or reuse any such Drawings, Specifications, other documents, or copies thereof on extensions of the Project or any other project without written consent of Owner and Engineer and specific written verification or adaptation by Engineer; or
 - 2. have or acquire any title or ownership rights in any other Contract Documents, reuse any such Contract Documents for any purpose without Owner's express written consent, or violate any copyrights pertaining to such Contract Documents.
 - B. The prohibitions of this Paragraph 3.05 will survive final payment, or termination of the Contract. Nothing herein shall preclude Contractor from retaining copies of the Contract Documents for record purposes.

ARTICLE 4 – COMMENCEMENT AND PROGRESS OF THE WORK

- 4.1 Commencement of Contract Times; Notice to Proceed
 - A. The Engineer will issue a Notice to Proceed after the Effective Date of the Contract. The Contract Times will commence to run on the day indicated in the Notice to Proceed.
- 4.2 Starting the Work
 - A. Contractor shall start to perform the Work on the date when the Contract Times commence to run. No Work shall be done at the Site prior to such date.
- 4.3 Reference Points
 - A. Owner shall provide engineering surveys to establish reference points for construction which in Engineer's judgment are necessary to enable Contractor to proceed with the Work. Contractor shall be responsible for laying out the Work, shall protect and preserve the established reference points and property monuments, and shall make no changes or relocations without the prior written approval of Owner. Contractor shall report to Engineer whenever any reference point or property monument is lost or destroyed or requires relocation because of necessary changes in grades or locations, and shall be responsible for the accuratereplacement or relocation of such reference points or property monuments by professionally qualified personnel.
- 4.4 Progress Schedule
 - A. Contractor shall adhere to the Progress Schedule established in accordance with Paragraph 2.06 as it may be adjusted from time to time as provided below.
 - 1. Contractor shall submit to Engineer for acceptance (to the extent indicated in Paragraph 2.06) proposed adjustments in the Progress Schedule that will not result in changing the Contract Times.
 - 2. Proposed adjustments in the Progress Schedule that will change the Contract Times shall be submitted in accordance with the requirements of Article 11.
 - B. Contractor shall carry on the Work and adhere to the Progress Schedule during all disputes or disagreements with Owner. No Work shall be delayed or postponed pending resolution of any disputes or disagreements, or during any appeal process, except as permitted by Paragraph 16.04, or as Owner and Contractor may otherwise agree in writing.

4.5 Delays in Contractor's Progress

- A. If Owner, Engineer, or anyone for whom Owner is responsible, delays, disrupts, or interferes with the performance or progress of the Work, then Contractor shall be entitled to an equitable adjustment in the Contract Times and Contract Price. Contractor's entitlement to an adjustment of the Contract Times is conditioned on such adjustment being essential to Contractor's ability to complete the Work within the Contract Times.
- B. Contractor shall not be entitled to an adjustment in Contract Price or Contract Times for delay, disruption, or interference caused by or within the control of Contractor. Delay, disruption, and interference attributable to and within the control of a Subcontractor or Supplier shall be deemed to be within the control of Contractor.
- C. If Contractor's performance or progress is delayed, disrupted, or interfered with by unanticipated causes not the fault of and beyond the control of Owner, Contractor, and those for which they are responsible, then Contractor shall be entitled to an equitable adjustment in Contract Times. Contractor's entitlement to an adjustment of the Contract Times is conditioned on such adjustment being essential to Contractor's ability to complete the Work within the Contract Times. Such an adjustment shall be Contractor's sole and exclusive remedy for the delays, disruption, and interference described in this paragraph. Causes of

delay, disruption, or interference that may give rise to an adjustment in Contract Times under this paragraph include but are not limited to the following:

- 1. severe and unavoidable natural catastrophes such as fires, floods, epidemics, and earthquakes;
- 2. abnormal weather conditions;
- 3. acts or failures to act of utility owners (other than those performing other work at or adjacent to the Site by arrangement with the Owner, as contemplated in Article 8); and
- 4. acts of war or terrorism.
- D. Delays, disruption, and interference to the performance or progress of the Work resulting from the existence of a differing subsurface or physical condition, an Underground Facility that was not shown or indicated by the Contract Documents, or not shown or indicated with reasonable accuracy, and those resulting from Hazardous Environmental Conditions, are governed by Article 5.
- E. Paragraph 8.03 governs delays, disruption, and interference to the performance or progress of the Work resulting from the performance of certain other work at or adjacent to the Site.Contractor shall not be entitled to an adjustment in Contract Price or Contract Times for any delay, disruption, or interference if such delay is concurrent with a delay, disruption, or interference aused by or within the control of Contractor.
- F. Contractor must submit any Change Order seeking an **adjustment in Contract Price or Contract Times** under this paragraph within 30 days of the commencement of the delaying, disrupting, or interfering event.

ARTICLE 5 – AVAILABILITY OF LANDS; SUBSURFACE AND PHYSICAL CONDITIONS; HAZARDOUS ENVIRONMENTAL CONDITIONS

- 5.1 Availability of Lands
 - A. Owner shall furnish the Site. Owner shall notify Contractor of any encumbrances or restrictions not of general application but specifically related to use of the Site with which Contractor must comply in performing the Work.
 - B. Upon reasonable written request, Owner shall furnish Contractor with a current statement of record legal title and legal description of the lands upon which permanent improvements are to be made and Owner's interest therein as necessary for giving notice of or filing a mechanic's or construction lien against such lands in accordance with applicable Laws and Regulations.
 - C. Contractor shall provide for all additional lands and access thereto that may be required for temporary construction facilities or storage of materials and equipment.
- 5.2 Use of Site and Other Areas
 - A. Limitation on Use of Site and Other Areas:
 - 1. Contractor shall confine construction equipment, temporary construction facilities, the storage of materials and equipment, and the operations of workers to the Site, adjacent areas that Contractor has arranged to use through construction easements or otherwise, and other adjacent areas permitted by Laws and Regulations, and shall not unreasonably encumber the Site and such other adjacent areas with construction equipment or other materials or equipment. Contractor shall assume full responsibility for (a) damage to the Site; (b) damage to any such other adjacent areas used for Contractor's operations; (c) damage to any other adjacent land or areas; and (d) for injuries and losses sustained by the owners or occupants of any such land or areas; provided that such damage or injuries result from the performance of the Work or from other actions or conduct of the Contractor or those for which Contractor is responsible.
 - If a damage or injury claim is made by the owner or occupant of any such land or area 2. because of the performance of the Work, or because of other actions or conduct of the Contractor or those for which Contractor is responsible, Contractor shall (a) take immediate corrective or remedial action as required by Paragraph 7.12, or otherwise; (b) promptly attempt to settle the claim as to all parties through negotiations with such owner or occupant, or otherwise resolve the claim by arbitration or other dispute resolution proceeding, or at law; and (c) to the fullest extent permitted by Laws and Regulations, indemnify and hold harmless Owner and Engineer, and the officers, directors, members, partners, employees, agents, consultants and subcontractors of each and any of them from and against any such claim, and against all costs, losses, and damages (including but not limited to all fees and charges of engineers, architects, attorneys, and other professionals and all court or arbitration or other dispute resolution costs) arising out of or relating to any claim or action, legal or equitable, brought by any such owner or occupant against Owner, Engineer, or any other party indemnified hereunder to the extent caused directly or indirectly, in whole or in part by, or based upon, Contractor's performance of the

Work, or because of other actions or conduct of the Contractor or those for which Contractor is responsible.

- B. Removal of Debris During Performance of the Work: During the progress of the Work the Contractor shall keep the Site and other adjacent areas free from accumulations of waste materials, rubbish, and other debris. Removal and disposal of such waste materials, rubbish, and other debris shall conform to applicable Laws and Regulations.
- Cleaning: Prior to Substantial Completion of the Work Contractor shall clean the Site and the C. Work and make it ready for utilization by Owner. At the completion of the Work Contractor shall remove from the Site and adjacent areas all tools, appliances, construction equipment and machinery, and surplus materials and shall restore to original condition all property not designated for alteration by the Contract Documents.
- D. Loading of Structures: Contractor shall not load nor permit any part of any structure to be loaded in any manner that will endanger the structure, nor shall Contractor subject any part of the Work or adjacent structures or land to stresses or pressures that will endanger them.
- 5.3 Subsurface and Physical Conditions
 - A. *Reports and Drawings*: The Supplementary Conditions identify:
 - those reports known to Owner of explorations and tests of subsurface conditions at or 1. adjacent to the Site;
 - 2. those drawings known to Owner of physical conditions relating to existing surface or subsurface structures at the Site (except Underground Facilities); and
 - Technical Data contained in such reports and drawings. 3.
 - B. *Reliance by Contractor on Technical Data Authorized*: Contractor may rely upon the accuracy of the Technical Data expressly identified in the Supplementary Conditions with respect to such reports and drawings, but such reports and drawings are not Contract Documents. If no such express identification has been made, then Contractor may rely upon the accuracy of the Technical Data (as defined in Article 1) contained in any geotechnical or environmental report prepared for the Project and made available to Contractor. Except for such reliance on Technical Data, Contractor may not rely upon or make any claim against Owner or Engineer, or any of their officers, directors, members, partners, employees, agents, consultants, or subcontractors, with respect to:
 - the completeness of such reports and drawings for Contractor's purposes, including, but 1. not limited to, any aspects of the means, methods, techniques, sequences, and procedures of construction to be employed by Contractor, and safety precautions and programs incident thereto; or
 - 2. other data, interpretations, opinions, and information contained in such reports or shown or indicated in such drawings; or
 - any Contractor interpretation of or conclusion drawn from any Technical Data or any 3. such other data, interpretations, opinions, or information.

5.4 Differing Subsurface or Physical Conditions

- A. Notice by Contractor: If Contractor believes that any subsurface or physical condition that is uncovered or revealed at the Site either:
 - 1. is of such a nature as to establish that any Technical Data on which Contractor is entitled to rely as provided in Paragraph 5.03 is materially inaccurate; or
 - is of such a nature as to require a change in the Drawings or Specifications; or 2.
 - 3. differs materially from that shown or indicated in the Contract Documents; or

4. is of an unusual nature, and differs materially from conditions ordinarily encountered and generally recognized as inherent in work of the character provided for in the Contract Documents;

then Contractor shall, promptly after becoming aware thereof and before further disturbing the subsurface or physical conditions or performing any Work in connection therewith (except in an emergency as required by Paragraph 7.15), notify Owner and Engineer in writing about such condition. Contractor shall not further disturb such condition or perform any Work in connection therewith (except with respect to an emergency) until receipt of a written statement permitting Contractor to do so.

- B. Engineer's Review and Statement to Contractor Regarding Site Condition: After receipt of written notice as required by the preceding paragraph, Engineer will promptly review the subsurface or physical condition in question; determine the necessity of Owner's obtaining additional exploration or tests with respect to the condition; conclude whether the condition falls within any one or more of the differing site condition categories in Paragraph 5.04.A above; obtain any pertinent cost or schedule information from Contractor; prepare recommendations regarding the Contractor's resumption of Work in connection with the subsurface or physical condition in question and the need for any change in the Drawings or Specifications; and shall issue a written statement to Contractor regarding the subsurface or physical condition in question, addressing the resumption of Work in connection with such condition and indicating whether any change in the Drawings or Specifications will be made.
- C. *Possible Price and Times Adjustments:*
 - 1. Contractor shall be entitled to an equitable adjustment in Contract Price or Contract Times, or both, to the extent that the existence of a differing subsurface or physical condition, or any related delay, disruption, or interference, causes an increase or decrease in Contractor's cost of, or time required for, performance of the Work; subject, however, to the following:
 - a. such condition must fall within any one or more of the categories described in Paragraph 5.04.A;
 - b. with respect to Work that is paid for on a unit price basis, any adjustment in Contract Price will be subject to the provisions of Paragraph 13.03; and,
 - c. Contractor's entitlement to an adjustment of the Contract Times is conditioned on such adjustment being essential to Contractor's ability to complete the Work within the Contract Times.
 - 2. Contractor shall not be entitled to any adjustment in the Contract Price or Contract Times with respect to a subsurface or physical condition if:
 - a. Contractor knew of the existence of such condition at the time Contractor made a commitment to Owner with respect to Contract Price and Contract Times by the submission of a Bid or becoming bound under a negotiated contract, or otherwise; or
 - b. the existence of such condition reasonably could have been discovered or revealed as a result of any examination, investigation, exploration, test, or study of the Site and contiguous areas expressly required by the Bidding Requirements or Contract Documents to be conducted by or for Contractor prior to Contractor's making such commitment; or
 - c. Contractor failed to give the written notice as required by Paragraph 5.04.A.

- 3. If Owner and Contractor agree regarding Contractor's entitlement to and the amount or extent of **any adjustment in the Contract Price or Contract Times**, or both, then any such adjustment shall be set forth in a Change Order.
- 4. Contractor may submit a Change Order regarding its entitlement to or the amount or extent of any adjustment in the Contract Price or Contract Times, or both, no later than 30 days after Owner's issuance of the Owner's written statement to Contractor regarding the subsurface or physical condition in question.

5.5 Underground Facilities

- A. *Contractor's Responsibilities*: The information and data shown or indicated in the Contract Documents with respect to existing Underground Facilities at or adjacent to the Site is based on information and data furnished to Owner or Engineer by the owners of such Underground Facilities, including Owner, or by others. Unless it is otherwise expressly provided in the Supplementary Conditions:
 - 1. Owner and Engineer do not warrant or guarantee the accuracy or completeness of any such information or data provided by others; and
 - 2. the cost of all of the following will be included in the Contract Price, and Contractor shall have full responsibility for:
 - a. reviewing and checking all information and data regarding existing Underground Facilities at the Site;
 - b. locating all Underground Facilities shown or indicated in the Contract Documents as being at the Site;
 - c. coordination of the Work with the owners (including Owner) of such Underground Facilities, during construction; and
 - d. the safety and protection of all existing Underground Facilities at the Site, and repairing any damage thereto resulting from the Work.
- B. *Notice by Contractor*: If Contractor believes that an Underground Facility that is uncovered or revealed at the Site was not shown or indicated in the Contract Documents, or was not shown or indicated with reasonable accuracy, then Contractor shall, promptly after becoming aware thereof and before further disturbing conditions affected thereby or performing any Work in connection therewith (except in an emergency as required by Paragraph 7.15), identify the owner of such Underground Facility and give written notice to that owner and to Owner and Engineer.
- C. Engineer's Review and Statement to Contractor Regarding Underground Facility: Engineer will promptly review the Underground Facility and conclude whether such Underground Facility was not shown or indicated in the Contract Documents, or was not shown or indicated with reasonable accuracy; obtain any pertinent cost or schedule information from Contractor; prepare any direction regarding the Contractor's resumption of Work in connection with the Underground Facility in question; determine the extent, if any, to which a change is required in the Drawings or Specifications to reflect and document the consequences of the existence or location of the Underground Facility; and issue a written statement to Contractor regarding the Underground Facility in question, addressing the resumption of Work in connection with such Underground Facility and indicating whether any change in the Drawings or Specifications will be made . During such time, Contractor shall be responsible for the safety and protection of such Underground Facility.
- D. Possible Price and Times Adjustments:
 - 1. Contractor shall be entitled to an equitable adjustment in the Contract Price or Contract Times, or both, to the extent that any existing Underground Facility at the Site that was

not shown or indicated in the Contract Documents, or was not shown or indicated with reasonable accuracy, or any related delay, disruption, or interference, causes an increase or decrease in Contractor's cost of, or time required for, performance of the Work; subject, however, to the following:

- a. Contractor did not know of and could not reasonably have been expected to be aware of or to have anticipated the existence or actual location of the Underground Facility in question;
- b. With respect to Work that is paid for on a unit price basis, any adjustment in Contract Price will be subject to the provisions of Paragraph 13.03;
- c. Contractor's entitlement to an adjustment of the Contract Times is conditioned on such adjustment being essential to Contractor's ability to complete the Work within the Contract Times; and
- d. Contractor gave the notice required in Paragraph 5.05.B.
- 2. If Engineer and Contractor agree regarding Contractor's entitlement to and the amount or extent of any adjustment in the Contract Price or Contract Times, or both, then any such adjustment shall be set forth in a Change Order.
- 3. Contractor may submit a Change Order regarding its entitlement to or the amount or extent of any adjustment in the Contract Price or Contract Times, or both, no later than 30 days after Owner's issuance of the Owner's written statement to Contractor regarding the Underground Facility in question.
- 5.6 Hazardous Environmental Conditions at Site
 - A. *Reports and Drawings*: The Supplementary Conditions identify:
 - 1. those reports and drawings known to Owner relating to Hazardous Environmental Conditions that have been identified at or adjacent to the Site; and
 - 2. Technical Data contained in such reports and drawings.
 - B. *Reliance by Contractor on Technical Data Authorized*: Contractor may rely upon the accuracy of the Technical Data expressly identified in the Supplementary Conditions with respect to such reports and drawings, but such reports and drawings are not Contract Documents. If no such express identification has been made, then Contractor may rely on the accuracy of the Technical Data (as defined in Article 1) contained in any geotechnical or environmental report prepared for the Project and made available to Contractor. Except for such reliance on Technical Data, Contractor may not rely upon or make any claim against Owner or Engineer, or any of their officers, directors, members, partners, employees, agents, consultants, or subcontractors with respect to:
 - 1. the completeness of such reports and drawings for Contractor's purposes, including, but not limited to, any aspects of the means, methods, techniques, sequences and procedures of construction to be employed by Contractor and safety precautions and programs incident thereto; or
 - 2. other data, interpretations, opinions and information contained in such reports or shown or indicated in such drawings; or
 - 3. any Contractor interpretation of or conclusion drawn from any Technical Data or any such other data, interpretations, opinions or information.
 - C. Contractor shall not be responsible for removing or remediating any Hazardous Environmental Condition encountered, uncovered, or revealed at the Site unless such removal or remediation is expressly identified in the Contract Documents to be within the scope of the Work.

- D. Contractor shall be responsible for controlling, containing, and duly removing all Constituents of Concern brought to the Site by Contractor, Subcontractors, Suppliers, or anyone else for whom Contractor is responsible, and for any associated costs; and for the costs of removing and remediating any Hazardous Environmental Condition created by the presence of any such Constituents of Concern.
- E. If Contractor encounters, uncovers, or reveals a Hazardous Environmental Condition whose removal or remediation is not expressly identified in the Contract Documents as being within the scope of the Work, or if Contractor or anyone for whom Contractor is responsible creates a Hazardous Environmental Condition, then Contractor shall immediately: (1) secure or otherwise isolate such condition; (2) stop all Work in connection with such condition and in any area affected thereby (except in an emergency as required by Paragraph 7.15); and (3) notify Owner and Engineer (and promptly thereafter confirm such notice in writing). Owner shall promptly consult with Engineer concerning the necessity for Owner to retain aqualified expert to evaluate such condition or take corrective action, if any. Promptly after consulting with Engineer, Owner shall take such actions as are necessary to permit Owner to timely obtain required permits and provide Contractor the written notice required by Paragraph 5.06.F. If Contractor or anyone for whom Contractor is responsible created the Hazardous Environmental Condition in question, then Owner may remove and remediate the Hazardous Environmental Condition, and impose a set-off against payments to account for the associated costs.
- F. Contractor shall not resume Work in connection with such Hazardous Environmental Condition or in any affected area until after Owner has obtained any required permits related thereto, and delivered written notice to Contractor either (1) specifying that such condition and any affected area is or has been rendered safe for the resumption of Work, or (2) specifying any special conditions under which such Work may be resumed safely.
- G. If Owner and Contractor cannot agree as to entitlement to or on the amount or extent, if any, of any adjustment in Contract Price or Contract Times, or both, as a result of such Work stoppage or such special conditions under which Work is agreed to be resumed by Contractor, then within 30 days of Owner's written notice regarding the resumption of Work, Contractor may submit a Change Order, or Owner may impose a set-off.
- H. If after receipt of such written notice Contractor does not agree to resume such Work based on a reasonable belief it is unsafe, or does not agree to resume such Work under such special conditions, then Owner may order the portion of the Work that is in the area affected by such condition to be deleted from the Work, following the contractual change procedures in Article 11. Owner may have such deleted portion of the Work performed by Owner's own forces or others in accordance with Article 8.
- I. To the fullest extent permitted by Laws and Regulations, Contractor shall indemnify and hold harmless Owner and Engineer, and the officers, directors, members, partners, employees, agents, consultants, and subcontractors of each and any of them from and against all claims, costs, losses, and damages (including but not limited to all fees and charges of engineers, architects, attorneys, and other professionals and all court or arbitration or other dispute resolution costs) arising out of or relating to the failure to control, contain, or remove a Constituent of Concern brought to the Site by Contractor or by anyone for whom Contractor is responsible, or to a Hazardous Environmental Condition created by Contractor or by anyone for whom Contractor is responsible. Nothing in this Paragraph 5.06.J shall obligate Contractor to indemnify any individual or entity from and against the consequences of that individual's or entity's own negligence.
- *J.* The provisions of Paragraphs 5.03, 5.04, and 5.05 do not apply to the presence of Constituents of Concern or to a Hazardous Environmental Condition uncovered or revealed at the Site.

ARTICLE 6 – BONDS AND INSURANCE

- 6.1 *Performance, Payment, and Other Bonds*
 - A. Contractor shall refer to the specific provisions of the Contract for Performance, Payment and other bonds that may be required.
- 6.2 Insurance—General Provisions
 - A. Contractor shall obtain and maintain insurance as required in the Contract.

ARTICLE 7 – CONTRACTOR'S RESPONSIBILITIES

- 7.1 Supervision and Superintendence
 - A. Contractor shall supervise, inspect, and direct the Work competently and efficiently, devoting such attention thereto and applying such skills and expertise as may be necessary to perform the Work in accordance with the Contract Documents. Contractor shall be solely responsible for the means, methods, techniques, sequences, and procedures of construction.
 - B. At all times during the progress of the Work, Contractor shall assign a competent resident superintendent who shall not be replaced without written notice to Owner and Engineer except under extraordinary circumstances.
- 7.2 Labor; Working Hours
 - A. Contractor shall provide competent, suitably qualified personnel to survey and lay out the Work and perform construction as required by the Contract Documents. Contractor shall at all times maintain good discipline and order at the Site.
 - B. Except as otherwise required for the safety or protection of persons or the Work or property at the Site or adjacent thereto, and except as otherwise stated in the Contract Documents, all Work at the Site shall be performed during regular working hours, Monday through Friday. Regular working hours shall be between 7:00 am to within 30 minutes before Sunset (Not to exceed 10 hours per day). Contractor will not perform Work on a Saturday, Sunday, or any City observed holiday. Contractor may perform Work outside regular working hours or on Saturdays, Sundays, or City observed holidays only with Engineer's written consent, which will not be unreasonably withheld.
 - C. If the Contractor desires to work outside the regular working hours as stated above, the Contractor must make advance application to, and obtain written approval from, the Engineer, (allowing at least 48 hours prior to the time of such work) to enable satisfactory arrangements to be made for inspecting the work in progress and coordination with other City departments (However, emergency work may be done without prior permission).
 - D. Night Work, with permission of the Engineer, may be performed, by the Contractor at no additional cost to the Owner, unless contract documents include a line item cost for night work. The Engineer's permission, however, may be revoked at any time by the Engineer, if the Contractor fails to maintain adequate equipment and supervision for the proper execution and control of the Work at night.

7.3 Services, Materials, and Equipment

A. Unless otherwise specified in the Contract Documents, Contractor shall provide and assume full responsibility for all services, materials, equipment, labor, transportation, construction equipment and machinery, tools, appliances, fuel, power, light, heat, telephone, water, sanitary facilities, temporary facilities, and all other facilities and incidentals necessary for the performance, testing, start up, and completion of the Work, whether or not such items are specifically called for in the Contract Documents.

- B. All materials and equipment incorporated into the Work shall be of good quality and new, except as otherwise provided in the Contract Documents. All special warranties and guarantees required by the Specifications shall expressly run to the benefit of Owner. If required by Engineer, Contractor shall furnish satisfactory evidence (including reports of required tests) as to the source, kind, and quality of materials and equipment.
- C. All materials and equipment shall be stored, applied, installed, connected, erected, protected, used, cleaned, and conditioned in accordance with instructions of the applicable Supplier, except as otherwise may be provided in the Contract Documents.
- D. <u>The contractor shall prepare a quality control program in accordance with FDOT Standard</u> <u>Specifications for Road and Bridge Construction, latest edition, Section 105 Contractor</u> <u>Quality Control General Requirements.</u>

7.4 "Or Equals"

- A. Whenever an item of material or equipment is specified or described in the Contract Documents by using the name of a proprietary item or the name of a particular Supplier, the Contract Price has been based upon Contractor furnishing such item as specified. The specification or description of such an item is intended to establish the type, function, appearance, and quality required. Unless the specification or description contains or is followed by words reading that no like, equivalent, or "or equal" item is permitted, Contractor may request that Engineer authorize the use of other items of material or equipment, or items from other proposed suppliers under the circumstances described below.
 - 1. If Engineer in its sole discretion determines that an item of material or equipment proposed by Contractor is functionally equal to that named and sufficiently similar so that no change in related Work will be required, Engineer shall deem it an "or equal" item. For the purposes of this paragraph, a proposed item of material or equipment will be considered functionally equal to an item so named if:
 - a. in the exercise of reasonable judgment Engineer determines that:
 - 1) it is at least equal in materials of construction, quality, durability, appearance, strength, and design characteristics;
 - 2) it will reliably perform at least equally well the function and achieve the results imposed by the design concept of the completed Project as a functioning whole;
 - 3) it has a proven record of performance and availability of responsive service; and
 - 4) it is not objectionable to Owner.
 - b. Contractor certifies that, if approved and incorporated into the Work:
 - 1) there will be no increase in cost to the Owner or increase in Contract Times; and
 - 2) it will conform substantially to the detailed requirements of the item named in the Contract Documents.
- B. *Contractor's Expense*: Contractor shall provide all data in support of any proposed "or equal" item at Contractor's expense.
- C. *Engineer's Evaluation and Determination*: Engineer will be allowed a reasonable time to evaluate each "or-equal" request. Engineer may require Contractor to furnish additional data about the proposed "or-equal" item. Engineer will be the sole judge of acceptability. No "or-equal" item will be ordered, furnished, installed, or utilized until Engineer's review is complete and Engineer determines that the proposed item is an "or-equal", which will be evidenced by an approved Shop Drawing or other written communication. Engineer will advise Contractor in writing of any negative determination.

D. *Effect of Engineer's Determination*: Neither approval nor denial of an "or-equal" request shall result in any change in Contract Price. The Engineer's denial of an "or-equal" request shall be

final and binding, and may not be reversed through an appeal under any provision of the Contract Documents.

E. *Treatment as a Substitution Request*: If Engineer determines that an item of material or equipment proposed by Contractor does not qualify as an "or-equal" item, Contractor may request that Engineer consider the proposed item as a substitute pursuant to Paragraph7.05.

7.5 Substitutes

- A. Unless the specification or description of an item of material or equipment required to be furnished under the Contract Documents contains or is followed by words reading that no substitution is permitted, Contractor may request that Engineer authorize the use of other items of material or equipment under the circumstances described below. To the extent possible such requests shall be made before commencement of related construction at the Site.
 - 1. Contractor shall submit sufficient information as provided below to allow Engineer to determine if the item of material or equipment proposed is functionally equivalent to that named and an acceptable substitute therefor. Engineer will not accept requests for review of proposed substitute items of material or equipment from anyone other than Contractor.
 - 2. The requirements for review by Engineer will be as set forth in Paragraph 7.05.B, as supplemented by the Specifications, and as Engineer may decide is appropriate under the circumstances.
 - 3. Contractor shall make written application to Engineer for review of a proposed substitute item of material or equipment that Contractor seeks to furnish or use. The application:
 - a. shall certify that the proposed substitute item will:
 - 1) perform adequately the functions and achieve the results called for by the general design,
 - 2) be similar in substance to that specified, and
 - 3) be suited to the same use as that specified.
 - b. will state:
 - 1) the extent, if any, to which the use of the proposed substitute item will necessitate a change in Contract Times,
 - 2) whether use of the proposed substitute item in the Work will require a change in any of the Contract Documents (or in the provisions of any other direct contract with Owner for other work on the Project) to adapt the design to the proposed substitute item, and
 - 3) whether incorporation or use of the proposed substitute item in connection with the Work is subject to payment of any license fee or royalty.
 - c. will identify:
 - 1) all variations of the proposed substitute item from that specified, and
 - 2) available engineering, sales, maintenance, repair, and replacement services.
 - d. shall contain an itemized estimate of all costs or credits that will result directly or indirectly from use of such substitute item, including but not limited to changes in Contract Price, shared savings, costs of redesign, and claims of other contractors affected by any resulting change.
- B. *Engineer's Evaluation and Determination*: Engineer will be allowed a reasonable time to evaluate each substitute request, and to obtain comments and direction from Owner. Engineer

may require Contractor to furnish additional data about the proposed substitute item. Engineer

will be the sole judge of acceptability. No substitute will be ordered, furnished, installed, or utilized until Engineer's review is complete and Engineer determines that the proposed item is an acceptable substitute. Engineer's determination will be evidenced by a Change Order or a Work Change Directive accounting for the substitution itself and all related impacts, including changes in Contract Price or Contract Times. Engineer will advise Contractor in writing of any negative determination.

- C. *Special Guarantee*: Owner may require Contractor to furnish at Contractor's expense a special performance guarantee or other surety with respect to any substitute.
- D. *Reimbursement of Engineer's Cost*: Engineer will record Engineer's costs in evaluating a substitute proposed or submitted by Contractor. Whether or not Engineer approves a substitute so proposed or submitted by Contractor, Contractor shall reimburse Owner for the reasonable charges of Engineer for evaluating each such proposed substitute. Contractor shall also reimburse Owner for the reasonable charges of Engineer for making changes in the Contract Documents (or in the provisions of any other direct contract with Owner) resulting from the acceptance of each proposed substitute.
- E. *Contractor's Expense*: Contractor shall provide all data in support of any proposed substitute at Contractor's expense.
- F. *Effect of Engineer's Determination*: If Engineer approves the substitution request, Contractor shall execute the proposed Change Order and proceed with the substitution. The Engineer's denial of a substitution request shall be final and binding, and may not be reversed through an appeal under any provision of the Contract Documents. Contractor may challenge the scope of reimbursement costs imposed under Paragraph 7.05.D, by timely submittal of a Change Order.
- 7.6 Concerning Subcontractors, Suppliers, and Others
 - A. Contractor may retain Subcontractors and Suppliers for the performance of parts of the Work. Such Subcontractors and Suppliers must be acceptable to Owner.
 - B. Contractor shall retain specific Subcontractors, Suppliers, or other individuals or entities for the performance of designated parts of the Work if required by the Contract to doso.
 - C. Subsequent to the submittal of Contractor's Bid or final negotiation of the terms of the Contract, Owner may not require Contractor to retain any Subcontractor, Supplier, or other individual or entity to furnish or perform any of the Work against which Contractor has reasonable objection.
 - D. Prior to entry into any binding subcontract or purchase order, Contractor shall submit to Owner the identity of the proposed Subcontractor or Supplier (unless Owner has already deemed such proposed Subcontractor or Supplier acceptable, during the bidding process or otherwise). Such proposed Subcontractor or Supplier shall be deemed acceptable to Owner unless Owner raises a substantive, reasonable objection within five days.
 - E. Owner may require the replacement of any Subcontractor, Supplier, or other individual or entity retained by Contractor to perform any part of the Work. Owner also may require Contractor to retain specific replacements; provided, however, that Owner may not require a replacement to which Contractor has a reasonable objection. If Contractor has submitted the identity of certain Subcontractors, Suppliers, or other individuals or entities for acceptance by Owner, and Owner has accepted it (either in writing or by failing to make written objection thereto), then Owner may subsequently revoke the acceptance of any such Subcontractor, Supplier, or other individual or entity so identified solely on the basis of substantive, reasonable objection after due investigation. Contractor shall submit an acceptable replacement for the rejected Subcontractor, Supplier, or other individual or entity.

- F. If Owner requires the replacement of any Subcontractor, Supplier, or other individual or entity retained by Contractor to perform any part of the Work, then Contractor shall be entitled to an adjustment in Contract Price or Contract Times, or both, with respect to the replacement; and Contractor shall initiate a Change Order for such adjustment within 30 days of Owner's requirement of replacement.
- G. No acceptance by Owner of any such Subcontractor, Supplier, or other individual or entity, whether initially or as a replacement, shall constitute a waiver of the right of Owner to the completion of the Work in accordance with the Contract Documents.
- H. On a monthly basis Contractor shall submit to Engineer a complete list of all Subcontractors and Suppliers having a direct contract with Contractor, and of all other Subcontractors and Suppliers known to Contractor at the time of submittal.
- I. Contractor shall be fully responsible to Owner and Engineer for all acts and omissions of the Subcontractors, Suppliers, and other individuals or entities performing or furnishing any of the Work just as Contractor is responsible for Contractor's own acts andomissions.
- J. Contractor shall be solely responsible for scheduling and coordinating the work of Subcontractors, Suppliers, and all other individuals or entities performing or furnishing any of the Work.
- K. Contractor shall restrict all Subcontractors, Suppliers, and such other individuals or entities performing or furnishing any of the Work from communicating with Engineer or Owner, except through Contractor or in case of an emergency, or as otherwise expressly allowed herein.
- L. The divisions and sections of the Specifications and the identifications of any Drawings shall not control Contractor in dividing the Work among Subcontractors or Suppliers or delineating the Work to be performed by any specific trade.
- M. All Work performed for Contractor by a Subcontractor or Supplier shall be pursuant to an appropriate contractual agreement that specifically binds the Subcontractor or Supplier to the applicable terms and conditions of the Contract Documents for the benefit of Owner and Engineer.
- N. Owner may furnish to any Subcontractor or Supplier, to the extent practicable, information about amounts paid to Contractor on account of Work performed for Contractor by the particular Subcontractor or Supplier.
- O. Nothing in the Contract Documents:
 - 1. shall create for the benefit of any such Subcontractor, Supplier, or other individual or entity any contractual relationship between Owner or Engineer and any such Subcontractor, Supplier, or other individual or entity; nor
 - 2. shall create any obligation on the part of Owner or Engineer to pay or to see to the payment of any money due any such Subcontractor, Supplier, or other individual or entity except as may otherwise be required by Laws and Regulations.

7.7 *Patent Fees and Royalties*

A. Contractor shall pay all license fees and royalties and assume all costs incident to the use in the performance of the Work or the incorporation in the Work of any invention, design, process, product, or device which is the subject of patent rights or copyrights held by others. If a particular invention, design, process, product, or device is specified in the Contract Documents for use in the performance of the Work and if, to the actual knowledge of Owner or Engineer, its use is subject to patent rights or copyrights calling for the payment of any license fee or royalty to others, the existence of such rights shall be disclosed by Owner in the Contract Documents.

- B. To the fullest extent permitted by Laws and Regulations, Contractor shall indemnify and hold harmless Owner and Engineer, and the officers, directors, members, partners, employees, agents, consultants and subcontractors of each and any of them from and against all claims, costs, losses, and damages (including but not limited to all fees and charges of engineers, architects, attorneys, and other professionals and all court or arbitration or other dispute resolution costs) arising out of or relating to any infringement of patent rights or copyrights incident to the use in the performance of the Work or resulting from the incorporation in the Work of any invention, design, process, product, or device not specified in the Contract Documents.
- 7.8 *Permits*
 - A. Contractor shall be responsible to obtain and pay for any permits and licenses referenced in the Bidding Documents.

7.9 Taxes

- A. Contractor shall pay all sales, consumer, use, and other similar taxes required to be paid by Contractor in accordance with the Laws and Regulations of the place of the Project which are applicable during the performance of the Work.
- 7.10 Laws and Regulations
 - A. Contractor shall give all notices required by and shall comply with all Laws and Regulations applicable to the performance of the Work. Except where otherwise expressly required by applicable Laws and Regulations, neither Owner nor Engineer shall be responsible for monitoring Contractor's compliance with any Laws or Regulations.
 - B. If Contractor performs any Work or takes any other action knowing or having reason to know that it is contrary to Laws or Regulations, Contractor shall bear all resulting costs and losses, and shall indemnify and hold harmless Owner and Engineer, and the officers, directors, members, partners, employees, agents, consultants, and subcontractors of each and any of them from and against all claims, costs, losses, and damages (including but not limited to all fees and charges of engineers, architects, attorneys, and other professionals and all court or arbitration or other dispute resolution costs) arising out of or relating to such Work or other action. It shall not be Contractor's responsibility to make certain that the Work described in the Contract Documents is in accordance with Laws and Regulations, but this shall not relieve Contractor of Contractor's obligations under Paragraph 3.03.
 - C. Owner or Contractor may give notice to the other party of any changes after the submission of Contractor's Bid (or after the date when Contractor became bound under a negotiated contract) in Laws or Regulations having an effect on the cost or time of performance of the Work, including but not limited to changes in Laws or Regulations having an effect on procuring permits and on sales, use, value-added, consumption, and other similar taxes. If Owner and Contractor are unable to agree on entitlement to or on the amount or extent, if any, of any adjustment in Contract Price or Contract Times resulting from such changes, then within 30 days of such notice Contractor may submit a Change Order, or Owner may initiate a Claim. The provisions of this paragraph shall not apply to any changes to prevailing wage rates. Changes to wage rates during the life of the Contract shall be the responsibility of the Contractor and shall not be eligible for claims for changes to the ContractPrice.

7.11 Record Documents

A. Contractor shall maintain in a safe place at the Site one printed record copy of all Drawings, Specifications, Addenda, Change Orders, Work Change Directives, written interpretations and clarifications, and approved Shop Drawings. Contractor shall keep such record documents in good order and annotate them to show changes made during construction. These record documents, together with all approved Samples, will be available to Engineer for reference. Upon completion of the Work, Contractor shall deliver these record documents to Engineer.

- 7.12 Safety and Protection
 - A. Contractor shall be solely responsible for initiating, maintaining, and supervising all safety precautions and programs in connection with the Work. Such responsibility does not relieve Subcontractors of their responsibility for the safety of persons or property in the performance of their work, nor for compliance with applicable safety Laws and Regulations. Contractor shall take all necessary precautions for the safety of, and shall provide the necessary protection to prevent damage, injury, or loss to:
 - 1. all persons on the Site or who may be affected by the Work;
 - 2. all the Work and materials and equipment to be incorporated therein, whether in storage on or off the Site; and
 - 3. other property at the Site or adjacent thereto, including trees, shrubs, lawns, walks, pavements, roadways, structures, other work in progress, utilities, and Underground Facilities not designated for removal, relocation, or replacement in the course of construction.
 - B. Contractor shall comply with all applicable Laws and Regulations relating to the safety of persons or property, or to the protection of persons or property from damage, injury, or loss; and shall erect and maintain all necessary safeguards for such safety and protection. Contractor shall notify Owner; the owners of adjacent property, Underground Facilities, and other utilities; and other contractors and utility owners performing work at or adjacent to the Site, when prosecution of the Work may affect them, and shall cooperate with them in the protection, removal, relocation, and replacement of their property or work in progress.
 - C. Contractor shall comply with the applicable requirements of Owner's safety programs, if any. The Supplementary Conditions identify any Owner's safety programs that are applicable to the Work.
 - D. Contractor shall inform Owner and Engineer of the specific requirements of Contractor's safety program with which Owner's and Engineer's employees and representatives must comply while at the Site.
 - E. All damage, injury, or loss to any property referred to in Paragraph 7.12.A.2 or 7.12.A.3 caused, directly or indirectly, in whole or in part, by Contractor, any Subcontractor, Supplier, or any other individual or entity directly or indirectly employed by any of them to perform any of the Work, or anyone for whose acts any of them may be liable, shall be remedied by Contractor at its expense (except damage or loss attributable to the fault of Drawings or Specifications or to the acts or omissions of Owner or Engineer or anyone employed by any of them, or anyone for whose acts any of them may be liable, and not attributable, directly or indirectly, in whole or in part, to the fault or negligence of Contractor or any Subcontractor, Supplier, or other individual or entity directly or indirectly employed by any of them).
 - F. Contractor's duties and responsibilities for safety and protection shall continue until such time as all the Work is completed and Engineer has issued a notice to Owner and Contractor in accordance with Paragraph 15.06.B that the Work is acceptable (except as otherwise expressly provided in connection with Substantial Completion).
 - G. Contractor's duties and responsibilities for safety and protection shall resume whenever Contractor or any Subcontractor or Supplier returns to the Site to fulfill warranty or correction obligations, or to conduct other tasks arising from the ContractDocuments.
 - H. Work in Confined Spaces shall follow the provisions of 29 CFR Section 1910.146, "Permit-Required Confined Spaces". The Owner has established a confined-space entry program for

its own use, and will be responsible for enforcement of the program for the Owner's personnel only. The Contractor is hereby notified that manholes and other structures included under the confined-space definition of 29 CFR 1910.146, shall be considered as hazardousatmospheric conditions. The structures may contain methane, hydrogen sulfide, carbon dioxide, and other gases which are dangerous to life or health. The Contractor shall allow its personnel or subcontractors to enter these confined spaces only through compliance with an entry permit program as specified herein. The Contractor shall establish and maintain a confined space entry program appropriate to the structures and conditions encountered. The program shall meet the requirements of 29 CFR 1910.146 and shall specifically address the provisions of Paragraph (d) therein. The Contractor shall enforce the requirements of Paragraphs (e) and (f), shall establish and conduct a training program in accordance with Paragraph (g), and shall comply with all other applicable requirements of the referenced regulation.

7.13 Safety Representative

- A. Contractor shall designate a qualified and experienced safety representative at the Site whose duties and responsibilities shall be the prevention of accidents and the maintaining and supervising of safety precautions and programs.
- 7.14 Hazard Communication Programs
 - A. Contractor shall be responsible for coordinating any exchange of material safety data sheets or other hazard communication information required to be made available to or exchanged between or among employers at the Site in accordance with Laws or Regulations.
- 7.15 Emergencies
 - A. In emergencies affecting the safety or protection of persons or the Work or property at the Site or adjacent thereto, Contractor is obligated to act to prevent threatened damage, injury, or loss. Contractor shall give Engineer prompt written notice if Contractor believes that any significant changes in the Work or variations from the Contract Documents have been caused thereby or are required as a result thereof. If Engineer determines that a change in the Contract Documents is required because of the action taken by Contractor in response to such an emergency, a Change Order or Work Change Directive will be issued.
- 7.16 Shop Drawings, Samples, and Other Submittals
 - A. Shop Drawing and Sample Submittal Requirements:
 - 1. Before submitting a Shop Drawing or Sample, Contractor shall have:
 - a. reviewed and coordinated the Shop Drawing or Sample with other Shop Drawings and Samples and with the requirements of the Work and the ContractDocuments;
 - b. determined and verified all field measurements, quantities, dimensions, specified performance and design criteria, installation requirements, materials, catalog numbers, and similar information with respect thereto;
 - c. determined and verified the suitability of all materials and equipment offered with respect to the indicated application, fabrication, shipping, handling, storage, assembly, and installation pertaining to the performance of the Work; and
 - d. determined and verified all information relative to Contractor's responsibilities for means, methods, techniques, sequences, and procedures of construction, and safety precautions and programs incident thereto.
 - 2. Each submittal shall bear a stamp or specific written certification that Contractor has satisfied Contractor's obligations under the Contract Documents with respect to Contractor's review of that submittal, and that Contractor approves the submittal.

- 3. With each submittal, Contractor shall give Engineer specific written notice of any variations that the Shop Drawing or Sample may have from the requirements of the Contract Documents. This notice shall be set forth in a written communication separate from the Shop Drawings or Sample submittal; and, in addition, in the case of Shop Drawings by a specific notation made on each Shop Drawing submitted to Engineer for review and approval of each such variation.
- B. *Submittal Procedures for Shop Drawings and Samples*: Contractor shall submit Shop Drawings and Samples to Engineer for review and approval in accordance with the accepted Schedule of Submittals. Each submittal will be identified as Engineer may require.
 - 1. Shop Drawings:
 - a. Contractor shall submit the number of copies required in the Specifications.
 - b. Data shown on the Shop Drawings will be complete with respect to quantities, dimensions, specified performance and design criteria, materials, and similar data to show Engineer the services, materials, and equipment Contractor proposes to provide and to enable Engineer to review the information for the limited purposes required by Paragraph 7.16.D.
 - 2. Samples:
 - a. Contractor shall submit the number of Samples required in the Specifications.
 - b. Contractor shall clearly identify each Sample as to material, Supplier, pertinent data such as catalog numbers, the use for which intended and other data as Engineer may require to enable Engineer to review the submittal for the limited purposes required by Paragraph 7.16.D.
 - 3. Where a Shop Drawing or Sample is required by the Contract Documents or the Schedule of Submittals, any related Work performed prior to Engineer's review and approval of the pertinent submittal will be at the sole expense and responsibility of Contractor.
- C. *Other Submittals*: Contractor shall submit other submittals to Engineer in accordance with the accepted Schedule of Submittals, and pursuant to the applicable terms of the Specifications.
- D. Engineer's Review:
 - 1. Engineer will provide timely review of Shop Drawings and Samples in accordance with the Schedule of Submittals acceptable to Engineer. Engineer's review and approval will be only to determine if the items covered by the submittals will, after installation or incorporation in the Work, conform to the information given in the Contract Documents and be compatible with the design concept of the completed Project as a functioning whole as indicated by the Contract Documents.
 - 2. Engineer's review and approval will not extend to means, methods, techniques, sequences, or procedures of construction or to safety precautions or programs incident thereto.
 - 3. Engineer's review and approval of a separate item as such will not indicate approval of the assembly in which the item functions.
 - 4. Engineer's review and approval of a Shop Drawing or Sample shall not relieve Contractor from responsibility for any variation from the requirements of the Contract Documents unless Contractor has complied with the requirements of Paragraph 7.16.A.3 and Engineer has given written approval of each such variation by specific written notation thereof incorporated in or accompanying the Shop Drawing or Sample. Engineer will document any such approved variation from the requirements of the Contract Documents in a Work Change Directive.

- 5. Engineer's review and approval of a Shop Drawing or Sample shall not relieve Contractor from responsibility for complying with the requirements of Paragraph 7.16.A and B.
- 6. Engineer's review and approval of a Shop Drawing or Sample, or of a variation from the requirements of the Contract Documents, shall not, under any circumstances, change the Contract Times or Contract Price, unless such changes are included in a ChangeOrder.
- 7. Neither Engineer's receipt, review, acceptance or approval of a Shop Drawing, Sample, or other submittal shall result in such item becoming a ContractDocument.
- 8. Contractor shall perform the Work in compliance with the requirements and commitments set forth in approved Shop Drawings and Samples, subject to the provisions of Paragraph 7.16.D.4.
- E. *Resubmittal Procedures*:
 - 1. Contractor shall make corrections required by Engineer and shall return the required number of corrected copies of Shop Drawings and submit, as required, new Samples for review and approval. Contractor shall direct specific attention in writing to revisions other than the corrections called for by Engineer on previous submittals.
 - 2. Contractor shall furnish required submittals with sufficient information and accuracy to obtain required approval of an item with no more than three submittals. Engineer will record Engineer's time for reviewing a fourth or subsequent submittal of a Shop Drawings, sample, or other item requiring approval, and Contractor shall be responsible for Engineer's charges to Owner for such time. Owner may impose a set-off against payments due to Contractor to secure reimbursement for such charges.
 - 3. If Contractor requests a change of a previously approved submittal item, Contractor shall be responsible for Engineer's charges to Owner for its review time, and Owner may impose a set-off against payments due to Contractor to secure reimbursement for such charges, unless the need for such change is beyond the control of Contractor.
- 7.17 *Contractor's General Warranty and Guarantee*
 - A. Contractor warrants and guarantees to Owner that all Work will be in accordance with the Contract Documents and will not be defective. Engineer and its officers, directors, members, partners, employees, agents, consultants, and subcontractors shall be entitled to rely on Contractor's warranty and guarantee.
 - B. Contractor's warranty and guarantee hereunder excludes defects or damage causedby:
 - 1. abuse, modification, or improper maintenance or operation by persons other than Contractor, Subcontractors, Suppliers, or any other individual or entity for whom Contractor is responsible; or
 - 2. normal wear and tear under normal usage.
 - C. Contractor's obligation to perform and complete the Work in accordance with the Contract Documents shall be absolute. None of the following will constitute an acceptance of Work that is not in accordance with the Contract Documents or a release of Contractor's obligation to perform the Work in accordance with the ContractDocuments:
 - 1. observations by Engineer;
 - 2. recommendation by Engineer or payment by Owner of any progress or final payment;
 - 3. the issuance of a certificate of Substantial Completion by Engineer or any payment related thereto by Owner;
 - 4. use or occupancy of the Work or any part thereof by Owner;
 - 5. any review and approval of a Shop Drawing or Sample submittal;
- 6. the issuance of a notice of acceptability by Engineer;
- 7. any inspection, test, or approval by others; or
- 8. any correction of defective Work by Owner.
- D. If the Contract requires the Contractor to accept the assignment of a contract entered into by Owner, then the specific warranties, guarantees, and correction obligations contained in the assigned contract shall govern with respect to Contractor's performance obligations to Owner for the Work described in the assigned contract.

7.18 Indemnification

- A. To the fullest extent permitted by Laws and Regulations, and in addition to any other obligations of Contractor under the Contract or otherwise, Contractor shall indemnify and hold harmless Owner and Engineer, and the officers, directors, members, partners, employees, agents, consultants and subcontractors of each and any of them from and against all claims, costs, losses, and damages (including but not limited to all fees and charges of engineers, architects, attorneys, and other professionals and all court or arbitration or other dispute resolution costs) arising out of or relating to the performance of the Work, provided that any such claim, cost, loss, or damage is attributable to bodily injury, sickness, disease, or death, or to injury to or destruction of tangible property (other than the Work itself), including the loss of use resulting therefrom but only to the extent caused by any negligent act or omission of Contractor, any Subcontractor, any Supplier, or any individual or entity directly or indirectly employed by any of them to perform any of the Work or anyone for whose acts any of them may be liable.
- B. In any and all claims against Owner or Engineer or any of their officers, directors, members, partners, employees, agents, consultants, or subcontractors by any employee (or the survivor or personal representative of such employee) of Contractor, any Subcontractor, any Supplier, or any individual or entity directly or indirectly employed by any of them to perform any of the Work, or anyone for whose acts any of them may be liable, the indemnification obligation under Paragraph 7.18.A shall not be limited in any way by any limitation on the amount or type of damages, compensation, or benefits payable by or for Contractor or any such Subcontractor, Supplier, or other individual or entity under workers' compensation acts, disability benefit acts, or other employee benefit acts.
- C. The indemnification obligations of Contractor under Paragraph 7.18.A shall not extend to the liability of Engineer and Engineer's officers, directors, members, partners, employees, agents, consultants and subcontractors arising out of:
 - 1. the preparation or approval of, or the failure to prepare or approve maps, Drawings, opinions, reports, surveys, Change Orders, Work Change Directives, designs, or Specifications; or
 - 2. giving directions or instructions, or failing to give them, if that is the primary cause of the injury or damage.

7.19 Delegation of Professional Design Services

- A. Contractor will not be required to provide professional design services unless such services are specifically required by the Contract Documents for a portion of the Work or unless such services are required to carry out Contractor's responsibilities for construction means, methods, techniques, sequences and procedures. Contractor shall not be required to provide professional services in violation of applicable Laws and Regulations.
- B. If professional design services or certifications by a design professional related to systems, materials, or equipment are specifically required of Contractor by the Contract Documents, Owner and Engineer will specify all performance and design criteria that such services must

Exhibit D - Technical Specifications

satisfy. Contractor shall cause such services or certifications to be provided by a properly licensed professional, whose signature and seal shall appear on all drawings, calculations, specifications, certifications, and other submittals prepared by such professional. Shop Drawings and other submittals related to the Work designed or certified by such professional, if prepared by others, shall bear such professional's written approval when submitted to Engineer.

- C. Owner and Engineer shall be entitled to rely upon the adequacy, accuracy, and completeness of the services, certifications, or approvals performed by such design professionals, provided Owner and Engineer have specified to Contractor all performance and design criteria that such services must satisfy.
- D. Pursuant to this paragraph, Engineer's review and approval of design calculations and design drawings will be only for the limited purpose of checking for conformance with performance and design criteria given and the design concept expressed in the Contract Documents. Engineer's review and approval of Shop Drawings and other submittals (except design calculations and design drawings) will be only for the purpose stated in Paragraph7.16.D.1.
- E. Contractor shall not be responsible for the adequacy of the performance or design criteria specified by Owner or Engineer.

ARTICLE 8 – OTHER WORK AT THE SITE

- 8.1 Other Work
 - A. In addition to and apart from the Work under the Contract Documents, the Owner may perform other work at or adjacent to the Site. Such other work may be performed by Owner's employees, or through contracts between the Owner and third parties. Owner may also arrange to have third-party utility owners perform work on their utilities and facilities at or adjacent to the Site.
 - B. If Owner performs other work at or adjacent to the Site with Owner's employees, or through contracts for such other work, then Owner shall give Contractor notice thereof prior to starting any such other work. If Owner has advance information regarding the start of any utility work at or adjacent to the Site, Owner shall provide such information to Contractor.
 - C. Contractor shall afford each other contractor that performs such other work, each utility owner performing other work, and Owner, if Owner is performing other work with Owner's employees, proper and safe access to the Site, and provide a reasonable opportunity for the introduction and storage of materials and equipment and the execution of such other work. Contractor shall do all cutting, fitting, and patching of the Work that may be required to properly connect or otherwise make its several parts come together and properly integrate with such other work. Contractor shall not endanger any work of others by cutting, excavating, or otherwise altering such work; provided, however, that Contractor may cut or alter others' work with the written consent of Engineer and the others whose work will be affected.
 - D. If the proper execution or results of any part of Contractor's Work depends upon work performed by others under this Article 8, Contractor shall inspect such other work and promptly report to Engineer in writing any delays, defects, or deficiencies in such other work that render it unavailable or unsuitable for the proper execution and results of Contractor's Work. Contractor's failure to so report will constitute an acceptance of such other work as fit and proper for integration with Contractor's Work except for latent defects and deficiencies in such other work.

8.2 Coordination

- A. If Owner intends to contract with others for the performance of other work at or adjacent to the Site, to perform other work at or adjacent to the Site with Owner's employees, or to arrangeto have utility owners perform work at or adjacent to the Site, the following will be set forth in the Supplementary Conditions or provided to Contractor prior to the start of any such other work:
 - 1. the identity of the individual or entity that will have authority and responsibility for coordination of the activities among the various contractors;
 - 2. an itemization of the specific matters to be covered by such authority and responsibility; and
 - 3. the extent of such authority and responsibilities.
- B. Unless otherwise provided in the Supplementary Conditions, Owner shall have sole authority and responsibility for such coordination.

8.3 Legal Relationships

A. If, in the course of performing other work at or adjacent to the Site for Owner, the Owner's employees, any other contractor working for Owner, or any utility owner for whom the Owner is responsible causes damage to the Work or to the property of Contractor or its Subcontractors, or delays, disrupts, interferes with, or increases the scope or cost of the performance of the Work, through actions or inaction, then Contractor shall be entitled to an equitable adjustment in the Contract Price or the Contract Times, or both. Contractor must submit any Change Order

seeking an equitable adjustment in the Contract Price or the Contract Times under this paragraph within 30 days of the damaging, delaying, disrupting, or interfering event. The entitlement to, and extent of, any such equitable adjustment shall take into account information (if any) regarding such other work that was provided to Contractor in the Contract Documents prior to the submittal of the Bid or the final negotiation of the terms of the Contract. When applicable, any such equitable adjustment in Contract Price shall be conditioned on Contractor assigning to Owner all Contractor's rights against such other contractor or utility owner with respect to the damage, delay, disruption, or interference that is the subject of the adjustment. Contractor's entitlement to an adjustment of the Contract Times is conditioned on such adjustment being essential to Contractor's ability to complete the Work within the Contract Times.

- B. Contractor shall take reasonable and customary measures to avoid damaging, delaying, disrupting, or interfering with the work of Owner, any other contractor, or any utility owner performing other work at or adjacent to the Site. If Contractor fails to take such measures and as a result damages, delays, disrupts, or interferes with the work of any such other contractor or utility owner, then Owner may impose a set-off against payments due to Contractor, and assign to such other contractor or utility owner the Owner's contractual rights against Contractor with respect to the breach of the obligations set forth in thisparagraph.
- C. When Owner is performing other work at or adjacent to the Site with Owner's employees, Contractor shall be liable to Owner for damage to such other work, and for the reasonable direct delay, disruption, and interference costs incurred by Owner as a result of Contractor's failure to take reasonable and customary measures with respect to Owner's other work. In response to such damage, delay, disruption, or interference, Owner may impose a set-off against payments due to Contractor.
- D. If Contractor damages, delays, disrupts, or interferes with the work of any other contractor, or any utility owner performing other work at or adjacent to the Site, through Contractor's failure to take reasonable and customary measures to avoid such impacts, or if any claim arising out of Contractor's actions, inactions, or negligence in performance of the Work at or adjacent to the Site is made by any such other contractor or utility owner against Contractor, Owner, or Engineer, then Contractor shall (1) promptly attempt to settle the claim as to all parties through negotiations with such other contractor or utility owner, or otherwise resolve the claim by arbitration or other dispute resolution proceeding or at law, and (2) indemnify and holdharmless Owner and Engineer, and the officers, directors, members, partners, employees, agents, consultants and subcontractors of each and any of them from and against any such claims, and against all costs, losses, and damages (including but not limited to all fees and charges of engineers, architects, attorneys, and other professionals and all court or arbitration or other dispute resolution costs) arising out of or relating to such damage, delay, disruption, or interference.

ARTICLE 9 – OWNER'S RESPONSIBILITIES

- 9.1 *Communications to Contractor*
 - A. Except as otherwise provided in these General Conditions, Owner shall issue all communications to Contractor through Engineer.
- 9.2 Replacement of Engineer
 - A. Owner may at its discretion appoint an engineer to replace Engineer, provided Contractor makes no reasonable objection to the replacement engineer. The replacement engineer's status under the Contract Documents shall be that of the former Engineer.
- 9.3 Furnish Data
 - A. Owner shall promptly furnish the data required of Owner under the ContractDocuments.
- 9.4 Pay When Due
 - A. Owner shall make payments to Contractor when they are due as set forth in Article15.
- 9.5 Lands and Easements; Reports, Tests, and Drawings
 - A. Owner's duties with respect to providing lands and easements are set forth in Paragraph 5.01.
 - B. Owner's duties with respect to providing engineering surveys to establish reference points are set forth in Paragraph 4.03.
 - C. Article 5 refers to Owner's identifying and making available to Contractor copies of reports of explorations and tests of conditions at the Site, and drawings of physical conditions relating to existing surface or subsurface structures at the Site.
- 9.6 Insurance
 - A. Owner's responsibilities, if any, with respect to purchasing and maintaining liability and property insurance are set forth in Article 6.
- 9.7 Change Orders or Work Change Directives
 - A. Owner's responsibilities with respect to Change Orders or Work Change Directives are set forth in Article 11.
- 9.8 Inspections, Tests, and Approvals
 - A. Owner's responsibility with respect to certain inspections, tests, and approvals is set forth in Paragraph 14.02.B.
- 9.9 *Limitations on Owner's Responsibilities*
 - A. The Owner shall not supervise, direct, or have control or authority over, nor be responsible for, Contractor's means, methods, techniques, sequences, or procedures of construction, or the safety precautions and programs incident thereto, or for any failure of Contractor to comply with Laws and Regulations applicable to the performance of the Work. Owner will not be responsible for Contractor's failure to perform the Work in accordance with the Contract Documents.

- 9.10 Undisclosed Hazardous Environmental Condition
 - A. Owner's responsibility in respect to an undisclosed Hazardous Environmental Condition is set forth in Paragraph 5.06.
- 9.11 Evidence of Financial Arrangements
 - A. If and to the extent the Owner has agreed to furnish the Contractor reasonable evidence that financial arrangements have been made to satisfy the Owner's obligations under the Contract Documents, the Owner's responsibility in respect thereof will be as set forth in the Supplementary Conditions.
- 9.12 Safety Programs
 - A. While at the Site, Owner's employees and representatives shall comply with the specific applicable requirements of Contractor's safety programs of which Owner has been informed.
 - B. Owner shall furnish copies of any applicable Owner safety programs to Contractor.

ARTICLE 10 – ENGINEER'S STATUS DURING CONSTRUCTION

- 10.1 Owner's Representative
 - A. Engineer will be Owner's representative during the construction period. The duties and responsibilities and the limitations of authority of Engineer as Owner's representative during construction are set forth in the Contract Documents and will not be changed without written consent of the Owner and the Engineer.
- 10.2 Visits to Site
 - A. Engineer will make visits to the Site at intervals appropriate to the various stages of construction as Engineer deems necessary in order to observe as an experienced and qualified design professional the progress that has been made and the quality of the various aspects of Contractor's executed Work. Based on information obtained during such visits and observations, Engineer, for the benefit of Owner, will determine, in general, if the Work is proceeding in accordance with the Contract Documents. Engineer will not be required to make exhaustive or continuous inspections on the Site to check the quality or quantity of the Work. Engineer's efforts will be directed toward providing for Owner a greater degree of confidence that the completed Work will conform generally to the Contract Documents. On the basis of such visits and observations, Engineer will keep Owner informed of the progress of the Work and will endeavor to guard Owner against defective Work.
 - B. Engineer's visits and observations are subject to all the limitations on Engineer's authority and responsibility set forth in Paragraph 10.08. Particularly, but without limitation, during or as a result of Engineer's visits or observations of Contractor's Work, Engineer will not supervise, direct, control, or have authority over or be responsible for Contractor's means, methods, techniques, sequences, or procedures of construction, or the safety precautions and programs incident thereto, or for any failure of Contractor to comply with Laws and Regulations applicable to the performance of the Work.
- 10.3 Project Representative
 - A. If Owner and Engineer have agreed that Engineer will furnish a Resident Project Representative to represent Engineer at the Site and assist Engineer in observing the progress and quality of the Work, then the authority and responsibilities of any such Resident Project Representative will be as provided in the Supplementary Conditions, and limitations on the responsibilities thereof will be as provided in Paragraph 10.08. If Owner designates another representative or agent to represent Owner at the Site who is not Engineer's consultant, agent, or employee, the responsibilities and authority and limitations thereon of such other individual or entity will be as provided in the Supplementary Conditions. Rejecting Defective Work
 - B. Engineer has the authority to reject Work in accordance with Article 14.
- 10.4 Shop Drawings, Change Orders, Work Change Directives and Payments
 - A. Engineer's authority, and limitations thereof, as to Shop Drawings and Samples, are set forth in Paragraph 7.16.
 - B. Engineer's authority, and limitations thereof, as to design calculations and design drawings submitted in response to a delegation of professional design services, if any, are set forth in Paragraph 7.19.
 - C. Engineer's authority as to Change Orders and Work Change Directives is set forth in Article 11.
 - D. Engineer's authority as to Applications for Payment is set forth in Article 15.
- 10.5 Determinations for Unit Price Work

- A. Engineer will determine the actual quantities and classifications of Unit Price Work performed by Contractor as set forth in Paragraph 13.03.
- 10.6 Decisions on Requirements of Contract Documents and Acceptability of Work
 - A. Engineer will render decisions regarding the requirements of the Contract Documents, and judge the acceptability of the Work, pursuant to the specific procedures set forth herein for initial interpretations, Change Orders, and acceptance of the Work. In rendering such decisions and judgments, Engineer will not show partiality to Owner or Contractor, and will not be liable to Owner, Contractor, or others in connection with any proceedings, interpretations, decisions, or judgments conducted or rendered in good faith.
- 10.7 Limitations on Engineer's Authority and Responsibilities
 - A. Neither Engineer's authority or responsibility under this Article 10 or under any other provision of the Contract, nor any decision made by Engineer in good faith either to exercise or not exercise such authority or responsibility or the undertaking, exercise, or performance of any authority or responsibility by Engineer, shall create, impose, or give rise to any duty in contract, tort, or otherwise owed by Engineer to Contractor, any Subcontractor, any Supplier, any other individual or entity, or to any surety for or employee or agent of any ofthem.
 - B. Engineer will not supervise, direct, control, or have authority over or be responsible for Contractor's means, methods, techniques, sequences, or procedures of construction, or the safety precautions and programs incident thereto, or for any failure of Contractor to comply with Laws and Regulations applicable to the performance of the Work. Engineer will not be responsible for Contractor's failure to perform the Work in accordance with the Contract Documents.
 - C. Engineer will not be responsible for the acts or omissions of Contractor or of any Subcontractor, any Supplier, or of any other individual or entity performing any of the Work.
 - D. Engineer's review of the final Application for Payment and accompanying documentation and all maintenance and operating instructions, schedules, guarantees, bonds, certificates of inspection, tests and approvals, and other documentation required to be delivered by Paragraph 15.06.A will only be to determine generally that their content complies with the requirements of, and in the case of certificates of inspections, tests, and approvals, that the results certified indicate compliance with the Contract Documents.
- *10.8* The limitations upon authority and responsibility set forth in this Paragraph 10.08 shall also apply to the Resident Project Representative, if any.*Compliance with Safety Program*
- A. While at the Site, Engineer's employees and representatives will comply with the specific applicable requirements of Owner's and Contractor's safety programs (if any) of which Engineer has been informed.

ARTICLE 11 – AMENDING THE CONTRACT DOCUMENTS; CHANGES IN THE WORK

- 11.1 Amending and Supplementing Contract Documents
 - A. The Contract Documents may be amended or supplemented by a Change Order or a Work Change Directive.
 - 1. *Change Orders*: If an amendment or supplement to the Contract Documents includes a change in the Contract Price or the Contract Times, such amendment or supplement <u>must</u> be set forth in a Change Order. A Change Order also may be used to establish amendments and supplements of the Contract Documents that do not affect the Contract Price or Contract Times.
 - 2. Work Change Directives: Engineer may order or authorize changes in the Work if the changes <u>do not</u> involve an adjustment in the Contract Price or the Contract Times and are compatible with the design concept of the completed Project as a functioning whole as indicated by the Contract Documents. Such changes will be accomplished by a Work Change Directive and will be binding on Contractor, which shall perform the Work involved promptly. If Contractor believes that a Work Change Directive justifies an adjustment in the Contract Price or Contract Times, or both, then Contractor shall submit a Change Order as provided herein. Following negotiations by the parties as to the Work Change Directive's effect, if any, on the Contract Price and Contract Times; or, if negotiations are unsuccessful, by a determination under the terms of the Contract Documents governing adjustments, expressly including Paragraph 11.04 regarding change of Contract Price or the Contract Times, or both, no later than 30 days after the completion of the Work set out in the Work Change Directive.
- 11.2 Owner-Authorized Changes in the Work
 - A. Without invalidating the Contract and without notice to any surety, Owner through the City Engineer, may, at any time or from time to time, order additions, deletions, or revisions in the Work. Such changes may be accomplished by a Change Order, if Owner and Contractor have agreed as to the effect, if any, of the changes on Contract Times or Contract Price. Upon receipt of any such document, Contractor shall promptly proceed with the Work involved; or, in the case of a deletion in the Work, promptly cease construction activities with respect to such deleted Work. Added or revised Work shall be performed under the applicable conditions of the Contract reasonably concludes cannot be performed in a manner consistent with Contractor's safety obligations under the Contract Documents.

11.3 Unauthorized Changes in the Work

A. Contractor shall not be entitled to an increase in the Contract Price or an extension of the Contract Times with respect to any work performed that is not required by the Contract Documents, as amended, modified, or supplemented, except in the case of an emergency as provided in Paragraph 7.15 or in the case of uncovering Work as provided in Paragraph 14.05.

- 11.4 Change of Contract Price
 - A. The **Contract Price may** <u>only</u> be changed by a Change Order. Any Change Order for an adjustment in the Contract Price shall comply with the provisions of Paragraph 11.06. Any Claim for an adjustment of Contract Price shall comply with the provisions of Article 12.
 - B. An adjustment in the Contract Price will be determined as follows:
 - 1. where the Work involved is covered by unit prices contained in the Contract Documents, then by application of such unit prices to the quantities of the items involved (subject to the provisions of Paragraph 13.03); or
 - 2. where the Work involved is not covered by unit prices contained in the Contract Documents, then by a mutually agreed lump sum (which may include an allowance for overhead and profit not necessarily in accordance with Paragraph 11.04.C.2); or
 - 3. where the Work involved is not covered by unit prices contained in the Contract Documents and the parties do not reach mutual agreement to a lump sum, then on the basis of the Cost of the Work (determined as provided in Paragraph 13.01) plus a Contractor's fee for overhead and profit (determined as provided in Paragraph 11.04.C).
 - C. *Contractor's Fee*: When applicable, the Contractor's fee for overhead and profit shall be determined as follows:
 - 1. a mutually acceptable fixed fee; or
 - 2. if a fixed fee is not agreed upon, then a fee based on the following percentages of the various portions of the Cost of the Work:
 - a. for costs incurred under Paragraphs 13.01.B.1 and 13.01.B.2, the Contractor's fee shall be 15 percent;
 - b. for costs incurred under Paragraph 13.01.B.3, the Contractor's fee shall be five percent;
 - c. where one or more tiers of subcontracts are on the basis of Cost of the Work plus a fee and no fixed fee is agreed upon, the intent of Paragraphs 11.04.C.2.a and 11.04.C.2.b is that the Contractor's fee shall be based on: (1) a fee of 15 percent of the costs incurred under Paragraphs 13.01.A.1 and 13.01.A.2 by the Subcontractor that actually performs the Work, at whatever tier, and (2) with respect to Contractor itself and to any Subcontractors of a tier higher than that of the Subcontractor that actually performs the Work, a fee of five percent of the amount (fee plus underlying costs incurred) attributable to the next lower tier Subcontractor; provided, however, that for any such subcontracted work the maximum total fee to be paid by Owner shall be no greater than 27 percent of the costs incurred by the Subcontractor that actually performs the work;
 - d. no fee shall be payable on the basis of costs itemized under Paragraphs 13.01.B.4, 13.01.B.5, and 13.01.C;
 - e. the amount of credit to be allowed by Contractor to Owner for any change which results in a net decrease in cost will be the amount of the actual net decrease in cost plus a deduction in Contractor's fee by an amount equal to five percent of such net decrease; and
 - f. when both additions and credits are involved in any one change, the adjustment in Contractor's fee shall be computed on the basis of the net change in accordance with Paragraphs 11.04.C.2.a through 11.04.C.2.e, inclusive.

11.5 Change of Contract Times

- A. The **Contract Times may** <u>only</u> be changed by a Change Order. Any Change Order for an adjustment in the Contract Times shall comply with the provisions of Paragraph 11.06. Any Claim for an adjustment in the Contract Times shall comply with the provisions of Article 12.
- B. An adjustment of the Contract Times shall be subject to the limitations set forth in Paragraph 4.05, concerning delays in Contractor's progress.

11.6 Change Orders

- A. Contractor shall submit a Change Order to Engineer to request an adjustment in the Contract Times or Contract Price; appeal an initial decision by Engineer concerning the requirements of the Contract Documents or relating to the acceptability of the Work under the Contract Documents; contest a set-off against payment due; or seek other relief under the Contract. The Change Order shall specify any proposed change in Contract Times or Contract Price, or both, or other proposed relief, and explain the reason for the proposed change, with citations to any governing or applicable provisions of the ContractDocuments.
 - 1. *Procedures*: Contractor shall submit each Change Order to Engineer promptly (but inno event later than 30 days) after the start of the event giving rise thereto, or after such initial decision. The Contractor shall submit supporting data, including the proposed change in Contract Price or Contract Time (if any), to the Engineer within 15 days after the submittal of the Change Order. The supporting data shall be accompanied by a written statement that the supporting data are accurate and complete, and that any requested time or price adjustment is the entire adjustment to which Contractor believes it is entitled as a result of said event.
 - 2. Engineer's Action: Engineer will review each Change Order and, within 30 days after receipt of the Contractor's supporting data, either deny the Change Order in whole, approve it in whole, or deny it in part and approve it in part. Such actions shall be in writing, with a copy provided to Contractor. If Engineer does not take action on the Change Order within 30 days, then Contractor may at any time thereafter submit a letter to the Engineer indicating that as a result of Engineer's inaction the Change Order is deemed denied, thereby commencing the time for appeal of the denial under Article 12.
 - 3. *Binding Decision*: Engineer's decision will be final and binding upon the Contractor, unless Contractor appeals the decision by filing a Claim under Article 12.

11.7 Execution of Change Orders

- A. Engineer and Contractor shall execute appropriate Change Orders covering:
 - 1. changes in the Contract Price or Contract Times which are agreed to by the parties, including any undisputed sum or amount of time for Work actually performed in accordance with a Change Order;
 - 2. changes in Contract Price resulting from an Owner set-off, unless Contractor has duly contested such set-off;
 - 3. changes in the Work which are: (a) ordered by Engineer pursuant to Paragraph 11.02, (b) required because of Engineer's acceptance of defective Work under Paragraph 14.04 or Engineer's correction of defective Work under Paragraph 14.07, or (c) agreed to by the parties; and
 - 4. changes to the Contract Price or Contract Times, or other changes, which embody the substance of any final and binding results under Paragraph 11.06, or Article 12.
- B. If Contractor refuses to execute a Change Order that is required to be executed under the terms of this Paragraph 11.07, it shall be deemed to be of full force and effect, as if fully executed.

11.8 Notification to Surety

A. If the provisions of any bond require notice to be given to a surety of any change affecting the general scope of the Work or the provisions of the Contract Documents (including, but not limited to, Contract Price or Contract Times), the giving of any such notice will be Contractor's responsibility. The amount of each applicable bond will be adjusted to reflect the effect of any such change.

ARTICLE 12 – CLAIMS

12.1 Claims

- A. *Claims Process*: The following disputes between Owner and Contractor shall be submitted to the Claims process set forth in this Article, which, together with Article 17 herein, shall serve as the formal dispute resolution procedure prescribed in the construction contract pursuant to Section 218.735(4), Florida Statutes:
 - 1. Appeals by Contractor of Engineer's decisions regarding Change Orders;
 - 2. Owner demands for adjustments in the Contract Price or Contract Times, or other relief under the Contract Documents; and
 - 3. Disputes that Engineer has been unable to address because they do not involve the design (as set forth in the Drawings, Specifications, or otherwise), the acceptability of the Work, or other engineering or technical matters.
- Submittal of Claim: Written notice stating the general nature of each Claim, dispute, or other B. matter shall be delivered by the claimant to the Engineer and other party to the contract promptly (but in no event later than 30 days) after the start of the event giving rise thereto. Notice of the amount or extent of the Claim, dispute, or other matter with supporting data shall be delivered to the Engineer and the other party to the Contract within 60 days after the start of such event (unless the Engineer allows additional time for claimant to submit additional or more accurate data in support of such Claim, dispute, or other matter). A Claim for an adjustment in Contract Price shall be prepared in accordance with the provisions of paragraph 11.04. A Claim for an adjustment in Contract Time shall be prepared in accordance with the provisions of paragraph 11.05. Each Claim shall be accompanied by claimant's statement certifying that the Claim is made in good faith that the supporting data are accurate and complete, and that to the best of claimant's knowledge and belief that the adjustment claimed is the entire adjustment to which the claimant believes it is entitled as a result of said event. The opposing party shall submit any response to the Engineer and the claimant within 30 days after receipt of the claimant's last submittal (unless the Engineer allows additionaltime).
- C. Review and Resolution: The Engineer will render a formal decision in writing within 30 days after receipt of the last submittal of the claimant or the last submittal of the opposing party, if any. The Engineer's written decision on such Claim, dispute, or other matter will be finaland binding upon the Owner and the Contractor unless a written notice of intention to appeal from the Engineer's written decision as set forth in Article 17 is delivered by the Contractor to the Engineer within 30 days after the date of such decision, and, if applicable, providing pre-suit notice to Owner of Contractor's intent to file a cause of action in Circuit Court in Marion County, Florida. Contractor shall be entitled to an appeal by filing a formal proceeding instituted by the appealing party in Circuit Court, Marion County, Florida, within 30 days of Contractor's notice to owner described above, 60 days after the date of the Engineer's written decision, or within 60 days after Substantial Completion, whichever is later (unless otherwise agreed in writing by the Engineer and the Contractor), to exercise such rights of remedies as the appealing party may have with respect to such Claim, dispute, or other matter in accordance with applicable laws and regulations. No Decision: If the Engineer does not render a formal decision in writing with the time stated in 12.01.C, a decision denying the Claim in its entirety shall be deemed to have been issued 31 days after receipt of the last submittal of the claimant or the last submittal of the opposing party, if any.
- D. *Partial Approval*: If the Engineer approves the Claim in part and denies it in part, suchaction shall be final and binding unless within 30 days of such action the other party invokes the procedure set forth in Article 17 for final resolution of disputes.
- E. *Denial of Claim*: A denial of the Claim shall be final and binding unless within 30 days of the denial the other party invokes the procedure set forth in Article 17 for the final resolution of

disputes.

F. *Final and Binding Results*: If the parties reach a mutual agreement regarding a Claim, whether through approval of the Claim, direct negotiations, or otherwise; or if a Claim is approved in part and denied in part, or denied in full, and such actions become final and binding; then the results of the agreement or action on the Claim shall be incorporated in a Change Order or Work Change Directive to the extent they affect the Contract, including the Work, the Contract Times, or the Contract Price.

ARTICLE 13 – COST OF THE WORK; ALLOWANCES; UNIT PRICE WORK

- 13.1 Cost of the Work
 - A. *Purposes for Determination of Cost of the Work*: The term Cost of the Work means the sum of all costs necessary for the proper performance of the Work at issue, as further defined below. The provisions of this Paragraph 13.01 are used for two distinct purposes:
 - 1. To determine Cost of the Work when Cost of the Work is a component of the Contract Price, under cost-plus-fee, time-and-materials, or other cost-based terms; or
 - 2. To determine the **value** of a Work Change Directive, Change Order, Claim, set-off, or other adjustment in Contract Price. When the value of any such adjustment is determined on the basis of Cost of the Work, Contractor is entitled only to those additional or incremental costs required because of the change in the Work or because of the event giving rise to the adjustment.
 - B. *Costs Included*: Except as otherwise may be agreed to in writing by Owner, costs included in the Cost of the Work shall be in amounts no higher than those prevailing in the locality of the Project, shall not include any of the costs itemized in Paragraph 13.01.C, and shall include only the following items:
 - 1. Payroll costs for employees in the direct employ of Contractor in the performance of the Work under schedules of job classifications agreed upon by Owner and Contractor. Such employees shall include, without limitation, superintendents, foremen, and other personnel employed full time on the Work. Payroll costs for employees not employed full time on the Work shall be apportioned on the basis of their time spent on the Work. Payroll costs shall include, but not be limited to, salaries and wages plus the cost of fringe benefits, which shall include social security contributions, unemployment, excise, and payroll taxes, workers' compensation, health and retirement benefits, bonuses, sick leave, and vacation and holiday pay applicable thereto. The expenses of performing Work outside of regular working hours, on Saturday, Sunday, or legal holidays, shall be included in the above to the extent authorized by Owner.
 - 2. Cost of all materials and equipment furnished and incorporated in the Work, including costs of transportation and storage thereof, and Suppliers' field services required in connection therewith. All cash discounts shall accrue to Contractor unless Owner deposits funds with Contractor with which to make payments, in which case the cashdiscounts shall accrue to Owner. All trade discounts, rebates, and refunds and returns from sale of surplus materials and equipment shall accrue to Owner, and Contractor shall make provisions so that they may be obtained.
 - 3. Payments made by Contractor to Subcontractors for Work performed by Subcontractors. If required by Owner, Contractor shall obtain competitive bids from subcontractors acceptable to Owner and Contractor and shall deliver such bids to Owner, who will then determine, with the advice of Engineer, which bids, if any, will be acceptable. If any subcontract provides that the Subcontractor is to be paid on the basis of Cost of the Work plus a fee, the Subcontractor's Cost of the Work and fee shall be determined in the same manner as Contractor's Cost of the Work and fee as provided in this Paragraph13.01.
 - 4. Costs of special consultants (including but not limited to engineers, architects, testing laboratories, surveyors, attorneys, and accountants) employed for services specifically related to the Work.
 - 5. Supplemental costs including the following:
 - a. The proportion of necessary transportation, travel, and subsistence expenses of Contractor's employees incurred in discharge of duties connected with the Work.
 - b. Cost, including transportation and maintenance, of all materials, supplies,

equipment, machinery, appliances, office, and temporary facilities at the Site, and hand tools not owned by the workers, which are consumed in the performance of the Work, and cost, less market value, of such items used but not consumed which remain the property of Contractor.

- c. Rentals of all construction equipment and machinery, and the parts thereof, whether rented from Contractor or others in accordance with rental agreements approved by Owner with the advice of Engineer, and the costs of transportation, loading, unloading, assembly, dismantling, and removal thereof. All such costs shall be in accordance with the terms of said rental agreements. The rental of any such equipment, machinery, or parts shall cease when the use thereof is no longer necessary for the Work.
- d. Sales, consumer, use, and other similar taxes related to the Work, and for which Contractor is liable, as imposed by Laws and Regulations.
- e. Deposits lost for causes other than negligence of Contractor, any Subcontractor, or anyone directly or indirectly employed by any of them or for whose acts any of them may be liable, and royalty payments and fees for permits andlicenses.
- f. Losses and damages (and related expenses) caused by damage to the Work, not compensated by insurance or otherwise, sustained by Contractor in connectionwith the performance of the Work (except losses and damages within the deductible amounts of property insurance established in accordance with Paragraph 6.05), provided such losses and damages have resulted from causes other than the negligence of Contractor, any Subcontractor, or anyone directly or indirectly employed by any of them or for whose acts any of them may be liable. Such losses shall include settlements made with the written consent and approval of Owner. No such losses, damages, and expenses shall be included in the Cost of the Work for the purpose of determining Contractor's fee.
- g. The cost of utilities, fuel, and sanitary facilities at the Site.
- h. Minor expenses such as communication service at the Site, express and courier services, and similar petty cash items in connection with the Work. The costs of premiums for all bonds and insurance that Contractor is required by the Contract Documents to purchase and maintain.
- C. Costs Excluded: The term Cost of the Work shall not include any of the followingitems:
 - 1. Payroll costs and other compensation of Contractor's officers, executives, principals (of partnerships and sole proprietorships), general managers, safety managers, engineers, architects, estimators, attorneys, auditors, accountants, purchasing and contracting agents, expediters, timekeepers, clerks, and other personnel employed by Contractor, whether at the Site or in Contractor's principal or branch office for general administration of the Work and not specifically included in the agreed upon schedule of job classifications referred to in Paragraph 13.01.B.1 or specifically covered by Paragraph 13.01.B.4. The payroll costs and other compensation excluded here are to be considered administrative costs covered by the Contractor's fee.
 - 2. Expenses of Contractor's principal and branch offices other than Contractor's office at the Site.
 - 3. Any part of Contractor's capital expenses, including interest on Contractor's capital employed for the Work and charges against Contractor for delinquentpayments.
 - 4. Costs due to the negligence of Contractor, any Subcontractor, or anyone directly or indirectly employed by any of them or for whose acts any of them may be liable, including but not limited to, the correction of defective Work, disposal of materials or equipment wrongly supplied, and making good any damage to property.

- 5. Other overhead or general expense costs of any kind and the costs of any item not specifically and expressly included in Paragraph 13.01.B.
- D. *Contractor's Fee*: When the Work as a whole is performed on the basis of cost-plus, Contractor's fee shall be determined as set forth in the Agreement. When the value of any Work covered by a Work Change Directive, Change Order, Claim, set-off, or other adjustment in Contract Price is determined on the basis of Cost of the Work, Contractor's fee shall be determined as set forth in Paragraph 11.04.C.
- E. *Documentation*: Whenever the Cost of the Work for any purpose is to be determined pursuant to this Article 13, Contractor will establish and maintain records thereof in accordance with generally accepted accounting practices and submit in a form acceptable to Engineer an itemized cost breakdown together with supporting data.

13.2 Allowances

- A. It is understood that Contractor has included in the Contract Price all allowances so named in the Contract Documents and shall cause the Work so covered to be performed for such sums and by such persons or entities as may be acceptable to Owner and Engineer.
- B. Cash Allowances: Contractor agrees that:
 - 1. the cash allowances include the cost to Contractor (less any applicable trade discounts) of materials and equipment required by the allowances to be delivered at the Site, and all applicable taxes; and
 - 2. Contractor's costs for unloading and handling on the Site, labor, installation, overhead, profit, and other expenses contemplated for the cash allowances have been included in the Contract Price and not in the allowances, and no demand for additional payment on account of any of the foregoing will be valid.
- C. *Contingency Allowance*: Contractor agrees that a contingency allowance, if any, is for the sole use of Owner to cover unanticipated costs.Prior to final payment, an appropriate Change Order will be issued as recommended by Engineer to reflect actual amounts due Contractor on account of Work covered by allowances, and the Contract Price shall be correspondingly adjusted.
- 13.3 Unit Price Work
 - A. Where the Contract Documents provide that all or part of the Work is to be Unit Price Work, initially the Contract Price will be deemed to include for all Unit Price Work an amount equal to the sum of the unit price for each separately identified item of Unit Price Work times the estimated quantity of each item as indicated in the Agreement.
 - B. The estimated quantities of items of Unit Price Work are not guaranteed and are solely for the purpose of comparison of Bids and determining an initial Contract Price. Payments to Contractor for Unit Price Work will be based on actual quantities.
 - C. Each unit price will be deemed to include an amount considered by Contractor to be adequate to cover Contractor's overhead and profit for each separately identified item.
 - D. Engineer will determine the actual quantities and classifications of Unit Price Work performed by Contractor. Engineer will review with Contractor the Engineer's preliminary determinations on such matters before rendering a written decision thereon (by recommendation of an Application for Payment or otherwise). Engineer's written decision thereon will be final and binding (except as modified by Engineer to reflect changed factual conditions or more accurate data) upon Contractor, subject to the provisions of the following paragraph.
 - E. Within 30 days of Engineer's written decision under the preceding paragraph, Contractor may submit a Change Order, or Engineer may file a Claim, seeking an adjustment in the Contract

Price if:

- 1. the quantity of any item of Unit Price Work performed by Contractor differs materially and significantly from the estimated quantity of such item indicated in the Agreement;
- 2. there is no corresponding adjustment with respect to any other item of Work; and
- 3. Contractor believes that it is entitled to an increase in Contract Price as a result of having incurred additional expense or Engineer believes that Owner is entitled to a decrease in Contract Price, and the parties are unable to agree as to the amount of any such increase or decrease.

ARTICLE 14 – TESTS AND INSPECTIONS; CORRECTION, REMOVAL OR ACCEPTANCE OF DEFECTIVE WORK

- 14.1 Access to Work
 - A. Owner, Engineer, their consultants and other representatives and personnel of Owner, independent testing laboratories, and authorities having jurisdiction will have access to the Site and the Work at reasonable times for their observation, inspection, and testing. Contractor shall provide them proper and safe conditions for such access and advise them of Contractor's safety procedures and programs so that they may comply therewith as applicable.
- 14.2 Tests, Inspections, and Approvals
 - A. Contractor shall give Engineer timely notice of readiness of the Work (or specific parts thereof) for all required inspections and tests, and shall cooperate with inspection and testing personnel to facilitate required inspections and tests.
 - B. Engineer on behalf of Owner shall retain and pay for the services of an independent inspector, testing laboratory, or other qualified individual or entity to perform quality assurance inspections and tests expressly required by the Contract Documents to be furnished and paid for by Owner, except that costs incurred in connection with tests or inspections of covered Work shall be governed by the provisions of Paragraph 14.05.
 - C. Contractor may, for Contractor's benefit, order and pay at their expense any additional testing which Contractor deems necessary to meet construction specifications.
 - D. If Laws or Regulations of any public body having jurisdiction require any Work (or part thereof) specifically to be inspected, tested, or approved by an employee or other representative of such public body, Contractor shall assume full responsibility for arranging and obtaining such inspections, tests, or approvals, pay all costs in connection therewith, and furnish Engineer the required certificates of inspection or approval.
 - E. Contractor shall be responsible for arranging, obtaining, and paying for all inspections and tests required:
 - 1. by the Contract Documents, unless the Contract Documents expressly allocate responsibility for a specific inspection or test to Owner;
 - 2. to attain Engineer's acceptance of materials or equipment to be incorporated in the Work;
 - 3. by manufacturers of equipment furnished under the Contract Documents;
 - 4. for testing, adjusting, and balancing of mechanical, electrical, and other equipment to be incorporated into the Work; and
 - 5. for acceptance of materials, mix designs, or equipment submitted for approval prior to Contractor's purchase thereof for incorporation in the Work.

Such inspections and tests shall be performed by independent inspectors, testing laboratories, or other qualified individuals or entities acceptable to Engineer. Results of all required testing and inspections shall be submitted to the Engineer.

- F. If the Contract Documents require the Work (or part thereof) to be approved by Engineer, or another designated individual or entity, then Contractor shall assume full responsibility for arranging and obtaining such approvals.
- G. If any Work (or the work of others) that is to be inspected, tested, or approved is covered by Contractor without written concurrence of Engineer, Contractor shall, if requested by Engineer, uncover such Work for observation. Such uncovering shall be at Contractor's expense unless Contractor had given Engineer timely notice of Contractor's intention to cover the same and Engineer had not acted with reasonable promptness in response to such notice.
- 14.3 Defective Work

- A. *Contractor's Obligation*: It is Contractor's obligation to assure that the Work is not defective.
- B. *Engineer's Authority*: Engineer has the authority to determine whether Work is defective, and to reject defective Work.
- C. *Notice of Defects*: Prompt notice of all defective Work of which Owner or Engineer has actual knowledge will be given to Contractor.
- D. *Correction, or Removal and Replacement:* Promptly after receipt of written notice of defective Work, Contractor shall correct all such defective Work, whether or not fabricated, installed, or completed, or, if Engineer has rejected the defective Work, remove it from the Project and replace it with Work that is not defective.
- E. *Preservation of Warranties*: When correcting defective Work, Contractor shall take no action that would void or otherwise impair Owner's special warranty and guarantee, if any, on said Work.
- F. *Costs and Damages*: In addition to its correction, removal, and replacement obligations with respect to defective Work, Contractor shall pay all claims, costs, losses, and damages arisingout of or relating to defective Work, including but not limited to the cost of the inspection, testing, correction, removal, replacement, or reconstruction of such defective Work, fines levied against Owner by governmental authorities because the Work is defective, and the costs of repair or replacement of work of others resulting from defective Work. Prior to final payment, if Owner and Contractor are unable to agree as to the measure of such claims, costs, losses, and damages resulting from defective Work, then Owner may impose a reasonable set- off against payments due under Article 15.
- 14.4 Acceptance of Defective Work
 - A. If, instead of requiring correction or removal and replacement of defective Work, Owner prefers to accept it, Owner may do so (subject, if such acceptance occurs prior to final payment, to Engineer's confirmation that such acceptance is in general accord with the design intent and applicable engineering principles, and will not endanger public safety). Contractor shall pay all claims, costs, losses, and damages attributable to Owner's evaluation of and determination to accept such defective Work (such costs to be approved by Engineer as to reasonableness), and for the diminished value of the Work to the extent not otherwise paid by Contractor. If any such acceptance occurs prior to final payment, the necessary revisions in the Contract Documents with respect to the Work shall be incorporated in a Change Order. If the parties are unable to agree as to the decrease in the Contract Price, reflecting the diminished value of Work so accepted, then Owner may impose a reasonable set-off against payments due under Article 15. If the acceptance of defective Work occurs after final payment, Contractor shall pay an appropriate amount to Owner.
- 14.5 Uncovering Work
 - A. Engineer has the authority to require additional inspection or testing of the Work, whether or not the Work is fabricated, installed, or completed.
 - B. If any Work is covered contrary to the written request of Engineer, then Contractor shall, if requested by Engineer, uncover such Work for Engineer's observation, and then replace the covering, all at Contractor's expense.
 - C. If Engineer considers it necessary or advisable that covered Work be observed by Engineer or inspected or tested by others, then Contractor, at Engineer's request, shall uncover, expose, or otherwise make available for observation, inspection, or testing as Engineer may require, that portion of the Work in question, and provide all necessary labor, material, and equipment.
 - 1. If it is found that the uncovered Work is defective, Contractor shall be responsible for all claims, costs, losses, and damages arising out of or relating to such uncovering, exposure, observation, inspection, and testing, and of satisfactory replacement or reconstruction

(including but not limited to all costs of repair or replacement of work of others); and pending Contractor's full discharge of this responsibility the Owner shall be entitled to impose a reasonable set-off against payments due under Article 15.

- 2. If the uncovered Work is not found to be defective, Contractor shall be allowed an increase in the Contract Price or an extension of the Contract Times, or both, directly attributable to such uncovering, exposure, observation, inspection, testing, replacement, and reconstruction. If the parties are unable to agree as to the amount or extent thereof, then Contractor may submit a Change Order within 30 days of the determination that the Work is not defective.
- 14.6 Engineer May Stop the Work
 - A. If the Work is defective, or Contractor fails to supply sufficient skilled workers, provide safe working environment, or suitable materials or equipment, or fails to perform the Work in such a way that the completed Work will conform to the Contract Documents, then Engineer may order Contractor to stop the Work, or any portion thereof, until the cause for such order hasbeen eliminated; however, this right of Engineer to stop the Work shall not give rise to any duty on the part of Engineer to exercise this right for the benefit of Contractor, any Subcontractor, any Supplier, any other individual or entity, or any surety for, or employee or agent of any of them.

14.7 Owner May Correct Defective Work

- A. If Contractor fails within a reasonable time after written notice from Engineer to correct defective Work, or to remove and replace rejected Work as required by Engineer, or if Contractor fails to perform the Work in accordance with the Contract Documents, or if Contractor fails to comply with any other provision of the Contract Documents, then Owner may, after seven days written notice to Contractor, correct or remedy any such deficiency.
- B. In exercising the rights and remedies under this Paragraph 14.07, Owner shall proceed expeditiously. In connection with such corrective or remedial action, Owner may exclude Contractor from all or part of the Site, take possession of all or part of the Work and suspend Contractor's services related thereto, and incorporate in the Work all materials and equipment stored at the Site or for which Owner has paid Contractor but which are stored elsewhere. Contractor shall allow Engineer, Owner, Owner's representatives, agents and employees, Owner's other contractors, and Engineer and Engineer's consultants access to the Site to enable Owner to exercise the rights and remedies under this paragraph.
- C. All claims, costs, losses, and damages incurred or sustained by Owner in exercising the rights and remedies under this Paragraph 14.07 will be charged against Contractor as set-offs against payments due under Article 15. Such claims, costs, losses and damages will include but not be limited to all costs of repair, or replacement of work of others destroyed or damaged by correction, removal, or replacement of Contractor's defective Work.
- D. Contractor shall not be allowed an extension of the Contract Times because of any delay in the performance of the Work attributable to the exercise by Owner of Owner's rights and remedies under this Paragraph 14.07.

ARTICLE 15 – PAYMENTS TO CONTRACTOR; SET-OFFS; COMPLETION; CORRECTION PERIOD

- 15.1 Progress Payments
 - A. *Basis for Progress Payments*: The Schedule of Values established as provided in Article 2 will serve as the basis for progress payments and will be incorporated into a form of Application for Payment acceptable to Engineer. Progress payments on account of Unit Price Work will be based on the number of units completed during the pay period, as determined under the provisions of Paragraph 13.03. Progress payments for cost-based Work will be based on Cost of the Work completed by Contractor during the pay period.
 - B. Applications for Payments:

1. At least 20 days before the date established in the Agreement for each progress payment (but not more often than once a month), Contractor shall submit to Engineer for review an Application for Payment filled out and signed by Contractor covering the Work completed as of the date of the Application and accompanied by such supporting documentation as is required by the Contract Documents. If payment is requested on the basis of materials and equipment not incorporated in the Work but delivered and suitably stored at the Site or at another location agreed to in writing, the Application for Payment shall also be accompanied by a bill of sale, invoice, or other documentation warranting that Owner has received the materials and equipment are covered by appropriate property insurance, a warehouse bond, or other arrangements to protect Owner's interest therein, all of which must be satisfactory to Owner.

- 2. Beginning with the second Application for Payment, each Application shall include an affidavit of Contractor stating that all previous progress payments received on account of the Work have been applied on account to discharge Contractor's legitimate obligations associated with prior Applications for Payment.
- 3. The amount of retainage with respect to progress payments will be as stipulated in the Agreement.
- C. Review of Applications:
 - 1. Engineer will, within 10 days after receipt of each Application for Payment, including each resubmittal, either indicate in writing a recommendation of payment and present the Application to Owner, or within 20 days (25 days if Engineer is a consultant to the City Engineer providing construction management services), as required by Florida Statute 218.735, return the Application to Contractor indicating in writing Engineer's reasons for refusing to recommend payment. In the latter case, Contractor may make the necessary corrections and resubmit the Application.
 - 2. Engineer's recommendation of any payment requested in an Application for Payment will constitute a representation by Engineer to Owner, based on Engineer's observations of the executed Work as an experienced and qualified design professional, and on Engineer's review of the Application for Payment and the accompanying data and schedules, that to the best of Engineer's knowledge, information and belief:
 - a. the Work has progressed to the point indicated;
 - b. the quality of the Work is generally in accordance with the Contract Documents (subject to an evaluation of the Work as a functioning whole prior to or upon Substantial Completion, the results of any subsequent tests called for in the Contract Documents, a final determination of quantities and classifications for Unit Price Work under Paragraph 13.03, and any other qualifications stated in the recommendation); and

- c. the conditions precedent to Contractor's being entitled to such payment appear to have been fulfilled in so far as it is Engineer's responsibility to observe the Work.
- 3. By recommending any such payment Engineer will not thereby be deemed to have represented that:
 - a. inspections made to check the quality or the quantity of the Work as it has been performed have been exhaustive, extended to every aspect of the Work in progress, or involved detailed inspections of the Work beyond the responsibilities specifically assigned to Engineer; or
 - b. there may be other matters or issues that might entitle Owner to withhold payment to Contractor.
- 4. Neither Engineer's review of Contractor's Work for the purposes of recommending payments nor Engineer's recommendation of any payment, including final payment, will impose responsibility on Engineer:
 - a. to supervise, direct, or control the Work, or
 - b. for the means, methods, techniques, sequences, or procedures of construction, or the safety precautions and programs incident thereto, or
 - c. for Contractor's failure to comply with Laws and Regulations applicable to Contractor's performance of the Work, orto make any examination to ascertain how or for what purposes Contractor has used the money paid on account of the Contract Price, or
 - d. to determine that title to any of the Work, materials, or equipment has passed to Owner free and clear of any Liens.
- 5. Engineer may refuse to recommend the whole or any part of any payment if, in Engineer's opinion, it would be incorrect to make the representations to Owner stated in Paragraph 15.01.C.2.
- 6. Engineer will recommend reductions in payment (set-offs) necessary in Engineer's opinion to protect Owner from loss because:
 - a. the Work is defective, requiring correction or replacement;
 - b. the Contract Price has been reduced by Change Orders;
 - c. Owner has been required to correct defective Work in accordance with Paragraph 14.07, or has accepted defective Work pursuant to Paragraph 14.04;
 - d. Owner has been required to remove or remediate a Hazardous Environmental Condition for which Contractor is responsible; or
 - e. Engineer has actual knowledge of the occurrence of any of the events that would constitute a default by Contractor and therefore justify termination for cause under the Contract Documents.
- D. Payment Becomes Due:
 - 1. Payment of an Application for Payment approved as per Paragraph 15.01.C. will become due twenty days after presentation of the Application for Payment to the Engineer (twenty-five days if Engineer is a consultant providing construction management services to the City Engineer), as required by Florida Statute 218.735.
 - 2. Payment of a revised Application for Payment previously rejected per Paragraph 15.01.C. and then subsequently corrected by the Contractor and approved as per Paragraph 15.01.C, will be due ten days after presentation of the revised Application for Payment to the Engineer, as required by Florida Statute 218.735
- E. Reductions in Payment by Owner:

- 1. In addition to any reductions in payment (set-offs) recommended by Engineer, Owner is entitled to impose a set-off against payment based on any of the following:
 - a. claims have been made against Owner on account of Contractor's conduct in the performance or furnishing of the Work, or Owner has incurred costs, losses, or damages on account of Contractor's conduct in the performance or furnishing of the Work, including but not limited to claims, costs, losses, or damages from workplace injuries, adjacent property damage, non-compliance with Laws and Regulations, and patent infringement;
 - b. Contractor has failed to take reasonable and customary measures to avoid damage, delay, disruption, and interference with other work at or adjacent to the Site;
 - c. Contractor has failed to provide and maintain required bonds or insurance;
 - d. Owner has been required to remove or remediate a Hazardous Environmental Condition for which Contractor is responsible;
 - e. Owner has incurred extra charges or engineering costs related to submittal reviews, evaluations of proposed substitutes, tests and inspections, or return visits to manufacturing or assembly facilities; the Work is defective, requiring correction or replacement;
 - f. Owner has been required to correct defective Work in accordance with Paragraph 14.07, or has accepted defective Work pursuant to Paragraph 14.04;
 - g. the Contract Price has been reduced by Change Orders;
 - h. an event that would constitute a default by Contractor and therefore justify a termination for cause has occurred;
 - i. liquidated damages have accrued as a result of Contractor's failure to achieve Milestones, Substantial Completion, or final completion of the Work;
 - j. Liens have been filed in connection with the Work, except where Contractor has delivered a specific bond satisfactory to Owner to secure the satisfaction and discharge of such Liens;
 - k. there are other items entitling Owner to a set off against the amount recommended.
- 2. If Owner imposes any set-off against payment, whether based on its own knowledge or on the written recommendations of Engineer, Owner will give Contractor immediate written notice (with a copy to Engineer) stating the reasons for such action and the specific amount of the reduction, and promptly pay Contractor any amount remaining after deduction of the amount so withheld. Owner shall promptly pay Contractor the amount so withheld, or any adjustment thereto agreed to by Owner and Contractor, if Contractor remedies the reasons for such action. The reduction imposed shall bebinding on Contractor unless it duly submits a Change Order contesting the reduction.
- 3. Upon a subsequent determination that Owner's refusal of payment was not justified, the amount wrongfully withheld shall be treated as an amount due as determined by Paragraph 15.01.C.1.

15.2 Contractor's Warranty of Title

A. Contractor warrants and guarantees that title to all Work, materials, and equipment furnished under the Contract will pass to Owner free and clear of (1) all Liens and other title defects, and (2) all patent, licensing, copyright, or royalty obligations, no later than seven days after the time of payment by Owner.

15.3 Substantial Completion

A. When Contractor considers the entire Work ready for its intended use Contractor shall notify Engineer in writing that the entire Work is substantially complete and request that Engineer issue a certificate of Substantial Completion. Contractor shall at the same time submit to Engineer an initial draft of punch list items to be completed or corrected before final payment.

- B. Promptly after Contractor's notification, Contractor, and Engineer shall make an inspection of the Work to determine the status of completion. If Engineer does not consider the Work substantially complete, Engineer will notify Contractor in writing giving the reasons therefor.
- C. If Engineer considers the Work substantially complete, Engineer will deliver to Contractor a certificate of Substantial Completion which shall fix the date of Substantial Completion. Engineer shall attach to the certificate a punch list of items to be completed or corrected before final payment.
- D. At the time of receipt of the certificate of Substantial Completion, Engineer and Contractor will confer regarding Owner's use or occupancy of the Work following Substantial Completion, review the builder's risk insurance policy with respect to the end of the builder's risk coverage, and confirm the transition to coverage of the Work under a permanent property insurance policy held by Owner. Unless Engineer and Contractor agree otherwise in writing,Owner shall bear responsibility for security, operation, protection of the Work, property insurance, maintenance, heat, and utilities upon Owner's use or occupancy of the Work.
- E. After Substantial Completion, the Contractor shall promptly begin work on the punch list of items to be completed or corrected prior to final payment. In appropriate cases Contractor may submit monthly Applications for Payment for completed punch list items, following the progress payment procedures set forth above.
- F. Owner shall have the right to exclude Contractor from the Site after the date of Substantial Completion subject to allowing Contractor reasonable access to remove its property and complete or correct items on the punch list.

15.4 Partial Use or Occupancy

- A. Prior to Substantial Completion of all the Work, Owner may use or occupy any substantially completed part of the Work which has specifically been identified in the Contract Documents, or which Engineer, and Contractor agree constitutes a separately functioning and usable part of the Work that can be used by Owner for its intended purpose without significant interference with Contractor's performance of the remainder of the Work, subject to the following conditions:
 - 1. At any time Engineer may request in writing that Contractor permit Owner to use or occupy any such part of the Work that Owner believes to be substantially complete. If and when Contractor agrees that such part of the Work is substantially complete, Contractor, and Engineer will follow the procedures of Paragraph 15.03.A through E for that part of the Work.
 - 2. At any time, Contractor may notify Engineer in writing that Contractor considers any such part of the Work substantially complete and request Engineer to issue a certificate of Substantial Completion for that part of the Work.
 - 3. Within a reasonable time after either such request, Contractor, and Engineer shall make an inspection of that part of the Work to determine its status of completion. If Engineer does not consider that part of the Work to be substantially complete, Engineer will notify Contractor in writing giving the reasons therefore. If Engineer considers that part of the Work to be substantially complete, the provisions of Paragraph 15.03 will apply with respect to certification of Substantial Completion of that part of the Work and the division of responsibility in respect thereof and access thereto.
 - 4. No use or occupancy or separate operation of part of the Work may occur prior to compliance with the requirements of Paragraph 6.05 regarding builder's risk or other property insurance.

15.5 Final Inspection

- A. Upon written notice from Contractor that the entire Work or an agreed portion thereof is complete, Engineer will promptly make a final inspection with Contractor and will notify Contractor in writing of all particulars in which this inspection reveals that the Work, or agreed portion thereof, is incomplete or defective. Contractor shall immediately take such measures as are necessary to complete such Work or remedy such deficiencies.
- B. <u>After filing the notice for Final Inspection and prior to final payment, the Contractor shall</u> <u>prepare an "As Built Survey". The survey shall be provided to the Engineer is an electronic</u> <u>survey in a form compatible with AutoCAD.</u>

15.6 Final Payment

- A. *Application for Payment*:
 - 1. After Contractor has, in the opinion of Engineer, satisfactorily completed all corrections identified during the final inspection and has delivered, in accordance with the Contract Documents, all maintenance and operating instructions, schedules, guarantees, bonds, certificates or other evidence of insurance, certificates of inspection, annotated record

documents (as provided in Paragraph 7.11), and other documents, Contractor may make application for final payment.

- 2. The final Application for Payment shall be accompanied (except as previously delivered) by:
 - a. all documentation called for in the Contract Documents;
 - b. consent of the surety, (signed by an agent, accompanied by a certified copy of such agent's authority to act for the surety), if any, to final payment;
 - c. satisfactory evidence that all title issues have been resolved such that title to all Work, materials, and equipment has passed to Owner free and clear of any Liens or other title defects, or will so pass upon final payment.
 - d. a list of all disputes that Contractor believes are unsettled; and
 - e. complete and legally effective releases or waivers (satisfactory to Owner) of all Lien rights arising out of the Work, and of Liens filed in connection with the Work.
- 3. In lieu of the releases or waivers of Liens specified in Paragraph 15.06.A.2 and as approved by Owner, Contractor may furnish receipts or releases in full and an affidavit of Contractor that: (a) the releases and receipts include all labor, services, material, and equipment for which a Lien could be filed; and (b) all payrolls, material and equipment bills, and other indebtedness connected with the Work for which Owner might in any way be responsible, or which might in any way result in liens or other burdens on Owner's property, have been paid or otherwise satisfied. If any Subcontractor or Supplier fails to furnish such a release or receipt in full, Contractor may furnish a bond or other collateral satisfactory to Owner to indemnify Owner against any Lien, or Owner at its option may issue joint checks payable to Contractor and specified Subcontractors and Suppliers.
- B. Engineer's Review of Application and Acceptance:
 - 1. If, on the basis of Engineer's observation of the Work during construction and final inspection, and Engineer's review of the final Application for Payment and accompanying documentation as required by the Contract Documents, Engineer is satisfied that the Work has been completed and Contractor's other obligations under the Contract have been fulfilled, Engineer will, within ten days after receipt of the final Application for Payment, indicate in writing Engineer's recommendation of final payment and present the Application for Payment to Owner for payment. Such recommendation shall account for any set-offs against payment that are necessary in

Exhibit D - Technical Specifications CON

Engineer's opinion to protect Owner from loss for the reasons stated above with respect to progress payments. At the same time Engineer will also give written notice to Contractor that the Work is acceptable, subject to the provisions of Paragraph 15.07. Otherwise, within 20 days (25 days if Engineer is a consultant to the City Engineer providing construction management services), as required by Florida Statute 218.735, Engineer will return the Application for Payment to Contractor, indicating in writing the reasons for refusing to recommend final payment, in which case Contractor shall make the necessary corrections and resubmit the Application for Payment.

C. *Completion of Work*: The Work is complete (subject to surviving obligations) when it is ready for final payment as established by the Engineer's written recommendation of final payment.

D. *Payment Becomes Due*: Once it is approved, Twenty days (twenty-five days if Engineer is a consultant providing construction management services to the City Engineer), as required by Florida Statute 218.735, after the presentation to Engineer of the final Application for Payment and accompanying documentation, the amount recommended by Engineer (less any further sum Owner is entitled to set off against Engineer's recommendation, including but not limitedto set-offs for liquidated damages and set-offs allowed under the provisions above with respect to progress payments) will become due and shall be paid by Owner to Contractor.

15.7 Waiver of Claims

- A. The making of final payment will not constitute a waiver by Owner of claims or rights against Contractor. Owner expressly reserves claims and rights arising from unsettled Liens, from defective Work appearing after final inspection pursuant to Paragraph 15.05, from Contractor's failure to comply with the Contract Documents or the terms of any special guarantees specified therein, from outstanding Claims by Owner, or from Contractor's continuing obligations under the Contract Documents.
- B. The acceptance of final payment by Contractor will constitute a waiver by Contractor of all claims and rights against Owner other than those pending matters that have been duly submitted or appealed under the provisions of Article 17.

15.8 Correction Period

- A. If within one year after the date of Substantial Completion (or such longer period of time as may be prescribed by the terms of any applicable special guarantee required by the Contract Documents, or by any specific provision of the Contract Documents), any Work is found to be defective, or if the repair of any damages to the Site, adjacent areas that Contractor has arranged to use through construction easements or otherwise, and other adjacent areas used by Contractor as permitted by Laws and Regulations, is found to be defective, then Contractor shall promptly, without cost to Owner and in accordance with Engineer's written instructions:
 - 1. correct the defective repairs to the Site or such other adjacent areas;
 - 2. correct such defective Work;
 - 3. if the defective Work has been rejected by Engineer, remove it from the Project and replace it with Work that is not defective, and
 - 4. satisfactorily correct or repair or remove and replace any damage to other Work, to the work of others, or to other land or areas resulting therefrom.
- B. If Contractor does not promptly comply with the terms of Engineer's written instructions, or in an emergency where delay would cause serious risk of loss or damage, Owner may have the defective Work corrected or repaired or may have the rejected Work removed and replaced. Contractor shall pay all claims, costs, losses, and damages (including but not limited to all fees and charges of engineers, architects, attorneys, and other professionals and all court or arbitration or other dispute resolution costs) arising out of or relating to such correction or repair or such removal and replacement (including but not limited to all costs of repair or

replacement of work of others).

- C. In special circumstances where a particular item of equipment is placed in continuousservice before Substantial Completion of all the Work, the correction period for that item may start to run from an earlier date if so provided in the Specifications.
- D. Where defective Work (and damage to other Work resulting therefrom) has been corrected or removed and replaced under this paragraph, the correction period hereunder with respect to such Work will be extended for an additional period of one year after such correction or removal and replacement has been satisfactorily completed.
- *E.* Contractor's obligations under this paragraph are in addition to all other obligations and warranties. The provisions of this paragraph shall not be construed as a substitute for, or a waiver of, the provisions of any applicable statute of limitation orrepose.

ARTICLE 16 – SUSPENSION OF WORK AND TERMINATION

- 16.1 Owner or Engineer May Suspend Work
 - A. At any time and without cause, Owner or Engineer may suspend the Work or any portion thereof for a period of not more than 90 consecutive days by written notice to Contractor. Such notice will fix the date on which Work will be resumed. Contractor shall resume the Work on the date so fixed. Contractor shall be entitled to an adjustment in the Contract Price or an extension of the Contract Times, or both, directly attributable to any such suspension. Any Change Order seeking such adjustments shall be submitted no later than 30 days after the date fixed for resumption of Work.
- 16.2 Owner May Terminate for Cause
 - A. The occurrence of any one or more of the following events will constitute a default by Contractor and justify termination for cause:
 - 1. Contractor's persistent failure to perform the Work in accordance with the Contract Documents (including, but not limited to, failure to supply sufficient skilled workers or suitable materials or equipment or failure to adhere to the Progress Schedule);
 - 2. Failure of Contractor to perform or otherwise to comply with a material term of the Contract Documents;
 - 3. Contractor's disregard of Laws or Regulations of any public body having jurisdiction; or
 - 4. Contractor's repeated disregard of the authority of Owner or Engineer.
 - B. If one or more of the events identified in Paragraph 16.02.A occurs, then after giving Contractor (and any surety) ten days written notice that Owner is considering a declaration that Contractor is in default and termination of the contract, Owner may proceed to:
 - 1. declare Contractor to be in default, and give Contractor (and any surety) notice that the Contract is terminated; and
 - 2. enforce the rights available to Owner under any applicable performance bond.
 - C. Subject to the terms and operation of any applicable performance bond, if Owner has terminated the Contract for cause, Owner may exclude Contractor from the Site, take possession of the Work, incorporate in the Work all materials and equipment stored at the Site or for which Owner has paid Contractor but which are stored elsewhere, and complete the Work as Owner may deem expedient.
 - D. Owner may not proceed with termination of the Contract under Paragraph 16.02.B if Contractor within seven days of receipt of notice of intent to terminate begins to correct its failure to perform and proceeds diligently to cure such failure.
 - E. If Owner proceeds as provided in Paragraph 16.02.B, Contractor shall not be entitled to receive any further payment until the Work is completed. If the unpaid balance of the Contract Price exceeds the cost to complete the Work, including all related claims, costs, losses, and damages (including but not limited to all fees and charges of engineers, architects, attorneys, and other professionals) sustained by Owner, such excess will be paid to Contractor. If the cost to complete the Work including such related claims, costs, losses, and damages exceeds such unpaid balance, Contractor shall pay the difference to Owner. Such claims, costs, losses, and damages incurred by Owner will be reviewed by Engineer as to their reasonableness and, when so approved by Engineer, incorporated in a Change Order. When exercising any rights or remedies under this paragraph, Owner shall not be required to obtain the lowest price for the Work performed.
 - F. Where Contractor's services have been so terminated by Owner, the termination will not affect any rights or remedies of Owner against Contractor then existing or which may thereafter

accrue, or any rights or remedies of Owner against Contractor or any surety under any payment bond or performance bond. Any retention or payment of money due Contractor by Owner will not release Contractor from liability.

G. If and to the extent that Contractor has provided a performance bond under the provisions of Paragraph 6.01.A, the provisions of that bond shall govern over any inconsistent provisions of Paragraphs 16.02.B and 16.02.D.

16.3 Owner May Terminate For Convenience

- A. Upon seven days written notice to Contractor, Owner may, without cause and without prejudice to any other right or remedy of Owner, terminate the Contract. In such case, Contractor shall be paid for (without duplication of any items):
 - 1. completed and acceptable Work executed in accordance with the Contract Documents prior to the effective date of termination, including fair and reasonable sums for overhead and profit on such Work;
 - 2. expenses sustained prior to the effective date of termination in performing services and furnishing labor, materials, or equipment as required by the Contract Documents in connection with uncompleted Work, plus fair and reasonable sums for overhead and profit on such expenses; and
 - 3. other reasonable expenses directly attributable to termination, including costs incurred to prepare a termination for convenience cost proposal.
- B. Contractor shall not be paid on account of loss of anticipated overhead, profits, or revenue, or other economic loss arising out of or resulting from such termination.
- 16.4 Contractor May Stop Work or Terminate
 - A. If, through no act or fault of Contractor, (1) the Work is suspended for more than 90 consecutive days by Owner or under an order of court or other public authority, or (2) Engineer fails to act on any Application for Payment within 30 days after it is submitted, or (3) Owner fails for 30 days to pay Contractor any sum finally determined to be due, then Contractor may, upon seven days written notice to Owner and Engineer, and provided Owner or Engineer do not remedy such suspension or failure within that time, terminate the contract and recover from Owner payment on the same terms as provided in Paragraph 16.03.
 - B. In lieu of terminating the Contract and without prejudice to any other right or remedy, if Engineer has failed to act on an Application for Payment within 30 days after it is submitted, or Owner has failed for 30 days to pay Contractor any sum finally determined to be due, Contractor may, seven days after written notice to Owner and Engineer, stop the Work until payment is made of all such amounts due Contractor, including interest thereon. The provisions of this paragraph are not intended to preclude Contractor from submitting a Change Order for an adjustment in Contract Price or Contract Times or otherwise for expenses or damage directly attributable to Contractor's stopping the Work as permitted by this paragraph.

ARTICLE 17 – FINAL RESOLUTION OF DISPUTES

- 17.1 Methods and Procedures
 - A. *Disputes Subject to Final Resolution*: The following disputed matters are subject to final resolution under the provisions of this Article, which serves as the formal dispute resolution procedure prescribed in the construction contract pursuant to Section 218.735(4), Florida Statutes:
 - 1. A timely appeal of an approval in part and denial in part of a Claim, or of a denial in full; andDisputes between Owner and Contractor concerning the Work or obligations under the Contract Documents, and arising after final payment has been made.
 - B. *Final Resolution of Disputes*: Neither mediation nor arbitration will be acceptable as a means for settling claims, disputes, or other matters. Claims and disputes between the Owner and the Contractor which cannot be resolved to the satisfaction of both parties, shall be filed in the Circuit Court, Marion County, Florida.

ARTICLE 18 – MISCELLANEOUS

- 18.1 Giving Notice
 - A. Whenever any provision of the Contract Documents requires the giving of written notice, it will be deemed to have been validly given if:
 - 1. delivered in person, by a commercial courier service or otherwise, to the individual or to a member of the firm or to an officer of the corporation for which it is intended; or
 - 2. delivered at or sent by registered or certified mail, postage prepaid, to the last business address known to the sender of the notice.
- 18.2 Computation of Times
 - A. When any period of time is referred to in the Contract by days, it will be computed to exclude the first and include the last day of such period. If the last day of any such period falls on a Saturday or Sunday or on a day made a legal holiday by the law of the applicable jurisdiction, such day will be omitted from the computation.
- 18.3 Cumulative Remedies
 - A. The duties and obligations imposed by these General Conditions and the rights and remedies available hereunder to the parties hereto are in addition to, and are not to be construed in any way as a limitation of, any rights and remedies available to any or all of them which are otherwise imposed or available by Laws or Regulations, by special warranty or guarantee, or by other provisions of the Contract. The provisions of this paragraph will be as effective as if repeated specifically in the Contract Documents in connection with each particular duty, obligation, right, and remedy to which they apply.
- 18.4 Limitation of Damages
 - A. With respect to any and all Change Orders, Claims, disputes subject to final resolution, and other matters at issue, neither Owner nor Engineer, nor any of their officers, directors, members, partners, employees, agents, consultants, or subcontractors, shall be liable to Contractor for any claims, costs, losses, or damages sustained by Contractor on or in connection with any other project or anticipated project.
- 18.5 No Waiver
 - A. A party's non-enforcement of any provision shall not constitute a waiver of that provision, nor shall it affect the enforceability of that provision or of the remainder of this Contract.
- 18.6 Survival of Obligations
 - A. All representations, indemnifications, warranties, and guarantees made in, required by, or given in accordance with the Contract, as well as all continuing obligations indicated in the Contract, will survive final payment, completion, and acceptance of the Work or termination or completion of the Contract or termination of the services of Contractor.
- 18.7 Controlling Law
- 18.8 This Contract is to be governed by the law of the state of Florida. *Headings*
 - A. Article and paragraph headings are inserted for convenience only and do not constitute parts of these General Conditions.

SECTION 01 10 00

SUMMARY

PART 1 - GENERAL

1.1 SUMMARY

A. The Work specified herein shall include construction of all streets, stormwater, traffic, water, sanitary sewer, and reclaimed water systems in the City of Ocala, City Limits or Service Area, as well as all modifications, rehabilitation of or connection to existing City of Ocala streets, stormwater, traffic, water, sanitary sewer, and reclaimed water systems.

B. Section Includes:

- 1. Contract description.
- 2. Work by Owner or other Work at the Site.
- 3. Owner-furnished products.
- 4. Contractor's use of Site and premises.
- 5. Future work.
- 6. Work sequence.
- 7. Owner occupancy.
- 8. Permits.
- 9. Specification conventions.

1.2 CONTRACT DESCRIPTION

- A. Work of the Project includes construction, rehabilitation, and modifications to streets, stormwater, traffic control, traffic management, potable water, sanitary sewer, reclaimed water systems, and electrical systems.
- B. Perform Work of each Contract under provisions of the Contract with Owner according to Conditions of Contract.

1.3 WORK BY OWNER OR OTHERS

- A. If work performed by the Owner or under Owner-awarded contracts interfere with each other due to work being performed at the same time or at the same Site, Owner will determine the sequence of work under all contracts according to "Work Sequence" and "Contractor's Use of Site and Premises" Articles in this Section.
- B. Coordinate Work with utilities of Owner and public or private agencies.
- C. Work under this Contract includes:
 - 1. Work as indicated on Drawings and defined herein.
- D. Items noted NIC (Not in Contract), will be furnished and installed by Owner.

1.4 OWNER-FURNISHED PRODUCTS (IF APPLICABLE)

- A. Owner's Responsibilities:
 - 1. Arrange for and deliver Owner-reviewed Shop Drawings, Product Data, and Samples to Contractor.
 - 2. Arrange and pay for delivery to Site.
 - 3. Upon delivery, inspect products jointly with Contractor.
 - 4. Submit claims for transportation damage and replace damaged, defective, or deficient items.
 - 5. Arrange for manufacturers' warranties, inspections, and service.
- B. Contractor's Responsibilities:
 - 1. Review Owner-reviewed Shop Drawings, Product Data, and Samples.
 - 2. Receive and unload products at Site; inspect for completeness or damage jointly with Owner.
 - 3. Handle, store, install, and finish products.
 - 4. Repair or replace items damaged after receipt.

1.5 CONTRACTOR'S USE OF SITE AND PREMISES

- A. Limit use of Site and premises to allow:
 - 1. Owner occupancy.
 - 2. Work by Owner.
 - 3. Work by Others as directed by the Owner.
 - 4. Use of Site and premises by the public as directed by the Owner.
- B. Construction Operations: Limited to areas indicated on Drawings or as described herein.
 - 1. Noisy and Disruptive Operations (such as Use of Jack Hammers and Other Noisy Equipment): Not allowed in close proximity to existing buildings during regular hours of operation. Coordinate and schedule such operations with Owner to minimize disruptions.
- C. Time Restrictions for Performing Work:
 - 1. Working Hours shall be in accordance with the General Conditions.
 - 2. Some Work including, but not limited to, abandonments existing piping systems, as well as connections, replacements, extensions thereto and thereof may necessitate work being done after or before normal work hours, said decision resting solely with the Engineer.
 - a. Normally such extended hours will be required only to maintain service to existing customers or to minimize inconvenience to those customers or members of the public.
 - b. This shall be considered incidental to the construction and no additional compensation shall be allowed therefore.
- D. Utility Outages and Shutdown:
 - 1. Coordinate and schedule electrical and other utility outages with Owner.
 - 2. Outages: Allowed only at previously agreed upon times.

- 3. At least one week before scheduled outage, submit Outage Request Plan to Owner itemizing the dates, times, and duration of each requested outage.
- E. Sound Level Restrictions: Sound pressure level measured at boundary of Site shall not exceed 40 dBA.

1.6 WORK SEQUENCE

- A. Construct Work in order to accommodate Owner's occupancy requirements during construction period. Coordinate construction schedule and operations with Owner.
- B. Sequencing of Construction Plan: Before start of construction, if required by the Engineer, submit three (3) hard copies and one (1) electronic copy of construction plan regarding phasing of all Work for acceptance by Owner. After acceptance of plan, construction sequencing shall comply with accepted plan unless deviations are accepted by Owner in writing.

1.7 OWNER OCCUPANCY

- A. Owner will occupy Site for conduct of normal operations.
- B. Cooperate with Owner to minimize conflict and to facilitate Owner's operations.
- C. Schedule the Work to accommodate Owner occupancy.

1.8 PERMITS

- A. The Owner will obtain all permits required for work within State, County, and Railroad Rights-of-Way.
 - 1. The Contractor shall verify the existence of the approved permit prior to commencing any work.
- B. Work within State of Florida Rights-of-Way:
 - 1. All work related to State rights-of-way or property shall be in full compliance with all requirements of the permit and to the satisfaction of the Florida Department of Transportation Standard Specifications for Road and Bridge Construction (latest edition.)
 - 2. Work within the rights-of-way of public thoroughfares, which are not under the jurisdiction of the State of Florida Department of Transportation, shall conform to the requirements of the agency having jurisdiction.
 - 3. Installation shall include all the required work and necessary signs to provide the required traffic control, detours, and any other work to maintain traffic.
 - 4. The Contractor shall notify the local Florida Department of Transportation Maintenance Engineer at least 48 hours prior to commencing work within the State rights-of-way and shall pay for any additional tests the State mayrequire.
 - 5. All work related to construction within the State rights-of-way shall be in full compliance with the terms of the permit and in accordance with the State of Florida Department of Transportation "Utility Accommodations Guide".

- 6. In the event of conflict between the requirements of Contract Documents and those of the State of Florida Department of Transportation, the more stringent requirements as determined by the Engineer, shall govern.
- 7. The costs of any and all items of work required by the State of Florida, payment for which is not specifically provided by bid items in the proposal, shall be included in the prices of bid items to which said items of work are related, incidental, or appurtenant. No additional compensation shall be allowed therefore.
- 8. The Contractor shall furnish copies of written approval or acceptance of the work by the Florida Department of Transportation to the Engineer along with the particular Periodic Estimate for Partial Payment on which payment for the State highway crossing item is requested. Final approval of the Project will not be issued until such approval has been furnished.
- C. Work within Marion County Rights-of-Way:
 - 1. All work in County rights-of-way or property shall be in full compliance with all requirements of the permit, current service area agreement and to the satisfaction of Marion County. Work within the rights-of-way of public thoroughfares which are not under the jurisdiction of Marion County shall conform to the requirements of the agency having jurisdiction. Installation shall include all the required work and necessary signs to provide the required traffic control, detours, and any other work to maintain traffic.
 - 2. The Contractor shall notify the Marion County Public Works Department and County Engineer's Office at least 24 hours prior to commencing work within the County rights-of-way, and shall pay for any additional tests that the County may require.
 - 3. All work related to the County highway crossings and within County highway rights-of-way shall be in full compliance with the terms of the permit and in accordance with the Marion County Public Works Manual.
 - 4. In the event of conflict between the requirements of these Specifications and Details and those of Marion County, the more stringent requirements as determined by the Engineer, shall govern.
 - 5. The costs of any and all items of work required by Marion County, payment for which is not specifically provided by bid items in the Proposal, shall be included in the prices of bid items to which said items of work are related, incidental, or appurtenant. No additional compensation shall be allowed therefore.
 - 6. The Contractor shall furnish copies of written approval or acceptance of the work by Marion County to the Engineer along with the particular Periodic Estimate for Partial Payment on which payment for the work is requested. Final approval of the Project will not be issued until such approval has been furnished.
- D. Work within Railroad Rights-of-Way:
 - 1. All work within railroad rights-of-way shall be in full compliance with all requirements of the permit and to the satisfaction of the railroad. Installation shall include all the required work and necessary signs to provide the required traffic control, detours, and any other work to maintain traffic.
- 2. The Contractor shall notify the Railroad Company seven (7) days prior to commencing work on Railroad property, and shall pay all charges for supervision by the Railroad Company during installation of the line work across or within said property.
- 3. All work related to the railroad crossings and within railroad rights-of-way shall be in full compliance with the terms of the permit and in accordance with all requirements of the Railroad Company.
- 4. The costs of any and all items of work required by the railroad, payment for which is not specifically provided by bid items in the proposal, shall be included in the prices of bid items to which said items of work are related, incidental, or appurtenant. No additional compensation shall be allowed therefore.
- 5. In the event of conflict between the requirements of the railroad and these Contract Documents, the more stringent requirements as determined by the Engineer, shall govern.
- 6. The Contractor shall furnish copies of written approval or acceptance of the work by the Railroad to the Engineer along with the particular Periodic Estimate for Partial Payment on which payment for the Railroad related item is requested. Final approval of the Project will not be issued until such approval has been furnished.

1.9 SPECIFICATION CONVENTIONS

A. These Specifications are written in imperative mood and streamlined form. This imperative language is directed to Contractor unless specifically noted otherwise. The words "shall be" are included by inference where a colon (:) is used within sentences or phrases.

PART 2 - PRODUCTS - Not Used

PART 3 - EXECUTION - Not Used

END OF SECTION

SECTION 01 22 00

MEASUREMENT AND PAYMENT

PART 1 - GENERAL

1.1 SUMMARY

A. General:

- 1. This Section includes the requirements for water, sanitary sewer, reclaimed water, stormwater, and associated road and Right-of-Way improvements measurement and payment for pay items required to complete the Work and as shown and specified in the Contract Documents.
- 2. Items listed in this Section correspond with the pay items on the Bid Form.
- 3. All pay items identified in this Section may not be represented on the Bid Form. The Contractor shall coordinate the pay items on the Bid Form with the corresponding paragraphs located herein.
- 4. The omission of reference to any item shall not alter the intent of the Bid Form or relieve the Contractor of the necessity of constructing a complete project under this Contract.
- 5. Payment shall be made for the items listed on the Bid Form on the basis of the Work actually performed and completed in strict accordance with the Contract Documents, such Work including but not limited to, the furnishing of all necessary labor, materials, equipment, tools, testing, transportation, delivery, disposal of waste and surplus material, restoration, and all other incidentals and appurtenances to complete the construction and installation of the Work as shown and specified.
- 6. No additional payment shall be made for clean-up work. The cost thereof shall be included in the price for related items as set forth in the Proposal.
- 7. The Contractor shall not be allowed additional payment or compensation for removing and replacing, relocating or otherwise protecting or adjusting existing culverts or other existing storm drainage facilities shown on the plans which may be affected by the construction. The cost thereof shall be included in the cost of bid items to which they are required or appurtenant.
- 8. The Contractor shall be responsible for any debris and foreign matter which is allowed to enter any system as a result of construction and shall be solely responsible for any damage resulting therefrom.
- 9. Except those items outlined in the Schedule of Prices Bid, the Contractor shall not be allowed additional payment or compensation for removing and replacing, shoring or bracing, relocating, or otherwise protecting or adjusting any and all utilities which may be affected by the construction. Specifically, the Contractor shall adjust all valve boxes, valve covers, manhole frames, and manhole covers to required grades. All methods of adjusting utilities shall be subject to the approval of the Engineer. The cost

of items described herein shall be included in the cost of bid items to which they are incidental or appurtenant.

- 10. Unless provided by specific bid items in the Schedule of Prices Bid, the following shall be considered incidental or appurtenant and no measurement or payment will be made:
 - a. Erosion and sediment control.
 - b. Clearing and grubbing.
 - c. Excavation and backfill.
 - d. Dewatering.
 - e. Trench boxes.
 - f. Installation and/or removal of sheeting and shoring.
 - g. Seeding and sodding.
 - h. Connections to existing pipes and facilities.

1.2 RELATED SECTIONS

- A. General Conditions.
- B. Agreement.
- C. Section 01 30 00 Administrative Requirements.

1.3 ESTIMATE OF QUANTITIES

A. The quantities set forth in the Bid Form are approximate and are given to establish a uniform basis for the comparison of bids. The Owner reserves the right to increase or decrease the quantity of any item or portion of the Work during the progress of construction in accordance with the terms of the Contract. The Bid Form shall serve as a basis of developing additive or deductive Change Orders.

1.4 MEASUREMENT OF QUANTITIES

- A. Unless otherwise provided in the specifications for the particular items involved, all measurements shall be taken from "finished grades and elevations" for vertical measurements and from pipe end to pipe end horizontally for lineal measurements. The method or combination of methods or measurements shall be those which will reflect with reasonable accuracy the actual areas of the finished Work as determined by the Engineer.
- B. The term "finished grade" as used herein shall mean the final elevation of the accepted Work as approved by the Engineer and when located in Florida Department of Transportation (F.D.O.T.) rights-of-way shall be the elevation required and approved by F.D.O.T. to conform to its Work as proposed or later modified. It shall be the Contractor's responsibility to determine the finished grade at any point as required by the Engineer or F.D.O.T.

- C. For those pay items which were not included in the Schedule of Prices Bid, it shall be mutually understood that all items for payment shall be made from the master list of pay items set forth below. Items that are not specifically listed hereafter shall utilize the basic numbering system set forth.
- D. Pay Items that indicate multiple measurement methods shall be paid at the method included in the Schedule of Prices Bid.

1.5 GENERAL CONSTRUCTION

- G-01. Mobilization:
 - 1. Method of Measurement:
 - a. Lump Sum: The Lump Sum (LS) price for Mobilization shall be full compensation for mobilization and demobilization activities required for all Work as shown and specified.
 - b. Per Project: The Per Project unit price for Mobilization shall be full compensation for all mobilization and demobilization activities required for completion of the Work as shown and specified for each project.
 - 2. Payments shall include all costs for mobilizing, general conditions for project divided by months to complete field office, temporary facilities, and all incidentals and appurtenances required to complete the project. Bonds shall be paid per project.

G-02. Bonds:

- 1. Method of Measurement:
 - a Lump Sum: The Lump Sum (LS) price for Bonds shall be full compensation for acquisition of all bonds specified in the Contract Documents. Incidental (I): The project price for Bonds shall be considered Incidental to the Contract.
 - b. Per Project: The Per Project price for Bonds shall be full compensation for acquisition of all bonds specified in the Contract Documents for each project.
- 2. Payment for Bonds will be made at the unit price set forth in the Bid Schedule and shall constitute full compensation for all costs associated with acquiring and maintaining all bonds specified in the Contract Documents.
- G-03. Project Sign:
 - 1. Method of Measurement:
 - a. Each (EA): The quantity to be paid under this unit cost shall be for the for each Project Sign complete in place.
 - 2. Payment for Project Sign will be made at the unit price set forth in the Bid Schedule and shall constitute full compensation for all costs associated with furnishing and installing Project Sign as shown and specified in the Contract Documents. (See Detail #G-31.)

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G-04. Call Out:

- 1. Method of Measurement:
 - a. Hour (HR): The quantity to be paid shall be the actual number of night time and weekend hours worked. Call Out time shall be defined as Monday through Friday, 7:00 PM to 7:00 AM, and any time Saturday and Sunday.
- 2. Payment for Call Out will be made at the unit price set forth in the Bid Schedule and shall constitute full compensation for all labor and equipment costs for one (1) four (4) person crew to perform Work during Call Out as shown and specified in the Contract Documents.

G-05. Maintenance of Traffic:

- 1. Method of Measurement:
 - a. Lump Sum (LS): The quantity to be paid under this unit cost shall be on a lump sum basis for Maintenance of Traffic in accordance with the Contract Documents.
 - b. Day: The quantity to be paid shall be the actual number of days that Maintenance of Traffic is complete in place during actual Contractor on-site work days.
 - c. Each (EA): The quantity to be paid under this unit cost shall be for the duration of Work at each site that Maintenance of Traffic is complete in place during actual Contractor on-site work days.
 - d. Hour (HR): The quantity to be paid shall be the actual number of hours that Maintenance of Traffic is complete in place during actual Contractor on-site work days.
- 2. Payment for this bid item shall be made at the unit price set forth in the Bid Schedule and shall constitute full compensation for Work specified in the Contract Documents. Payment shall include, but is not limited to, all costs for traffic control, road closures, detours, and all incidentals and appurtenances required by the Engineer and F.D.O.T., and other items required to provide the required Maintenance of Traffic, except for any items designated to be paid for separately or to be specifically included in the costs of other Work under the Contract. <u>The work shall be completed in</u> <u>accordance with FDOT Standard Specifications for Road and Bridge</u> <u>Construction, latest edition, Section 102, Maintenance of Traffic.</u>

G-06. Silt Fence and Sediment Control:

- 1. Method of Measurement:
 - a Lump Sum (LS): The quantity to be paid under this unit cost shall be on a lump sum basis for Silt Fence and Sediment Control in accordance with the Contract Documents.
 - b. Foot (FT): The quantity to be paid shall be the actual number of feet of Silt Fence and Sediment Control furnished and installed.
- 2. Payment for this bid item shall be made at the unit price set forth in the Bid Schedule and shall constitute full compensation for Work specified in the Contract Documents. Payment shall include, but is not limited to, all labor, materials, equipment, incidentals, and appurtenances required for silt fence

installation, protection of inlets and pipes, and other costs associated with runoff water protection and sediment control as shown and specified.

- G-07. Tree Protection/Construction Fence:
 - 1. Method of Measurement:
 - a. Lump Sum (LS): The quantity to be paid under this unit cost shall be on a lump sum basis for Tree Protection/Construction Fence in accordance with the Contract Documents.
 - b. Foot (FT): The quantity to be paid shall be the actual number of feet of Tree Protection/Construction Fence furnished and installed in accordance with the Contract Documents.
 - 2. Payment for this bid item shall be made at the unit price set forth in the Bid Schedule and shall constitute full compensation for Work specified in the Contract Documents. Payment shall include, but is not limited to, all labor, materials, equipment, incidentals, and appurtenances required for tree protection and construction fencing as shown and specified. <u>The work shall</u> <u>be completed in accordance with FDOT Standard Specifications for Road and</u> <u>Bridge Construction, latest edition, Section 110 Clearing and Grubbing</u>
- G-08. Remove and Relocate Existing Mailboxes:
 - 1. Not used
- G-09. Clearing and Grubbing Light:
 - 1. Not used
- G-10. Clearing and Grubbing Heavy:
 - 1. Method of Measurement:
 - a Lump Sum (LS): The quantity to be paid under this unit cost shall be on a lump sum basis for Clearing and Grubbing – Heavy in accordance with the Contract Documents.
 - b. Square Yard (SY): The quantity to be paid shall be the actual number of square yards within the drip line of trees over 6-inch diameter cleared and grubbed in accordance with the Contract Documents.
 - 2. Payment for this bid item shall be made at the unit price set forth in the Bid Schedule and shall constitute full compensation for Work specified in the Contract Documents. Payment shall include, but is not limited to, all costs for clearing and grubbing of trees over 6-inch diameter, disposal of materials, and all incidentals and appurtenances required to complete the clearing and grubbing as shown and specified. <u>This will be paid for in</u> <u>accordance with FDOT Standard Specifications for Road and Bridge</u> <u>Construction, latest edition, Section 110 Clearing and Grubbing.</u>
- G-11. Excavation:
 - 1. Method of Measurement:
 - a. Cubic Yard (CY): The quantity to be paid shall be the number of cubic yards of Excavation calculated from the dimensions shown on the Drawings.
 - b. Square Yard (SY): The quantity to be paid shall be the number of

square yards of excavation, at the depth shown, calculated from the dimensions shown on the Drawings.

- 2. Payment for this bid item shall be made at the unit price set forth in the Bid Schedule and shall constitute full compensation for Work specified in the Contract Documents. Payment shall include, but is not limited to, all costs for excavation, on-site hauling, dewatering, and all incidentals and appurtenances required to complete the excavation as shown and specified. Payment will not be made for over-excavated Work. Consider all materials excavated as unclassified regardless of material encountered. When performing trench excavation in excess of 5-feet in depth, comply with OSHA requirements for trench safety standards, 29 CFR 1926, subpart b, and all subsequent revisions or updates adopted by the Department of Labor. Submission of bid and subsequent execution of Contract will serve as certification that all trench excavation in excess of 5-feet in depth will be in compliance with section 553.62, Florida Statutes. Excavation will be paid for in accordance with FDOT Standard Specifications for Road and Bridge Construction, latest edition, Section 102 Excavation and Embankment.
- G-12. Imported Backfill Material:
 - 1. Not used
- G-13. Ditch Excavation:
 - 1. Not used
- G-14. Construct Berm:
 - 1. Not used
- G-15. Grading:
 - 1. Not used
- G-16. Dewatering:
 - 1. Not used
- G-17. Remove and Replace Unsuitable Material:
 - 1. Not used
- G-18. Stabilized Subgrade and Sub-Base:
 - 1. Method of Measurement:
 - a Square Yard (SY): The quantity to be paid shall be the actual number of square yards of Stabilized Subgrade and Sub-Base installed in accordance with the Contract Documents.
 - 2. Payment for this bid item shall be made at the unit price set forth in the Bid Schedule and shall constitute full compensation for Work specified in the Contract Documents. Payment shall include, but is not limited to, all costs for excavation, installation, mixing, grading, compaction, and all incidentals and appurtenances required to stabilize the road subgrade as specified in Florida Department of Transportation Standard Specifications for Road and Bridge Construction (latest edition.)

G-19. Lime Rock Base:

- 1. Method of Measurement:
 - a Square Yard (SY): The quantity to be paid shall be the actual number of square yards of Lime Rock Base in place in accordance with the Contract Documents.
- 2. Payment for this bid item shall be made at the unit price set forth in the Bid Schedule and shall constitute full compensation for Work specified in the Contract Documents. Payment shall include, but is not limited to, all costs for excavation, installation, grading, compaction, prime, sand, and all incidentals and appurtenances required to complete the Lime Rock Base installation specified in Florida Department of Transportation Standard Specifications for Road and Bridge Construction (latest edition.)
- G-20. No. 57 Stone:
 - 1. Not used
- G-21. Removal of Existing Concrete Sidewalks and Driveways:
 - 1. Not used
- G-22. Removal of Existing Concrete Curb and Gutter and/or traffic separator: 1. Not used
- G-23. Concrete Fill:
 - 1. Not used
- G-24. Asphalt Coatings:
 - 1. Method of Measurement:
 - a. Gallon (GAL): The quantity to be paid shall be the actual number of gallons of Asphalt Coating in place in accordance with the Contract Documents.
 - 2. Payment for this bid item shall be made at the unit price set forth in the Bid Schedule and shall constitute full compensation for Work specified in the Contract Documents. Payment shall include, but not limited to, all costs for prime coat, tack coat, crack fill, sand, and all incidentals and appurtenances required to complete the sealing of the asphalt as shown and specified in FDOT Standard Specifications for Road and Bridge Construction (latest edition)
- G-25. Asphalt Pavement Removal:
 - 1. Not used
- G-26. Temporary Asphalt Milling:
 - 1. Not used
- G-27. Asphalt Milling:
 - 1. Not used
- G-28. Compacted Roadway Subbase:
 - 1. Method of Measurement:
 - a Square Yard (SY): The quantity to be paid shall be the actual

number of square yards of Compacted Roadway Subbase in place as shown and specified in the Contract Documents.

- 2. Payment for this pay item shall be made at the unit price set forth in the Bid Schedule and shall constitute full compensation for Work specified in the Contract Documents. Payment shall include, but is not limited to, all costs for excavation, grading, fill, compaction, and all incidentals and appurtenances required to complete Compacted Roadway Subbase as shown and specified. <u>This will be paid for in accordance with FDOT Standard Specifications for Road and Bridge Construction, latest edition, Section 160 Stabilizing.</u>
- G-29. Reclaimed Asphalt Pavement Base:
 - 1. Not used
- G-30. Limerock Base Course (Asphalt Pavement):
 - 1. Method of Measurement:
 - a Square Yard (SY): The quantity to be paid shall be the actual number of square yards of Asphalt Pavement in place in accordance with the Contract Documents.
 - 3. Payment for this pay item shall be made at the unit price set forth in the Bid Schedule and shall constitute full compensation for Work specified in the Contract Documents. Payment shall include, but is not limited to, all costs for lime rock installation, grading, priming, asphalt installation, and all incidentals and appurtenances required to complete the Asphalt Pavement as shown and specified. <u>This will be paid for in accordance with FDOT Standard Specifications for Road and Bridge Construction, latest edition, Section 230 Limerock stabilized base.</u>
 - 2.
- G-31. Asphalt Milling and Replacement:
 - 1. Not used
- G-32. Asphalt:
 - 1. Method of Measurement:
 - a. Ton: The quantity to be paid shall be the actual number of tons of Asphalt furnished and installed in accordance with the Contract Documents.
 - 3. Payment for these bid items shall be made at the unit price set forth in the Bid Schedule and shall constitute full compensation for Work specified in the Contract Documents. Payment shall include, but is not limited to, all costs for asphalt installation, compaction, prime and tack coats, and all incidentals and appurtenances required to complete the asphalt installation as shown and specified. <u>This will be paid for in accordance with FDOT Standard Specifications for Road and Bridge Construction, latest edition, Section 330:.Hot Mix Asphalt – General Construction Requirements and Section 334 Superpaave <u>Asphalt Concrete.</u></u>

G-33. Roadway Guardrail:

- 1. Not used
- G-34. Object Markers: 1. Not used
- G-35. Delineators: 1. Not used
- G-36. Rumble Strips: 2. Not used
- G-37. Grounding Electrode: 1. Not used
- G-38. Signal Conduit: 1. Not used
- G-39. Span Wire Assembly: 1. Not used
- G-40. Pull and Junction Box, Furnish and Install: 1. Not used
- G-41. Pull and Junction Box, Install: 1. Not used
- G-42. Pull and Junction Box, Relocate: 1. Not used
- G-43. Stormwater Manholes:
 - 1. Method of Measurement:
 - a Each (EA): The quantity to be paid shall be the actual number Stormwater Manholes furnished and installed in accordance with the Contract Documents.
 - 2. Payment for this pay item shall be made at the unit price set forth in the Bid Schedule and shall constitute full compensation for Work specified in the Contract Documents. Payment shall include, but is not limited to, all costs for excavation, dewatering, shoring and bracing, installation of structures, compaction, backfill, and all incidentals and appurtenances

required to complete the installation of the structures as specified in Florida Department of Transportation Standard Specifications for Road and Bridge Construction (latest edition.) <u>This will be paid for in</u> <u>accordance with FDOT Standard Specifications for Road and Bridge</u> Construction, latest edition, Section 449: Precast Drainage Products.

- G-44. Remove and Replace Stormwater Manhole:
 - 1. Not used
- G-45. Stormwater Manhole Cover Adjustments:
 - 1. Not used
- G-46. Stormwater Piping:
 - 1. Method of Measurement:
 - a. Linear Foot (LF): The quantity to be paid shall be the actual number of linear feet of stormwater piping furnished and installed in accordance with the Contract Documents.
 - 2. Payment for this pay item shall be made at the unit price set forth in the Bid Schedule and shall constitute full compensation for Work specified in the Contract Documents. Payment shall include, but is not limited to, all costs for excavation, installation of pipe, backfill, dewatering, shoring and bracing, compaction, pipe connections to new or existing structures and all incidentals and appurtenances required to complete the installation of the drainage pipe as specified in Florida Department of Transportation Standard Specifications for Road and Bridge Construction (latest edition.) <u>This will be paid for in accordance with FDOT Standard Specifications for Road and Bridge Construction, latest edition, Section 430 Pipe Culverts.</u>
- G-47. Clean Existing Storm Drain Pipes:
 - 1. Not used
- G-48. Clean Existing Storm Drain Inlets:
 - 1. Not used
- G-49. Concrete Mitered End:
 - 1. Not used
- G-50. Concrete Flumes:
 - 1. Method of Measurement:
 - 2. Not used
- G-51. Underdrain:
 - 1. Not used
- G-52. Construction Survey:
 - 1. Method of Measurement:
 - a. Lump Sum (LS): The quantity to be paid shall be on a lump sum basis for Construction Survey in accordance with the Contract Documents. Incidental (I): The project price for the Construction Survey

shall be considered Incidental to the Contract.

- b. Hour (HR): The quantity to be paid shall be for the actual number of hours of Construction Survey performed.
- 2. Payment for this item shall be made at the unit price set forth in the Bid Schedule and shall constitute full compensation for Work specified in the Contract Documents. Payment shall include, but is not limited to, all costs for survey layout, markers, and all incidentals and appurtenances required to complete the survey requirements as shown and specified.
- G-53. As-Built Drawings:
 - 1. Method of Measurement:
 - a. Lump Sum (LS): The quantity to be paid shall be on a lump sum basis for As-Built Drawings in accordance with the Contract Documents. Incidental (I): The project price for Preparation of As-Built Drawings shall be considered Incidental to the Contract.
 - b. Hour (HR): The quantity to be paid shall be for the actual number of hours of As-Built Drawing services performed.
 - 2. Payment for this item shall be made at the unit price set forth in the Bid Schedule and shall constitute full compensation for Work specified in the Contract Documents. Payment shall include, but is not limited to, all costs for excavation, surveying, locating, backfill, compaction, data processing,

drawing preparation, and all incidentals and appurtenances required to complete the As-Built Drawings as specified.

G-54. Pipe Handrail:

1. Not used

- G-55. Bollards:
 - 1. Not used
- G-56. Concrete Curb, Gutter, Valley and Drop Curb 1. Not used
- G-57. Concrete Curb, Gutter, Valley and Drop Curb Removal and Replacement 1. Not used
- G-58. Concrete:
 - 1. Not used
- G-59. Patterned/Textured Pavement, Vehicular Areas for Crosswalk: 1. Not used
- G-60. Architectural Pavers: 1. Not used
- G-61. Concrete Curb Ramps with Detectable Warning Surface: 1. Not used
- G-62. Detectable Warning on Existing Walking Surface, Retrofit: 1. Not used

G-63. Roof Drain Assembly: 1. Not used

G-64. Ditch Blocks: 1. Not used

G-65. Ditch Blocks Removal and Replacement: 1. Not used

G-66. Rip Rap 1. Not used

- G-67. Concrete Rubble (2-FT Thick): 1. Not used
- G-68. Remove and Replace End Walls: 1. Not used
- G-69. Remove and Reinstall Culvert Pipe: 1. Not used
- G-70. Remove and Replace Culvert Pipe: 1. Not used
- G-71. Abandonment of Stormwater Force Main: 1. Not used
- G-72. Remove and Abandon Stormwater Pump Station: 1. Not used
- G-73. Farm Fencing: 1. Not used
- G-74. Farm Fencing Gates: 1. Not used
- G-75. Farm Fencing Removal and Replacement: 1. Not used
- G-76. Chain Link Fencing: 1. Not used
- G-77. Chain Link Fence Gates: 1. Not used
- G-78. Chain Link Fencing Removal and Replacement: 1. Not used

- G-79. Performance Turff (Seed and Mulch:)
 - 1. Method of Measurement:
 - a Square Yard (SY): The quantity to be paid shall be the actual number of square yards of Seed and Mulch furnished and installed in accordance with the Contract Documents.
 - 2. Payment for this item shall be made at the unit price set forth in the Bid Schedule and shall constitute full compensation for Work specified in the Contract Documents. Payment shall include, but is not limited to, all costs for grading, installations, seeding, mulching, watering for a minimum of sixty (60) days, fertilizer, and all incidentals and appurtenances required to complete the seed and mulch as shown and specified in Florida Department of Transportation Standard Specifications for Road and Bridge Construction (latest edition.)
- G-80. Sod:
 - 1. Not used
- G-81. TMS Vehicle Sensor, Class II, Type 1 (6-FT): 1. Not used
- G-82. TMS Vehicle Speed/Class Unit, 9 Electronics Unit with Equipment Cable: 1. Not used
- G-83. TMS Solar Power Unit, New Pole: 1. Not used
- G-84. TMS Inductive Loop Assembly: 1. Not used
- G-85. TMS Cabinet, Pole Mount: 1. Not used
- G-86. ITS Wireless Communication Device, Master Radio: 1. Not used
- G-87. ITS Wireless Communication Device, Ethernet Subscriber: 1. Not used
- G-88. Traffic Loops:
 - 1. Not used
- G-89. Highway Signing (Traffic Control Sign Assembly:)
 - 1. Method of Measurement:
 - a. Per Assembly (AS): The quantity to be paid shall be the actual number of traffic control sign assemblies furnished and installed in accordance with the Contract Documents.
 - 2. Payment for this item shall be made at the unit price set forth in the Bid Schedule and shall constitute full compensation for Work specified in the Contract Documents. Payment shall include, but is not limited to, all costs

for traffic control sign, post, installation and all incidentals and appurtenances required to complete the installation as specified in Florida Department of Transportation Standard Specifications for Road and Bridge Construction (latest edition.)

- G-90. Traffic Control Sign Assembly Removal and Relocation:
 - 1. Not used
- G-91. Reflective Pavement Markers:
 - 1. Not used
- G-92. Standard Wheel Stops:
 - 1. Not used
- G-93. Temporary Striping:
 - 1. Not used
- G-94. Thermoplastic Striping:
 - 1. Method of Measurement:
 - a. Linear Foot (LF): The quantity to be paid shall be the actual number of gross linear feet of Thermoplastic Striping furnished and installed in accordance with the Contract Documents.
 - b. Square Foot (SF): The quantity to be paid shall be the actual number of square feet of Thermoplastic Striping furnished and installed in accordance with the Contract Documents.
 - 2. Payment for this item shall be made at the unit price set forth in the Bid Schedule and shall constitute full compensation for Work specified in the Contract Documents. Payment shall include, but is not limited to, all costs for layout and application of striping and all incidentals and appurtenances required to complete the thermoplastic striping as shown and specified. <u>Thermoplastic Striping will be paid for in accordance with FDOT Standard Specifications for Road and Bridge Construction, latest edition, Section 711:</u> <u>Thermoplastic Pavement Markings</u>.

G-95. Thermoplastic Pavement Markings:

- 1. Method of Measurement:
 - a Each (EA): The quantity to be paid shall be the actual number of Thermoplastic Pavement Markings furnished and installed in accordance with the Contract Documents.
- 2. Payment for this item shall be made at the unit price set forth in the Bid Schedule and shall constitute full compensation for Work specified in the Contract Documents. Payment shall include, but is not limited to, all costs for layout and application of thermoplastic pavement markings and all incidentals and appurtenances required to complete Thermoplastic Pavement Markings as shown and specified.
- G-96. Painted Pavement Markings:
 - 1. Not used

G-97. Arrow Boards: 2. Not used

- G-98. Miscellaneous Utility Locates: 1. Not used
- G-99. Speed Humps: 1. Not used
- G-100. Traffic Separator: 1. Not used
- G-101. Signal Head, Install: 1. Not used
- G-102. Signal Head, Remove & Replace: 1. Not used
- G-103. Traffic Control Sign, Install: 1. Not used
- G-104. Traffic Control Sign Panel, Remove & Replace: 1. Not used
- G-105. Striping Removal: 1. Not used
- G-106. Drainage Inlets: 1. Not used
- 1.6 WATER SYSTEM CONSTRUCTION See Utility section of this project manual.

1.7 SANITARY SEWER SYSTEM

See Utility section of this project manual.

1.8 RECLAIMED WATER SYSTEM CONSTRUCTION Not used

END OF SECTION

SECTION 01 25 00

SUBSTITUTION PROCEDURES

PART 1 - GENERAL

1.1 SECTION INCLUDES

- A. Quality assurance.
- B. Product options.
- C. Product substitution procedures.

1.2 QUALITY ASSURANCE

- A. Contract is based on products and standards established in Contract Documents without consideration of proposed substitutions.
- B. Products specified define standard of quality, type, function, dimension, appearance, and performance required.
- C. Substitution Proposals: Permitted for specified products except where specified otherwise. Do not substitute products unless substitution has been accepted and approved in writing by Engineer.

1.3 **PRODUCT OPTIONS**

A. See Section 01 60 00 - Product Requirements.

1.4 PRODUCT SUBSTITUTION PROCEDURES

- A. Engineer will consider requests for substitutions only within 30 days after date established in Notice to Proceed.
- B. Substitutions may be considered when a product becomes unavailable through no fault of Contractor.
- C. Document each request with complete data, substantiating compliance of proposed substitution with Contract Documents, including:
 - 1. Manufacturer's name and address, product, trade name, model, or catalog number, performance and test data, and reference standards.

- 2. Itemized point-by-point comparison of proposed substitution with specified product, listing variations in quality, performance, and other pertinent characteristics.
- 3. Reference to Article and Paragraph numbers in Specification Section.
- 4. Cost data comparing proposed substitution with specified product and amount of net change to Contract Sum.
- 5. Changes required in other Work.
- 6. Availability of maintenance service and source of replacement parts as applicable.
- 7. Certified test data to show compliance with performance characteristics specified.
- 8. Samples when applicable or requested.
- 9. Other information as necessary to assist Architect/Engineer's evaluation.
- D. A request constitutes a representation that Contractor:
 - 1. Has investigated proposed product and determined that it meets or exceeds quality level of specified product.
 - 2. Will provide same warranty for substitution as for specified product.
 - 3. Will coordinate installation and make changes to other Work that may be required for the Work to be complete with no additional cost to Owner.
 - 4. Waives claims for additional costs or time extension that may subsequently become apparent.
 - 5. Will coordinate installation of the accepted substitute, making such changes as may be required for the Work to be complete in all respects.
 - 6. Will reimburse Owner and Engineer for review or redesign services associated with reapproval by authorities having jurisdiction.
- E. Substitutions will not be considered when they are indicated or implied on Shop Drawing or Product Data submittals without separate written request or when acceptance will require revision to Contract Documents.
- F. Substitution Submittal Procedure:
 - 1. Submit requests for substitutions to the Engineer in writing.
 - 2. Submit three copies of Request for Substitution for consideration. Limit each request to one proposed substitution.
 - 3. Submit Shop Drawings, Product Data, and certified test results attesting to proposed product equivalence. Burden of proof is on proposer.
 - 4. Engineer will notify Contractor in writing of decision to accept or reject request.

PART 2 - PRODUCTS - Not Used

PART 3 - EXECUTION - Not Used

END OF SECTION

SECTION 01 30 00

ADMINISTRATIVE REQUIREMENTS

PART 1 - GENERAL

1.1 SECTION INCLUDES

- A. Coordination and Project conditions.
- B. Preconstruction meeting.
- C. Progress meetings.
- D. Preinstallation meetings.
- E. Closeout meeting.

1.2 COORDINATION AND PROJECT CONDITIONS

- A. Coordinate scheduling, submittals, and Work of various Sections of Project Manual to ensure efficient and orderly sequence of installation of interdependent construction elements.
- B. Verify that utility requirements and characteristics of operating equipment are compatible with existing utilities. Coordinate Work of various Sections having interdependent responsibilities for installing, connecting to, and placing operating equipment inservice.
- C. Coordinate space requirements, supports, and installation of mechanical and electrical Work indicated diagrammatically on Drawings. Follow routing shown for pipes, ducts, and conduit as closely as practical; place runs parallel with lines of building. Use spaces efficiently to maximize accessibility for other installations, for maintenance, and for repairs.
 - 1. Coordination Drawings: Prepare as required to coordinate all portions of Work. Show relationship and integration of different construction elements that require coordination during fabrication or installation to fit in space provided or to function as intended. Indicate locations where space is limited for installation and access and where sequencing and coordination of installations are important.
- D. Coordination Meetings: In addition to other meetings specified in this Section, hold coordination meetings with personnel and Subcontractors to ensure coordination of Work.
- E. In finished areas, except as otherwise indicated, conceal pipes, ducts, and wiring within construction. Coordinate locations of fixtures and outlets with finish elements.

- F. Coordinate completion and clean-up of Work of separate Sections in preparation for Substantial Completion.
- G. After Owner's occupancy of premises, coordinate access to Site for correction of defective Work and Work not complying with Contract Documents, to minimize disruption of Owner's activities.

1.3 PRECONSTRUCTION MEETING

- A. Owner will schedule and preside over meeting after Notice of Award.
- B. Attendance Required: Per General Conditions.
- C. Minimum Agenda:
 - 1. Distribution of Contract Documents.
 - 2. Submission of list of Subcontractors, list of products, schedule of values, and Progress Schedule.
 - 3. Designation of personnel representing parties in Contract.
 - 4. Communication procedures.
 - 5. Procedures and processing of requests for interpretations, field decisions, submittals, substitutions, Applications for Payments, proposal request, Change Orders, and Contract closeout procedures.
 - 6. Scheduling.
 - 7. Critical Work sequencing.
 - 8. Status of required permits.

1.4 PROGRESS MEETINGS

- A. Schedule and administer meetings throughout progress of the Work at maximum monthly intervals.
- B. Make arrangements for meetings, prepare agenda with copies for participants, and preside over meetings.
- C. Attendance Required: Job superintendent, major Subcontractors and suppliers, Engineer, and Owner, as appropriate to agenda topics for each meeting.
- D. Minimum Agenda:
 - 1. Review minutes of previous meetings.
 - 2. Review of Work progress.
 - 3. Field observations, problems, and decisions.
 - 4. Identification of problems impeding planned progress.
 - 5. Review of submittal schedule and status of submittals.
 - 6. Review of off-Site fabrication and delivery schedules.

- 7. Maintenance of Progress Schedule.
- 8. Corrective measures to regain projected schedules.
- 9. Planned progress during succeeding work period.
- 10. Coordination of projected progress.
- 11. Maintenance of quality and work standards.
- 12. Effect of proposed changes on Progress Schedule and coordination.
- 13. Other business relating to Work.
- E. Contractor: Record minutes and distribute copies to participants and those affected by decisions made within two (2) days after meeting.

1.5 PREINSTALLATION MEETINGS

- A. When required in individual Specification Sections, convene preinstallation meetings at Project Site before starting Work of specific Section.
- B. Require attendance of parties directly affecting, or affected by, Work of specific Section.
- C. Notify Engineer five (5) days in advance of meeting date.
- D. Prepare agenda and preside over meeting:
 - 1. Review conditions of installation, preparation, and installation procedures.
 - 2. Review coordination with related Work.
- E. Record minutes and distribute copies to participants and those affected by decisions made within two (2) days after meeting.

1.6 CLOSEOUT MEETING

- A. Schedule Project closeout meeting with sufficient time to prepare for requesting Substantial Completion. Preside over meeting and be responsible for minutes.
- B. Attendance Required: Contractor, major Subcontractors, Engineer, Owner, and others appropriate to agenda.
- C. Notify Engineer five (5) days in advance of meeting date.
- D. Minimum Agenda:
 - 1. Start-up of facilities and systems.
 - 2. Operations and maintenance manuals.
 - 3. Testing, adjusting, and balancing.
 - 4. System demonstration and observation.
 - 5. Operation and maintenance instructions for Owner's personnel.
 - 6. Contractor's inspection of Work.
 - 7. Contractor's preparation of an initial "punch list."

- 8. Procedure to request Engineer inspection to determine date of Substantial Completion.
- 9. Completion time for correcting deficiencies.
- 10. Inspections by authorities having jurisdiction.
- 11. Certificate of Occupancy, if required, and transfer of insurance responsibilities.
- 12. Final cleaning.
- 13. Preparation for final inspection.
- 14. Closeout Submittals:
 - a. Project record documents.
 - b. Operating and maintenance documents.
 - c. Operating and maintenance materials.
 - d. Affidavits.
- 15. Final Application for Payment.
- 16. Contractor's demobilization of Site.
- 17. Maintenance.
- E. Record minutes and distribute copies to participants and those affected by decisions made within two (2) days after meeting.

PART 2 - PRODUCTS - Not Used

PART 3 - EXECUTION - Not Used

END OF SECTION

SECTION 01 32 16

CONSTRUCTION PROGRESS SCHEDULE

PART 1 - GENERAL

1.1 SECTION INCLUDES

- A. Submittals.
- B. Bar chart schedules.
- C. Review and evaluation.
- D. Updating schedules.
- E. Distribution.
- 1.2 SUBMITTALS
 - A. Submit preliminary progress schedule in accordance with the General Conditions.
 - B. Schedule Updates:
 - 1. Overall percent complete, projected and actual.
 - 2. Completion progress by listed activity and sub-activity, to within five (5) working days prior to submittal.
 - 3. Changes in Work scope and activities modified since submittal.
 - 4. Delays in submittals or resubmittals, deliveries, or Work.
 - 5. Adjusted or modified sequences of Work.
 - 6. Other identifiable changes.
 - 7. Revised projections of progress and completion.

1.3 BAR CHART SCHEDULES

- A. Format: Bar chart Schedule, to include at least:
 - 1. Identification and listing in chronological order of those activities reasonably required to complete the Work, including:
 - a. Subcontract Work.
 - b. Major equipment design, fabrication, factory testing, and delivery dates including required lead times.
 - c. Move-in and other preliminary activities.
 - d. Equipment and equipment system test and startup activities.
 - e. Project closeout and cleanup.
 - f. Work sequences, constraints, and milestones.
 - 2. Listings identified by Specification Section number.

- 3. Identification of the following:
 - a. Horizontal time frame by year, month, and week.
 - b. Duration, early start, and completion for each activity and sub-activity.
 - c. Critical activities and Project float.
 - d. Sub-schedules to further define critical portions of Work.
- B. Sheet Size: 11 inches high x 17 inches wide.
- 1.4 REVIEW AND EVALUATION
 - A. Participate in joint review and evaluation of schedules with Engineer at each submittal.
 - B. Evaluate Project status to determine Work behind schedule and Work ahead of schedule.
 - C. After review, revise schedules incorporating results of review, and resubmit within five (5) days.
- 1.5 UPDATING SCHEDULES
 - A. Maintain schedules to record actual start and finish dates of completed activities.
 - B. Indicate progress of each activity to date of revision, with projected completion date of each activity. Update schedules to depict current status of Work.
 - C. Identify activities modified since previous submittal, major changes in Work, and other identifiable changes.
 - D. Upon approval of a Change Order, include the change in the next schedule submittal.
 - E. Indicate changes required to maintain Date of Substantial Completion.
 - F. Submit sorts as required to support recommended changes.
 - G. Prepare narrative report to define problem areas, anticipated delays, and impact on schedule. Report corrective action taken or proposed and its effect.

1.6 DISTRIBUTION

- A. Following joint review, distribute copies of updated schedules to Contractor's Project site file, to Subcontractors, suppliers, Engineer, Owner, and other concerned parties.
- B. Instruct recipients to promptly report, in writing, problems anticipated by projections shown in schedules.

PART 2 - PRODUCTS - Not Used

PART 3 - EXECUTION - Not Used

SECTION 01 33 00

SUBMITTAL PROCEDURES

PART 1 - GENERAL

1.1 SECTION INCLUDES

- A. Definitions.
- B. Submittal procedures.
- C. Construction progress schedules.
- D. Proposed product list.
- E. Product data.
- F. Electronic CAD files of Project Drawings.
- G. Shop Drawings.
- H. Samples.
- I. Other submittals.
- J. Test reports.
- K. Certificates.
- L. Manufacturer's instructions.
- M. Manufacturer's field reports.
- N. Erection Drawings.
- O. Construction photographs.
- P. Contractor review.
- Q. Engineer review.
- 1.2 DEFINITIONS
 - A. Action Submittals: Written and graphic information and physical samples that require Engineer's responsive action.

- B. Informational Submittals: Written and graphic information and physical Samples that do not require Engineer's responsive action. Submittals may be rejected for not complying with requirements.
- 1.3 SUBMITTAL PROCEDURES
 - A. Transmit each submittal with Engineer-accepted form.
 - B. In addition to the specified number of hard copies, one (1) electronic copy of each submittal shall be transmitted to the Engineer. The electronic copy shall be in Portable Document Format (.pdf) unless otherwise specified.
 - C. Sequentially number transmittal forms. Mark revised submittals with original number and sequential alphabetic suffix.
 - D. Identify: Project, Contractor, Subcontractor and supplier, pertinent Drawing and detail number, and Specification Section number appropriate to submittal.
 - E. Apply Contractor's stamp, signed or initialed, certifying that review, approval, verification of products required, field dimensions, adjacent construction Work, and coordination of information is according to requirements of the Work and Contract Documents.
 - F. Schedule submittals to expedite Project, and deliver to Engineer. Coordinate submission of related items.
 - G. Identify variations in Contract Documents and product or system limitations that maybe detrimental to successful performance of completed Work.
 - H. Allow space on submittals for Contractor and Engineer review stamps.
 - I. When revised for resubmission, identify changes made since previous submission.
 - J. Distribute copies of reviewed submittals as appropriate. Instruct parties to promptly report inability to comply with requirements.
 - K. Submittals not requested will not be recognized nor processed.
 - L. Incomplete Submittals: Engineer will not review. Complete submittals for each item are required. Delays resulting from incomplete submittals are not the responsibility of Engineer.

1.4 CONSTRUCTION PROGRESS SCHEDULES

A. Comply with General Conditions and Section 01 32 16 - Construction Progress Schedule.

1.5 PROPOSED PRODUCT LIST

- A. Within fifteen (15) days after date of Notice to Proceed, submit list of major products proposed for use, with name of manufacturer, trade name, and model number of each product.
- B. For products specified only by reference standards, indicate manufacturer, trade name, model or catalog designation, and reference standards.

1.6 PRODUCT DATA

- A. Product Data: Action Submittal: Submit to Engineer for review for assessing conformance with information given and design concept expressed in Contract Documents.
- B. Submit number of copies Contractor requires, plus three (3) copies Engineer willretain.

C. Mark each copy to identify applicable products, models, options, and other data. Supplement manufacturers' standard data to provide information specific to this Project.

- D. Indicate product utility and electrical characteristics, utility connection requirements, and location of utility outlets for service for functional equipment and appliances.
- E. After review, produce copies and distribute according to "Submittal Procedures" Article and for record documents described in Section 01 70 00 Execution and Closeout Requirements.

1.7 ELECTRONIC CAD FILES OF PROJECT DRAWINGS

- A. Electronic CAD Files of Project Drawings: May only be used to expedite production of Shop Drawings for the Project. Use for other Projects or purposes is not allowed.
- B. Electronic CAD Files of Project Drawings: Distributed only under the following conditions:
 - 1. Use of files is solely at receiver's risk. Engineer does not warrant accuracy offiles. Receiving files in electronic form does not relieve receiver of responsibilities for measurements, dimensions, and quantities set forth in Contract Documents. In the event of ambiguity, discrepancy, or conflict between information on electronic media and that in Contract Documents, notify Engineer of discrepancy and use information in hard-copy Drawings and Specifications.
 - 2. CAD files do not necessarily represent the latest Contract Documents, existing conditions, and as-built conditions. Receiver is responsible for determining and complying with these conditions and for incorporating addenda andmodifications.
 - 3. User is responsible for removing information not normally provided on Shop Drawings and removing references to Contract Documents. Shop Drawings submitted with information associated with other trades or with references to Contract Documents will not be reviewed and will be immediately returned.

- 4. Receiver shall not hold Engineer responsible for data or file clean-up required to make files usable, nor for error or malfunction in translation, interpretation, or use of this electronic information.
- 5. Receiver shall understand that even though Engineer has computer virus scanning software to detect presence of computer viruses, there is no guarantee that computer viruses are not present in files or in electronic media.
- 6. Receiver shall not hold Engineer responsible for such viruses or their consequences, and shall hold Engineer harmless against costs, losses, or damage caused by presence of computer virus in files or media.

1.8 SHOP DRAWINGS

- A. Shop Drawings: Action Submittal: Submit to Engineer for assessing conformance with information given and design concept expressed in Contract Documents.
- B. Indicate special utility and electrical characteristics, utility connection requirements, and location of utility outlets for service for functional equipment and appliances.
- C. When required by individual Specification Sections, provide Shop Drawings signed and sealed by a Professional Engineer licensed in the State of Florida responsible for designing components shown on Shop Drawings.
 - 1. Include signed and sealed calculations to support design.
 - 2. Submit Shop Drawings and calculations in form suitable for submission to and approval by authorities having jurisdiction.
 - 3. Make revisions and provide additional information when required by authorities having jurisdiction.
- D. Submit number of opaque reproductions Contractor requires, plus three (3) copies Engineer will retain.
- E. After review, produce copies and distribute according to "Submittal Procedures" Article and for record documents described in Section 01 70 00 Execution and Closeout Requirements.

1.9 SAMPLES

- A. Samples: Action Submittal: Submit to Engineer for assessing conformance with information given and design concept expressed in Contract Documents.
- B. Samples for Selection as Specified in Product Sections:
 - 1. Submit to Engineer for aesthetic, color, and finish selection.
 - 2. Submit Samples of finishes, textures, and patterns for Engineer selection.
- C. Submit Samples to illustrate functional and aesthetic characteristics of products, with integral parts and attachment devices. Coordinate Sample submittals for interfacing work.

- D. Include identification on each Sample, with full Project information.
- E. Submit number of Samples specified in individual Specification Sections; Engineer will retain one (1) Sample.
- F. Reviewed Samples that may be used in the Work are indicated in individual Specification Sections.
- G. Samples will not be used for testing purposes unless specifically stated in Specification Section.
- H. After review, produce copies and distribute according to "Submittal Procedures" Article and for record documents described in Section 01 70 00 Execution and Closeout Requirements.
- 1.10 OTHER SUBMITTALS
 - A. Closeout Submittals: Comply with Section 01 70 00 Execution and Closeout Requirements.
 - B. Informational Submittal: Submit data for Engineer's knowledge as Contract administrator or for Owner.
 - C. Submit information for assessing conformance with information given and design concept expressed in Contract Documents.

1.11 TEST REPORTS

- A. Informational Submittal: Submit reports for Engineer's knowledge as Contract administrator or for Owner.
- B. Submit test reports for information for assessing conformance with information given and design concept expressed in Contract Documents.

1.12 CERTIFICATES

- A. Informational Submittal: Submit certification by manufacturer, installation/application Subcontractor, or Contractor to Engineer, in quantities specified for Product Data.
- B. Indicate material or product conforms to or exceeds specified requirements. Submit supporting reference data, affidavits, and certifications as appropriate.
- C. Certificates may be recent or previous test results on material or product but must be acceptable to Engineer.

1.13 MANUFACTURER'S INSTRUCTIONS

- A. Informational Submittal: Submit manufacturer's installation instructions for Engineer's knowledge as Contract administrator or for Owner.
- B. Submit printed instructions for delivery, storage, assembly, installation, startup, adjusting, and finishing, to Engineer in quantities specified for Product Data.
- C. Indicate special procedures, perimeter conditions requiring special attention, and special environmental criteria required for application or installation.

1.14 MANUFACTURER'S FIELD REPORTS

- A. Informational Submittal: Submit reports for Engineer's knowledge as Contract administrator or for Owner.
- B. Submit report in duplicate within five (5) days of observation to Engineer for information.
- C. Submit reports for information for assessing conformance with information given and design concept expressed in Contract Documents.
- 1.15 ERECTION DRAWINGS
 - A. Informational Submittal: Submit Drawings for Engineer's knowledge as Contract administrator or for Owner.
 - B. Submit Drawings for information assessing conformance with information given and design concept expressed in Contract Documents.
 - C. Data indicating inappropriate or unacceptable Work may be subject to action by Engineer or Owner.
- 1.16 CONSTRUCTION PHOTOGRAPHS
 - A. Provide photographs of Site and construction throughout progress of Work produced by an experienced photographer acceptable to Engineer.
 - B. Each month submit photographs with Application for Payment.
 - C. The quantity of photographs taken shall be sufficient to document progress of Work.
 - D. Digital Images: Deliver complete set of digital image electronic files on CD-ROM to Owner with Project record documents. Identify electronic media with date photographs were taken. Submit images that have same aspect ratio as sensor, uncropped.
 - 1. Digital Images: Uncompressed TIFF format, produced by digital camera with minimum sensor size of 4.0 megapixels, and image resolution of not less than 1600 by 1200 pixels.

2. Date and Time: Include date and time in filename for each image.

1.17 CONTRACTOR REVIEW

- A. Review for compliance with Contract Documents and approve submittals before transmitting to Engineer.
- B. Contractor shall be Responsible for:
 - 1. Determination and verification of materials including manufacturer's catalog numbers.
 - 2. Determination and verification of field measurements and field construction criteria.
 - 3. Checking and coordinating information in submittal with requirements of Work and of Contract Documents.
 - 4. Determination of accuracy and completeness of dimensions and quantities.
 - 5. Confirmation and coordination of dimensions and field conditions at Site.
 - 6. Construction means, techniques, sequences, and procedures.
 - 7. Safety precautions.
 - 8. Coordination and performance of Work of all trades.
- C. Stamp, sign or initial, and date each submittal to certify compliance with requirements of Contract Documents.
- D. Do not fabricate products or begin Work for which submittals are required until approved submittals have been received from Engineer.

1.18 ENGINEER REVIEW

- A. Do not make "mass submittals" to Engineer. "Mass submittals" are defined as six or more submittals or items in one day or 20 or more submittals or items in one week. If "mass submittals" are received, Engineer's review time will be extended as necessary to perform proper review. Engineer will review "mass submittals" based on priority determined by Engineer after consultation with Owner and Contractor.
- B. Informational submittals and other similar data are for Engineer's information, do not require Engineer's responsive action, and will not be reviewed or returned with comment.
- C. Submittals made by Contractor that are not required by Contract Documents may be returned without action.
- D. Submittal approval does not authorize changes to Contract requirements unless accompanied by Change Order.
- E. Owner may withhold monies due to Contractor to cover additional costs beyond the second submittal review.

PART 2 - PRODUCTS - Not Used

PART 3 - EXECUTION - Not Used

END OF SECTION

SECTION 01 40 00

QUALITY REQUIREMENTS

PART 1 - GENERAL

1.1 SECTION INCLUDES

- A. Quality control.
- B. Tolerances.
- C. References.
- D. Labeling.
- E. Testing and inspection services.
- F. Manufacturers' field services.

1.2 QUALITY CONTROL

- A. Monitor quality control over suppliers, manufacturers, products, services, Site conditions, and workmanship, to produce Work of specified quality.
- B. Comply with specified standards as the minimum quality for the Work except where more stringent tolerances, codes, or specified requirements indicate higher standards or more precise workmanship.
- C. Perform Work using persons qualified to produce required and specified quality.
- D. Products, materials, and equipment may be subject to inspection by Engineer and Owner at place of manufacture or fabrication. Such inspections shall not relieve Contractor of complying with requirements of Contract Documents.
- E. Supervise performance of Work in such manner and by such means to ensure that Work, whether completed or in progress, will not be subjected to harmful, dangerous, damaging, or otherwise deleterious exposure during construction period.

1.3 TOLERANCES

A. Monitor fabrication and installation tolerance control of products to produce acceptable Work. Do not permit tolerances to accumulate.

- B. Comply with manufacturers' recommended tolerances and tolerance requirements in reference standards. When such tolerances conflict with Contract Documents, request clarification from Engineer before proceeding.
- C. Adjust products to appropriate dimensions; position before securing products in place.

1.4 **REFERENCES**

- A. For products or workmanship specified by association, trade, or other consensus standards, comply with requirements of standard except when more rigid requirements are specified or are required by applicable codes.
- B. Conform to reference standard by date of issue current as of date of Contract Documents except where specific date is established by code.
- C. Obtain copies of standards and maintain on Site when required by product Specification Sections.
- D. When requirements of indicated reference standards conflict with Contract Documents, request clarification from Engineer before proceeding.
- E. Neither contractual relationships, duties, or responsibilities of parties in Contract nor those of Engineer shall be altered from Contract Documents by mention or inference in reference documents.

1.5 LABELING

- A. Attach label from agency approved by authorities having jurisdiction for products, assemblies, and systems required to be labeled by applicable code.
- B. Label Information: Include manufacturer's or fabricator's identification, approved agency identification, and the following information, as applicable, on each label:
 - 1. Model number.
 - 2. Serial number.
 - 3. Performance characteristics.
- C. Manufacturer's Nameplates, Trademarks, Logos, and Other Identifying Marks on Products: Not allowed on surfaces exposed to view in public areas, interior or exterior.

1.6 TESTING AND INSPECTION SERVICES

- A. Contractor shall employ and pay for specified services of an independent firm to perform all testing and inspection.
- B. Independent firm will perform tests, inspections, and other services specified in individual Specification Sections and as required by Engineer.

- C. Testing, inspections, and source quality control may occur on or off Project Site. Perform off-Site testing as required by Engineer or Owner.
- D. Reports shall be submitted by independent firm to Engineer, Contractor, and authorities having jurisdiction, in duplicate, indicating observations and results of tests and compliance or noncompliance with Contract Documents.
 - 1. Submit final report indicating correction of Work previously reported as noncompliant.
- E. Cooperate with independent firm; furnish samples of materials, design mix, equipment, tools, storage, safe access, and assistance by incidental labor as requested.
 - 1. Notify Engineer and independent firm 48 hours before expected time for operations requiring services.
 - 2. Make arrangements with independent firm and pay for additional Samples and tests required for Contractor's use.
- F. Employment of testing agency or laboratory shall not relieve Contractor of obligation to perform Work according to requirements of Contract Documents.
- G. Retesting or re-inspection required because of nonconformance with specified or indicated requirements shall be performed by same independent firm on instructions from Engineer.
- H. Agency Responsibilities:
 - 1. Test Samples of mixes submitted by Contractor.
 - 2. Provide qualified personnel at Site. Cooperate with Engineer and Contractor in performance of services.
 - 3. Perform indicated sampling and testing of products according to specified standards.
 - 4. Ascertain compliance of materials and mixes with requirements of Contract Documents.
 - 5. Promptly notify Engineer and Contractor of observed irregularities or nonconformance of Work or products.
 - 6. Perform additional tests required by Engineer.
 - 7. Attend preconstruction meetings and progress meetings.
- I. Agency Reports: After each test, promptly submit two (2) copies of report to Engineer, Contractor, and authorities having jurisdiction. When requested by Engineer, provide interpretation of test results. Include the following:
 - 1. Date issued.
 - 2. Project title and number.
 - 3. Name of inspector.
 - 4. Date and time of sampling or inspection.
 - 5. Identification of product and Specification Section.
 - 6. Location in Project.
 - 7. Type of inspection or test.
- 8. Date of test.
- 9. Results of tests.
- 10. Conformance with Contract Documents.
- J. Limits on Testing Authority:
 - 1. Agency or laboratory may not release, revoke, alter, or enlarge on requirements of Contract Documents.
 - 2. Agency or laboratory may not approve or accept any portion of the Work.
 - 3. Agency or laboratory may not assume duties of Contractor.
 - 4. Agency or laboratory has no authority to stop the Work.

1.7 MANUFACTURER'S FIELD SERVICES

- A. When specified in individual Specification Sections, require material or product suppliers or manufacturers to provide qualified staff personnel to observe Site conditions, conditions of surfaces and installation, quality of workmanship, startup of equipment, testing, adjusting, and balancing of equipment, and commissioning as applicable, and to initiate instructions when necessary.
- B. Submit qualifications of observer to Engineer thirty (30) days in advance of required observations. Observer is subject to approval of Engineer.
- C. Report observations and Site decisions or instructions given to applicators or installers that are supplemental or contrary to manufacturer's written instructions.
- D. Refer to Section 01 33 00 Submittal Procedures, "Manufacturer's Field Reports" Article.

PART 2 - PRODUCTS - Not Used

PART 3 - EXECUTION - Not Used

END OF SECTION

SECTION 01 50 00

TEMPORARY FACILITIES AND CONTROLS

PART 1 - GENERAL

1.1 SECTION INCLUDES

- A. Temporary Utilities:
 - 1. Temporary electricity.
 - 2. Temporary lighting for construction purposes.
 - 3. Temporary heating.
 - 4. Temporary cooling.
 - 5. Temporary ventilation.
 - 6. Temporary water service.
 - 7. Temporary sanitary facilities.
- B. Construction Facilities:
 - 1. Vehicular access.
 - 2. Parking.
 - 3. Progress cleaning and waste removal.
 - 4. Project identification.
 - 5. Traffic regulation.
 - 6. Fire-prevention facilities.
- C. Temporary Controls:
 - 1. Barriers.
 - 2. Enclosures and fencing.
 - 3. Security.
 - 4. Water control.
 - 5. Dust control.
 - 6. Erosion and sediment control.
 - 7. Noise control.
 - 8. Pest and rodent control.
 - 9. Pollution control.
- D. Removal of utilities, facilities, and controls.

1.2 REFERENCES

- A. ASTM International:
 - 1. ASTM E 84 Standard Test Method for Surface Burning Characteristics of Building Materials.
 - 2. ASTM E 90 Standard Test Method for Laboratory Measurement of Airborne Sound Transmission Loss of Building Partitions and Elements.

3. ASTM E 119 - Standard Test Methods for Fire Tests of Building Construction and Materials.

1.3 TEMPORARY ELECTRICITY

- A. Provide and pay for power service required from utility source as needed for construction operation.
- B. Provide temporary electric feeder from existing building electrical service, if applicable, at location as directed by Owner. Do not disrupt Owner's use of service.
- C. Power Service Characteristics: as required for construction operations.
- D. Provide power outlets with branch wiring and distribution boxes located as required for construction operations. Provide suitable, flexible power cords as required for portable construction tools and equipment.
- E. Provide main service disconnect and overcurrent protection at location meeting all applicable codes and regulations.
- F. Permanent convenience receptacles may be used during construction.

1.4 TEMPORARY LIGHTING FOR CONSTRUCTION PURPOSES

- A. Provide and maintain lighting necessary for safe and functional construction operations.
- B. Provide and maintain one (1) watt/sq ft lighting to exterior staging and storage areas after dark for security purposes.
- C. Provide and maintain 0.25 watt/sq ft HID lighting to interior work areas after dark for security purposes.
- D. Provide branch wiring from power source to distribution boxes with lighting conductors, pigtails, lamps, and the like, for specified lighting levels.
- E. Maintain lighting and provide routine repairs.
- F. Permanent building lighting may be used upon written permission from the Owner during construction, if applicable.

1.5 TEMPORARY HEATING

- A. Provide and pay for heating devices and heat as needed to maintain specified conditions for construction operations.
- B. Contractor shall be responsible for all operation and maintenance costs associated with temporary heating.

- C. Maintain minimum ambient temperature as required in individual Sections of the Contract Documents.
- 1.6 TEMPORARY COOLING
 - A. Provide and pay for cooling devices and cooling as needed to maintain specified conditions for construction operations.
 - B. Contractor shall be responsible for all operation and maintenance costs associated with temporary heating.
 - C. Maintain maximum ambient temperature as required in individual Sections of the Contract Documents.
- 1.7 TEMPORARY VENTILATION
 - A. Ventilate enclosed areas to achieve curing of materials, to dissipate humidity, and to prevent accumulation of dust, fumes, vapors, or gases.
- 1.8 TEMPORARY WATER SERVICE
 - A. Provide suitable quality water service as needed to maintain specified conditions for construction operations.
 - B. Contractor shall be responsible for coordination, cost of temporary connection(s), and cost of temporary water.
 - C. Extend branch piping with outlets located so that water is available by hoses with threaded connections.
- 1.9 TEMPORARY SANITARY FACILITIES
 - A. Provide and maintain required facilities and enclosures. Existing facility use is not permitted. Provide facilities at time of Project mobilization.
- 1.10 VEHICULAR ACCESS
 - A. Construct temporary all-weather access roads from public thoroughfares to serve construction area, of width and load-bearing capacity to accommodate unimpeded traffic for construction purposes.
 - B. All temporary vehicular access crossing public rights-of-way, property, or easements shall be coordinated with the authority having jurisdiction and comply with all applicable regulations.
 - C. Construct temporary bridges and culverts to span low areas and allow unimpeded drainage.

- D. Extend and relocate vehicular access as Work progress requires and provide detours as necessary for unimpeded traffic flow.
- E. Locate as indicated on Drawings or approved by Engineer.
- F. Provide unimpeded access for emergency vehicles. Maintain twenty (20) foot-wide driveways with turning space between and around combustible materials.
- G. Provide and maintain access to fire hydrants and control valves free of obstructions.
- H. Provide means of removing mud from vehicle wheels before entering streets.
- I. Use designated existing on-Site roads for construction traffic upon written approval from the Owner.

1.11 PARKING

- A. Provide temporary parking areas to accommodate construction personnel.
- B. Locate as indicated on Drawings or approved by Engineer.
- C. Off-Site Parking:
 - 1. If Site space is not adequate, provide additional off-Site parking.
 - 2. The Contractor shall provide to the Engineer written permission or executed permit from property owner prior to utilizing off-Site parking that is not on Cityproperty.
- D. Use of designated areas of existing on-Site streets and driveways used for construction traffic is not permitted. Tracked vehicles are not allowed on paved areas.
- E. Use of designated areas of existing parking facilities used by construction personnel is permitted upon written approval from the Owner.
- F. Do not allow heavy vehicles or construction equipment in parking areas.
- G. Do not allow vehicle parking on existing pavement.
- H. Designate two (2) parking space for Engineer.
- I. Permanent Pavements and Parking Facilities:
 - 1. Bases for permanent roads and parking areas may be used for construction traffic.
 - 2. Avoid traffic loading beyond paving design capacity. Tracked vehicles are not allowed.
 - 3. Use of permanent parking structures is not permitted.
- J. Maintenance:
 - 1. Maintain traffic and parking areas in sound condition free of excavated material, construction equipment, products, mud, snow, ice, and the like.

- 2. Maintain existing and permanent paved areas used for construction; promptly repair breaks, potholes, low areas, standing water, and other deficiencies, to maintain paving and drainage in original condition.
- K. Removal, Repair:
 - 1. Remove temporary materials and construction before Substantial Completion.
 - 2. Remove underground Work and compacted materials to depth of two (2) feet; fill and grade Site as indicated.
 - 3. Repair existing facilities damaged by use, to original condition.
- L. Mud from Site vehicles: Provide means of removing mud from vehicle wheels before entering streets.
- 1.12 PROGRESS CLEANING AND WASTE REMOVAL
 - A. Maintain areas free of waste materials, debris, and rubbish. Maintain Site in clean and orderly condition.
 - B. Remove debris and rubbish from pipe chases, plenums, attics, crawl spaces, and other closed or remote spaces, before enclosing spaces.
 - C. Broom and vacuum clean interior areas before starting surface finishing, and continue cleaning to eliminate dust.
 - D. Collect and remove waste materials, debris, and rubbish from Site and dispose of off-Site as required to maintain a safe, neat, and orderly Site.
 - E. Open free-fall chutes are not permitted. Terminate closed chutes into appropriate containers with lids.

1.13 PROJECT IDENTIFICATION

A. Project Identification Sign:

- 1. Project Identification Sign shall comply with Owner standards.
- 2. Main signage boards shall be ³/₄-inch pressure treated plywood mounted on a twoinch (2") x four-inch (4") pressure treated wood frame painted on all sides.
- 3. Sign portability:
 - a. Each sign shall consist of two of the above described plywood sheets and frames hinged together at the top to form a two-sided sign that folds together for transportation from location to location, transportation provided by the Contractor.
 - b. When installed at the site, the hinged connection will allow the bottom portion to move outward forming a triangle with the ground, allowing the sign to stand on its own.
 - c. The sign faces shall be positioned so that oncoming traffic from both directions can read one side.

- 4. Lettering shall be black intermediate grade vinyl or approved equal.
- 5. Border Line shall be black, a minimum of one half inch (1/2") wide, and inset one inch (1") from the board edge.
- B. Project Informational Signs:
 - 1. Painted informational signs of same colors and lettering as Project identification sign or standard products; size lettering for legibility at 100-footdistance.
 - 2. Provide sign at each field office and storage shed, and provide directional signs to direct traffic into and within Site. Relocate as Work progress requires.
 - 3. Provide directional traffic signs to and within Site as required by the agency having jurisdiction.
 - 4. No other signs are allowed without Owner's permission except those required by law.
- C. Finishes, Painting: Adequate to withstand weathering, fading, and chipping for duration of construction.
- D. Show content, layout, lettering, color, foundation, structure, sizes, and grades of members.
- E. Sign Materials:
 - 1. Structure and Framing: New wood or metal, structurally adequate.
 - 2. Sign Surfaces: Exterior grade plywood with medium-density overlay, minimum of 3/4 inches thick, standard large sizes to minimize joints.
 - 3. Rough Hardware: Galvanized.
 - 4. Paint and Primers: Exterior quality, two (2) coats; sign background of color as selected.
 - 5. Lettering: Exterior quality paint or precut vinyl self-adhesive products, colors as selected.
- F. Installation:
 - 1. Install Project identification sign within fifteen (15) days after date established by Notice to Proceed.
 - 2. Erect at location of high public visibility adjacent to main entrance to Site.
 - 3. Erect supports and framing on secure foundation, rigidly braced and framed to resist wind loadings.
 - 4. Install sign surface plumb and level, with butt joints. Anchor securely.
 - 5. Paint exposed surfaces of sign, supports, and framing.
- G. Maintenance: Maintain clean signs and supports; repair deterioration and damage.
- H. Removal: Remove signs, framing, supports, and foundations at completion of Project and restore area.

1.14 TRAFFIC REGULATION

- A. Signs, Signals, and Devices:
 - 1. Post-Mounted and Wall-Mounted Traffic Control and Informational Signs: As approved by authorities having jurisdiction.
 - 2. Traffic Control Signals: As approved by local jurisdictions.
 - 3. Traffic Cones, Drums, Flares, and Lights: As approved by authorities having jurisdiction.
 - 4. Flag Person Equipment: As required by authorities having jurisdiction.
- B. Flag Persons: Provide trained and equipped flag persons to regulate traffic when construction operations or traffic encroach on public traffic lanes.
- C. Flares and Lights: Use flares and lights during hours of low visibility to delineate traffic lanes and to guide traffic.
- D. Haul Routes:
 - 1. Consult with authorities having jurisdiction and establish public thoroughfares to be used for haul routes and Site access.
 - 2. Confine construction traffic to designated haul routes.
 - 3. Provide traffic control at critical areas of haul routes to regulate traffic and to minimize interference with public traffic.
- E. Traffic Signs and Signals:
 - 1. Provide signs at approaches to Site and on Site, at crossroads, detours, parking areas, and elsewhere as needed to direct construction and affected public traffic.
 - 2. Provide, operate, and maintain traffic control signals to direct and maintain orderly flow of traffic in areas under Contractor's control and areas affected by Contractor's operations.
 - 3. Relocate signs and signals as Work progresses, to maintain effective traffic control.
- F. Removal:
 - 1. Remove equipment and devices when no longer required.
 - 2. Repair damage caused by installation.
 - 3. Remove post settings completely.

1.15 FIRE-PREVENTION FACILITIES

- A. Prohibit smoking within buildings under construction and demolition. Designate area on Site where smoking is permitted. Provide approved ashtrays in designated smoking areas.
- B. Establish fire watch for cutting, welding, and other hazardous operations capable of starting fires. Maintain fire watch before, during, and after hazardous operations until threat of fire does not exist.
- C. Portable Fire Extinguishers: NFPA 10; 10-pound capacity, 4A-60B: C UL rating.

- 1. Provide minimum of one (1) fire extinguisher in every construction trailer and storage shed.
- D. Provide fire extinguishers for construction equipment as required by applicable federal, state, and local codes.

1.16 BARRIERS

- A. Provide barriers to prevent unauthorized entry to construction areas, to allow for Owner's use of Site, and to protect existing facilities and adjacent properties from damage from construction operations and demolition.
- B. Provide barricades and covered walkways required by authorities having jurisdiction for public rights-of-way and for public access to existing building.
- C. Tree and Plant Protection: Preserve and protect existing trees and plants designated to remain.
 - 1. Protect areas within drip lines from traffic, parking, storage, dumping, chemically injurious materials and liquids, ponding, and continuous running water.
 - 2. Provide 6-foot-high barriers around drip line, with access for maintenance.
 - 3. Replace trees and plants damaged by construction operations.
- D. Protect non-owned vehicular traffic, stored materials, Site, and structures from damage.
- 1.17 ENCLOSURES AND FENCING
 - A. Construction: Commercial-grade chain-link fence unless otherwise shown or specified.
 - B. Provide 6-foot-high fence around construction Site and storage area(s); equip with vehicular and pedestrian gates with locks.
 - C. Exterior Enclosures:
 - 1. Provide temporary weathertight closure of exterior openings to accommodate acceptable working conditions and protection for products, to allow for temporary heating, cooling, and maintenance of required ambient temperatures identified in individual Specification Sections, and to prevent entry of unauthorized persons. Provide access doors with self-closing hardware and locks.

1.18 SECURITY

- A. Security Program:
 - 1. Protect Work on existing premises and Owner's operations from theft, vandalism, and unauthorized entry.
 - 2. Initiate program in coordination with Owner's existing security system at Project mobilization.
 - 3. Maintain program throughout construction period until directed by Engineer.

- B. Entry Control:
 - 1. Restrict entrance of persons and vehicles to Project Site and existing facilities.
 - 2. Allow entrance only to authorized persons with proper identification.
 - 3. Maintain log of workers and visitors and make available to Owner on request.
 - 4. Coordinate access of Owner's personnel to Site in coordination with Owner's security forces.
- C. Personnel Identification:
 - 1. Provide identification badge for each person authorized to enter premises.
 - 2. Badge to Include: Personal photograph, name, expiration date, and employer.
 - 3. Maintain list of accredited persons and submit copy to Owner on request.
 - 4. Require return of badges at expiration of employment on the Work.

1.19 WATER CONTROL

- A. Grade Site to drain. Maintain excavations free of water. Provide, operate, and maintain necessary pumping equipment.
- B. Protect Site from puddles or running water. Provide water barriers as required to protect Site from soil erosion.
- 1.20 DUST CONTROL
 - A. Execute Work by methods that minimize raising dust from construction operations.
 - B. Provide positive means to prevent airborne dust from dispersing into atmosphere.
- 1.21 EROSION AND SEDIMENT CONTROL
 - A. Plan and execute construction by methods to control surface drainage from cuts and fills from borrow and waste disposal areas. Prevent erosion and sedimentation.
 - B. Minimize surface area of bare soil exposed at one time.
 - C. Provide temporary measures including berms, dikes, drains, and other devices to prevent water flow.
 - D. Construct fill and waste areas by selective placement to avoid erosive surface silts and clays.
 - E. Periodically inspect earthwork to detect evidence of erosion and sedimentation. Promptly apply corrective measures.
- 1.22 NOISE CONTROL
 - A. Provide methods, means, and facilities to minimize noise produced by construction operations.

- 1.23 PEST AND RODENT CONTROL
 - A. Provide methods, means, and facilities to prevent pests and insects from damaging the Work.
 - B. Provide methods, means, and facilities to prevent rodents from accessing or invading premises.
- 1.24 POLLUTION CONTROL
 - A. Provide methods, means, and facilities to prevent contamination of soil, water, and atmosphere from discharge of noxious, toxic substances and pollutants produced by construction operations.
 - B. Comply with pollution and environmental control requirements of authorities having jurisdiction.
- 1.25 REMOVAL OF UTILITIES, FACILITIES, AND CONTROLS
 - A. Remove temporary utilities, equipment, facilities, and materials before Substantial Completion inspection.
 - B. Remove underground installations to minimum depth of two (2) feet.
 - C. Clean and repair damage caused by installation or use of temporary Work.
 - D. Restore existing facilities used during construction to original condition. Restore permanent facilities used during construction to specified condition.

PART 2 - PRODUCTS - Not Used

PART 3 - EXECUTION - Not Used

END OF SECTION

SECTION 01 60 00

PRODUCT REQUIREMENTS

PART 1 - GENERAL

1.1 SECTION INCLUDES

- A. Products.
- B. Product delivery requirements.
- C. Product storage and handling requirements.
- D. Product options.
- E. Equipment electrical characteristics and components.
- 1.2 PRODUCTS
 - A. At minimum, comply with specified requirements and reference standards.
 - B. Specified products define standard of quality, type, function, dimension, appearance, and performance required.
 - C. Furnish products of qualified manufacturers that are suitable for intended use. Furnish products of each type by single manufacturer unless specified otherwise. Confirm that manufacturer's production capacity can provide sufficient product, on time, to meet Project requirements.
 - D. Do not use materials and equipment removed from existing premises except as specifically permitted by Contract Documents.
 - E. Furnish interchangeable components from same manufacturer for components being replaced.

1.3 PRODUCT DELIVERY REQUIREMENTS

- A. Transport and handle products according to manufacturer's instructions.
- B. Promptly inspect shipments to ensure products comply with requirements, quantities are correct, and products are undamaged.
- C. Provide equipment and personnel to handle products; use methods to prevent soiling, disfigurement, or damage.

1.4 PRODUCT STORAGE AND HANDLING REQUIREMENTS

- A. Store and protect products according to manufacturer's instructions.
- B. Store products with seals and labels intact and legible.
- C. Store sensitive products in weathertight, climate-controlled enclosures in an environment suitable to product.
- D. For exterior storage of fabricated products, place products on sloped supports aboveground.
- E. Provide off-Site storage and protection when Site does not permit on-Site storage or protection.
- F. Cover products subject to deterioration with impervious sheet covering. Provide ventilation to prevent condensation and degradation of products.
- G. Store loose granular materials on solid flat surfaces in well-drained area. Prevent mixing with foreign matter.
- H. Provide equipment and personnel to store products; use methods to prevent soiling, disfigurement, or damage.
- I. Arrange storage of products to permit access for inspection. Periodically inspect to verify products are undamaged and are maintained in acceptable condition.

1.5 PRODUCT OPTIONS

- A. Products Specified by Reference Standards or by Description Only: Products complying with specified reference standards or description.
- B. Products Specified by Naming One or More Manufacturers: Products of one of manufacturers named and complying with Specifications; no options or substitutions allowed.
- C. Products Specified by Naming One or More Manufacturers with Provision for Substitutions: Submit Request for Substitution for any manufacturer not named, according to Section 01 25 00 Substitution Procedures.

PART 2 - PRODUCTS

2.1 EQUIPMENT ELECTRICAL CHARACTERISTICS AND COMPONENTS

A. Wiring Terminations: Furnish terminal lugs to match branch circuit conductor quantities, sizes, and materials indicated. Include lugs for terminal box.

B. Cord and Plug: Furnish minimum 6-foot long cord and plug including grounding connector for connection to electric wiring system. Cord of longer length may be specified in individual Specification Sections.

PART 3 - EXECUTION - Not Used

END OF SECTION

SECTION 01 70 00

EXECUTION AND CLOSEOUT REQUIREMENTS

PART 1 - GENERAL

1.1 SECTION INCLUDES

- A. Field engineering.
- B. Closeout procedures.
- C. Starting of systems.
- D. Demonstration and instructions.
- E. Project record documents.
- F. Operation and maintenance data.
- G. Manual for materials and finishes.
- H. Manual for equipment and systems.
- I. Spare parts and maintenance products.
- J. Product warranties and product bonds.
- K. Examination.
- L. Preparation.
- M. Execution.
- N. Cutting and patching.
- O. Protecting installed construction.
- P. Final cleaning.
- 1.2 FIELD ENGINEERING
 - A. Employ land surveyor registered in State of Florida and acceptable to Engineer.
 - B. Locate and protect survey control and reference points. Promptly notify Engineer of discrepancies discovered.

- C. Control datum for survey is indicated on Drawings.
- D. Prior to beginning Work, verify and establish floor elevations of existing facilities to ensure that new Work will meet existing elevations in smooth and level alignment except where specifically detailed or indicated otherwise.
- E. Verify setbacks and easements; confirm Drawing dimensions and elevations.
- F. Provide field engineering services. Establish elevations, lines, and levels using recognized engineering survey practices.
- G. Submit copy of Site drawing and certificate signed by land surveyor certifying elevations and locations of the Work are in conformance with Contract Documents.
- H. Maintain complete and accurate log of control and survey Work as Work progresses.
- I. Protect survey control points prior to starting Site Work; preserve permanent reference points during construction.
- J. Promptly report to Engineer loss or destruction of reference point or relocation required because of changes in grades or other reasons.
- K. Replace dislocated survey control points based on original survey control. Make no changes without prior written notice to Engineer.
- L. Final Survey: Prior to Substantial Completion, prepare final survey illustrating locations, dimensions, angles, and elevations of all Work and the relationship to permanent bench marks and property lines.
 - 1. All elevations shall be referenced to N.A.V.D 88.
 - 2. All drawings shall have their boundaries tied into the City of Ocala GPS horizontal control network with a minimum of two corners at each end of one boundary line identified by state plane coordinates.
 - 3. Include certification, signed by surveyor, that the survey meets State of Florida applicable standards of practice for As-Built/Record Surveys.

1.3 CLOSEOUT PROCEDURES

- A. Prerequisites to Substantial Completion: Complete following items before requesting Certification of Substantial Completion, either for entire Work or for portions of Work:
 - 1. Submit maintenance manuals, Project record documents, digital images of construction photographs, and other similar final record data in compliance with this Section.
 - 2. Complete facility startup, testing, adjusting, balancing of systems and equipment, demonstrations, and instructions to Owner's operating and maintenance personnel as specified in compliance with this Section.
 - 3. Conduct inspection to establish basis for request that Work is substantially complete. Create comprehensive list (initial punch list) indicating items to be

completed or corrected, value of incomplete or nonconforming Work, reason for being incomplete, and date of anticipated completion for each item. Include copy of list with request for Certificate of Substantial Completion.

- 4. Obtain and submit releases enabling Owner's full, unrestricted use of Project and access to services and utilities. Include certificate of occupancy, operating certificates, and similar releases from authorities having jurisdiction and utility companies.
- 5. Deliver tools, spare parts, extra stocks of material, and similar physical items to Owner.
- 6. Make final change-over of locks and transmit keys directly to Owner. Advise Owner's personnel of change-over in security provisions.
- 7. Discontinue or change over and remove temporary facilities and services from Project Site, along with construction tools, mockups, and similar elements.
- 8. Perform final cleaning according to this Section.
- B. Substantial Completion Inspection:
 - 1. When Contractor considers Work to be substantially complete, submit to Engineer:
 - a. Written certificate that Work, or designated portion, is substantially complete.
 - b. List of items to be completed or corrected (initial punch list).
 - 2. Within seven (7) days after receipt of request for Substantial Completion, Engineer will make inspection to determine whether Work or designated portion is substantially complete.
 - 3. Should Engineer determine that Work is not substantially complete:
 - a. Engineer will promptly notify Contractor in writing, stating reasons for its opinion.
 - b. Contractor shall remedy deficiencies in Work and send second written request for Substantial Completion to Engineer.
 - c. Engineer will reinspect Work.
 - d. Redo and Inspection of Deficient Work: Repeated until Work passes Engineer's inspection.
 - 4. When Engineer finds that Work is substantially complete, Engineer will:
 - a. Prepare Certificate of Substantial Completion, accompanied by Contractor's list of items to be completed or corrected as verified and amended by Engineer and Owner (final punch list).
 - b. Submit Certificate to Owner and Contractor for their written acceptance of responsibilities assigned to them in Certificate.
 - 5. After Work is substantially complete, Contractor shall:
 - a. Allow Owner occupancy of Project under provisions stated in Certificate of Substantial Completion.
 - b. Complete Work listed for completion or correction within time period stipulated.

- C. Prerequisites for Final Completion: Complete following items before requesting final acceptance and final payment.
 - 1. When Contractor considers Work to be complete, submit written certification that:
 - a. Contract Documents have been reviewed.
 - b. Work has been examined for compliance with Contract Documents.
 - c. Work has been completed according to Contract Documents.
 - d. Work is completed and ready for final inspection.
 - 2. Submittals: Submit following:
 - a. Final punch list indicating all items have been completed or corrected.
 - b. Final payment request with final releases and supporting documentation not previously submitted and accepted. Include certificates of insurance for products and completed operations where required.
 - c. Specified warranties, workmanship/maintenance bonds, maintenance agreements, and other similar documents.
 - d. Accounting statement for final changes to Contract Sum.
 - e. Contractor's affidavit of payment of debts and claims.
 - f. Contractor affidavit of release of liens.
 - g. Consent of surety to final payment.
 - 3. Perform final cleaning for Contractor-soiled areas according to this Section.
- D. Final Completion Inspection:
 - 1. Within seven (7) days after receipt of request for final inspection, Engineer will make inspection to determine whether Work or designated portion is complete.
 - 2. Should Engineer consider Work to be incomplete or defective:
 - a. Engineer will promptly notify Contractor in writing, listing incomplete or defective Work.
 - b. Contractor shall remedy stated deficiencies and send second written request to Engineer that Work is complete.
 - c. Engineer will reinspect Work.
 - d. Redo and Inspection of Deficient Work: Repeated until Work passes Engineer's inspection.

1.4 STARTING OF SYSTEMS

- A. Coordinate schedule for startup of various equipment and systems.
- B. Notify Engineer seven (7) days prior to startup of each item.
- C. Verify that each piece of equipment or system has been checked for proper lubrication, drive rotation, belt tension, control sequence, and for conditions which may cause damage.
- D. Verify that tests, meter readings, and electrical characteristics agree with those required by equipment or system manufacturer.

- E. Verify that wiring and support components for equipment are complete and tested.
- F. Execute startup under supervision of manufacturer's representative or Contractors' personnel according to manufacturer's instructions.
- G. When specified in individual Specification Sections, require manufacturer to provide authorized representative who will be present at Site to inspect, check, and approve equipment or system installation prior to startup and will supervise placing equipmentor system in operation.
- H. Submit a written report according to Section 01 33 00 Submittal Procedures that equipment or system has been properly installed and is functioning correctly.

1.5 DEMONSTRATION AND INSTRUCTIONS

- A. Demonstrate operation and maintenance of products to Owner's personnel two (2) weeks prior to date of Substantial Completion.
- B. Demonstrate Project equipment and instruct in classroom environment at a location determined by the Owner and instructed by authorized manufacturer's representative who is knowledgeable about the Project.
- C. Video Recordings: If required by the Engineer, provide high-quality color video recordings of demonstration and instructional sessions. Engage commercial videographer to record sessions. Include classroom instructions, demonstrations, board diagrams, and other visual aids. Include menu navigation.
- D. For equipment or systems requiring seasonal operation, perform demonstration for other season within six (6) months.
- E. Use operation and maintenance manuals as basis for instruction. Review contents of manual with Owner's personnel in detail to explain all aspects of operation and maintenance.
- F. Demonstrate startup, operation, control, adjustment, troubleshooting, servicing, maintenance, and shutdown of each item of equipment at scheduled time, at equipment location.
- G. Prepare and insert additional data in operations and maintenance manuals when need for additional data becomes apparent during instruction.
- H. Required instruction time for each item of equipment and system is specified in individual Specification Sections.

1.6 PROJECT RECORD DOCUMENTS

- A. Maintain on Site one set of the following record documents; record actual revisions to the Work:
 - 1. Drawings.
 - 2. Specifications.
 - 3. Addenda.
 - 4. Change Orders and other modifications to the Contract.
 - 5. Reviewed Shop Drawings, product data, and Samples.
 - 6. Manufacturer's instruction for assembly, installation, and adjusting.
- B. Ensure entries are complete and accurate, enabling future reference byOwner.
- C. Store record documents separate from documents used for construction.
- D. Record information concurrent with construction progress, not less than weekly.
- E. Specifications: Legibly mark and record, at each product Section, description of actual products installed, including the following:
 - 1. Manufacturer's name and product model and number.
 - 2. Product substitutions or alternates used.
 - 3. Changes made by Addenda and modifications.
- F. As-Built Drawings:
 - 1. As-Built Drawings shall be prepared, signed, and sealed by a Professional Mapper and Surveyor (PMS), licensed to practice in the State of Florida. If the project was designed by an Engineer hired by the Developer, the As-Builts shall also be sealed by the Professional Engineer registered in the State of Florida and submitted on CD or DVD using state plane coordinates.
 - 2. The following information is required on all As-Built Drawings. The Contractor shall note that additional information may be required by the Engineer when deemed necessary.
 - a. Include Contract modifications such as Addenda, supplementary instructions, change directives, field orders, minor changes in the Work, and Change Orders.
 - b. Unless otherwise specified, the original construction plans, with as-built information shown, will be accepted for those projects contracted by the City.
 - c. The drawings shall be revised (redrawn) to scale to indicate final as-built data (true to scale) and in accordance to all construction changes. Only changing a station and off-set note or just adding notes is not acceptable for horizontal changes. In making changes to the drawings, utility lines or other features to be changed shall be erased before new lines are drawn, notations to be changed shall be reworded as required.
 - d. Items that were not installed as shown shall be so indicated by placing a "revision cloud" around the as-built information and a note shall be placed on

the sheet near the lower right-hand corner in bold marking indicating that the information contained within the cloud is as-built. The as-built date shall also be shown.

- e. Items that were constructed exactly per plan shall be shown by placing an asterisk adjacent to the as-built information indicating that it was built per plan with no changes.
- f. Subdivisions:

g.

- As-Built subdivision construction plans shall not be accepted as asbuilts unless specifically authorized by the Engineer. Subdivision asbuilts shall be prepared on 24" x 36" plan sheets. Each sheet shall show only right-of-way, lot lines, lot numbers, street names, lot dimensions. Separate sheets shall be prepared for street, water, and sewer construction.
- 2) The Owner will provide locate services on newly installed water and sewer lines after approval of final As-Built Drawings and valve tie sheets. Should locates be requested before approval is received, the system will be considered private and will be the responsibility of the Contractor to locate.
- Water, Sewer, and Reclaim As-Built Drawings:
 - 1) Pipe location and depth.
 - 2) Pipes shall be referenced to power poles (identify power pole number) or other permanent structures such as inlets, sidewalks, edge of pavement, or right-of-way lines. Where no permanent above grade structure exists, pipes shall be referenced to rights-of-way lines and edge of pavement every one hundred feet.
 - 3) Fittings shall be referenced on the drawings. At least two (2) above ground, visible reference distances shall be shown for each fitting. Insets may be used to decrease drawing scale and increase detail. Where water mains are adjusted vertically, fittings and their elevations must be shown on As-Builts. Provide a cross-section detail showing the fittings and measurements.
 - 4) Where service lines are installed, the services shall be shown in their relative position. Services shall be clearly identified as to single or double services. Where services vary more than two feet (2') from the property corner, the distance from the service to the property corner shall be shown. Show the size and type of service pipe. This may be noted in a legend.
 - 5) Reference all valves two inches (2") in diameter and larger. Valves shall be referenced on Valve Tie Sheets. Valves shall be shown in their relative positions to one another and shall clearly indicate which lines they control. Sheet numbers of Valve Tie Sheets shall be shown on the As-Built Drawings for easy referencing.
 - 6) Reference all existing valves within fifty feet of the Site.

- 7) Where pipes are stubbed out, the end of the main shall be referenced by the distance from the end of the pipe to the nearest upstream valve or fitting plus one additional reference.
- 8) Under general notes, the name of the manufacturer and model number shall be shown for all valves referenced.
- 9) All As-Built Drawings shall be prepared by using the Owner's Standard Legend and Abbreviations.
- 10) The size and type of water mains shall be indicated between all valves and tees.
- 11) The following items shall be located by Global Positioning System (GPS) equipment: valve boxes, meter boxes, fire hydrants, fittings, casings and points of connection to the existing system. Depending on the type of project there may be other features that require GPS location.
- 3. Procedure for Submitting As-Build Drawings:
 - a. Original Submittal: Three (3) copies of all required As-Built materials, including Valve Tie Sheets, shall be submitted to the Engineer. No originals or certified copies shall be submitted in the Original Submittal. Submittals must be furnished with a cover sheet or letter of transmittal. As-Builts submitted without cover sheets will not be accepted. In lieu of paper submittals, As-Builts can be submitted electronically until the final submittal.
 - b. As-Built Review: The Original Submittal shall be reviewed for content and compliance to the specified requirements. If the As-Builts are found to be incomplete, one set will be returned with comments marked in red. The Contractor shall correct the As-Builts as indicated.
 - c. Resubmittal: After corrections, additions, or deletions are complete, the As-Builts shall be resubmitted. Three (3) sets of those items that were returned for corrections along with the red lined set shall be resubmitted. Resubmittal without the red lined set will be refused. No resubmittals will be accepted without a cover sheet. No originals or certified copies shall be submitted with the Resubmittal.
 - d. Final Submittal: After all As-Builts have been reviewed and comply with all specified requirements, the Engineer shall notify the Contractor to submit final As-Builts. Final As-Builts shall include a cover letter, two copies of the As-Builts signed, sealed and dated by a professional mapper and surveyor, and one electronic file with one reproducible original. The Final Submittal shall also include As-Built Drawings in AutoCAD .dwg format. The Contractor shall verify the version of AutoCAD utilized by the Owner to prevent file compatibility issues.

1.7 OPERATION AND MAINTENANCE DATA

A. Submit in PDF composite electronic indexed file.

- B. Submit data bound in 8-1/2 x 11-inch text pages, three D side ring binders with durable plastic covers.
- C. Prepare binder cover with printed title "OPERATION AND MAINTENANCE INSTRUCTIONS," title of Project, and subject matter of binder when multiple binders are required.
- D. Internally subdivide binder contents with permanent page dividers, logically organized as described below; with tab titling clearly printed under reinforced laminated plastic tabs.
- E. Drawings: Provide with reinforced punched binder tab. Bind in with text; fold larger drawings to size of text pages.
- F. Contents: Prepare table of contents for each volume, with each product or system description identified, typed on white paper, in three parts as follows:
 - 1. Part 1: Directory, listing names, addresses, and telephone numbers of Engineer, Contractor, Subcontractors, and major equipment suppliers.
 - 2. Part 2: Operation and maintenance instructions, arranged by system and subdivided by Specification Section. For each category, identify names, addresses, and telephone numbers of Subcontractors and suppliers. Include the following:
 - a. Significant design criteria.
 - b. List of equipment.
 - c. Parts list for each component.
 - d. Operating instructions.
 - e. Maintenance instructions for equipment and systems.
 - f. Maintenance instructions for finishes, including recommended cleaning methods and materials, and special precautions identifying detrimental agents.
 - g. Safety precautions to be taken when operating and maintaining or working near equipment.
 - 3. Part 3: Project documents and certificates, including the following:
 - a. Shop Drawings and product data.
 - b. Air and water balance reports.
 - c. Certificates.
 - d. Photo copies of warranties.

1.8 MANUAL FOR MATERIALS AND FINISHES

- A. Submit two (2) copies of preliminary draft or proposed formats and outlines of contents before start of Work. Engineer will review draft and return one (1) copy with comments.
- B. For equipment or component parts of equipment put into service during construction and operated by Owner, submit documents within ten (10) days after acceptance.

- C. Submit one copy of completed volumes before Substantial Completion. Draft copy to be reviewed and returned after Substantial Completion, with Engineer comments. Revise content of document sets as required prior to final submission.
- D. Submit three (3) sets of revised final volumes within ten (10) days after final inspection.
- E. Submit in PDF composite electronic indexed file of final manual within ten (10) days after final inspection.
- F. Building Products, Applied Materials, and Finishes: Include product data, with catalog number, size, composition, and color and texture designations. Include information for re-ordering custom-manufactured products.
- G. Instructions for Care and Maintenance: Include manufacturer's recommendations for cleaning agents and methods, precautions against detrimental agents and methods, and recommended schedule for cleaning and maintenance.
- H. Moisture Protection and Weather Exposed Products: Include product data listing applicable reference standards, chemical composition, and details of installation. Include recommendations for inspections, maintenance, and repair.
- I. Additional Requirements: As specified in individual product Specification Sections.
- J. Include listing in table of contents for design data, with tabbed fly sheet and space for insertion of data.

1.9 MANUAL FOR EQUIPMENT AND SYSTEMS

- A. Submit two (2) copies of preliminary draft or proposed formats and outlines of contents before start of Work. Engineer will review draft and return one (1) copy with comments.
- B. For equipment, or component parts of equipment put into service during construction and operated by Owner, submit documents within ten (10) days after acceptance.
- C. Submit one copy of completed volumes before Substantial Completion. Draft copy will be reviewed and returned after Substantial Completion, with Engineer comments. Revise content of document sets as required prior to final submission.
- D. Submit three (3) sets of revised final volumes within ten (10 days after final inspection.
- E. Submit in PDF composite electronic indexed file of final manual within ten (10) days after final inspection.
- F. Each Item of Equipment and Each System: Include description of unit or system and component parts. Identify function, normal operating characteristics, and limiting conditions. Include performance curves, with engineering data and tests, and complete nomenclature and model number of replaceable parts.

- G. Panelboard Circuit Directories: Provide electrical service characteristics, controls, and communications; typed.
- H. Include color-coded wiring diagrams as installed.
- I. Operating Procedures: Include startup, break-in, and routine normal operating instructions and sequences. Include regulation, control, stopping, shutdown, and emergency instructions. Include summer, winter, and special operating instructions.
- J. Maintenance Requirements: Include routine procedures and guide for preventative maintenance and troubleshooting; disassembly, repair, and reassembly instructions; and alignment, adjusting, balancing, and checking instructions.
- K. Include servicing and lubrication schedule and list of lubricants required.
- L. Include manufacturer's printed operation and maintenance instructions.
- M. Include sequence of operation by controls manufacturer.
- N. Include original manufacturer's parts list, illustrations, assembly drawings, and diagrams required for maintenance.
- O. Include control diagrams by controls manufacturer as installed.
- P. Include Contractor's coordination drawings with color-coded piping diagrams as installed.
- Q. Include charts of valve tag numbers, with location and function of each valve, keyed to flow and control diagrams.
- R. Include list of original manufacturer's spare parts, current prices, and recommended quantities to be maintained in storage.
- S. Include test and balancing reports as specified in Section 01 40 00 Quality Requirements.
- T. Additional Requirements: As specified in individual product Specification Sections.
- U. Include listing in table of contents for design data with tabbed dividers and space for insertion of data.

1.10 SPARE PARTS AND MAINTENANCE PRODUCTS

A. Furnish spare parts, maintenance, and extra products in quantities specified in individual Specification Sections.

- B. Deliver to Project Site and place in location as directed by Owner; obtain receipt prior to final payment.
- 1.11 PRODUCT WARRANTIES AND PRODUCT BONDS
 - A. Obtain warranties and bonds executed in duplicate by responsible Subcontractors, suppliers, and manufacturers within ten (10) days after completion of applicable item of Work.
 - B. Execute and assemble transferable warranty documents and bonds from Subcontractors, suppliers, and manufacturers.
 - C. Verify documents are in proper form, contain full information, and are notarized.
 - D. Co-execute submittals when required.
 - E. Include table of contents and assemble in three D side ring binder with durable plastic cover.
 - F. Submit prior to final Application for Payment.
 - G. Time of Submittals:
 - 1. For equipment or component parts of equipment put into service during construction with Owner's permission, submit documents within ten (10) days after acceptance.
 - 2. Make other submittals within ten (10) days after date of Substantial Completion, prior to final Application for Payment.
 - 3. For items of Work for which acceptance is delayed beyond Substantial Completion, submit within ten (10) days after acceptance, listing date of acceptance as beginning of warranty or bond period.

PART 2 - PRODUCTS - Not Used

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Verify that existing Site conditions and substrate surfaces are acceptable for subsequent Work. Beginning new Work means acceptance of existing conditions.
- B. Verify that existing substrate is capable of structural support or attachment of new Work being applied or attached.
- C. Examine and verify specific conditions described in individual Specification Sections.

- D. Verify that utility services are available with correct characteristics and in correct locations.
- 3.2 PREPARATION
 - A. Clean substrate surfaces prior to applying next material or substance according to manufacturer's instructions.
 - B. Seal cracks or openings of substrate prior to applying next material or substance.
 - C. Apply manufacturer-required or -recommended substrate primer, sealer, or conditioner prior to applying new material or substance in contact or bond.

3.3 EXECUTION

- A. Comply with manufacturer's installation instructions, performing each step in sequence. Maintain one set of manufacturer's installation instructions at Project Site during installation and until completion of construction.
- B. When manufacturer's installation instructions conflict with Contract Documents, request clarification from Engineer before proceeding.
- C. Verify that field measurements are as indicated on approved Shop Drawings or as instructed by manufacturer.
- D. Secure products in place with positive anchorage devices designed and sized to withstand stresses, vibration, physical distortion, or disfigurement.
 - 1. Secure Work true to line and level and within specified tolerances, or if not specified, industry-recognized tolerances.
 - 2. Physically separate products in place, provide electrical insulation, or provide protective coatings to prevent galvanic action or corrosion between dissimilar metals.
 - 3. Exposed Joints: Provide uniform joint width and arrange to obtain best visual effect. Refer questionable visual-effect choices to Engineer for final decision.
- E. Allow for expansion of materials and movement of structures.
- F. Climatic Conditions and Project Status: Install each unit of Work under conditions to ensure best possible results in coordination with entire Project.
 - 1. Isolate each unit of Work from incompatible Work as necessary to prevent deterioration.
 - 2. Coordinate enclosure of Work with required inspections and tests to minimize necessity of uncovering Work for those purposes.
- G. Mounting Heights: Where not indicated, mount individual units of Work at industry recognized standard mounting heights for particular application indicated.
 - 1. Refer questionable mounting heights choices to Engineer for final decision.

- 2. Elements Identified as Accessible to Handicapped: Comply with applicable codes and regulations.
- H. Adjust operating products and equipment to ensure smooth and unhindered operation.
- I. Clean and perform maintenance on installed Work as frequently as necessary through remainder of construction period. Lubricate operable components as recommended by manufacturer.
- 3.4 CUTTING AND PATCHING
 - A. Employ skilled and experienced installers to perform cutting and patching.
 - B. Submit written request in advance of cutting or altering elements affecting:
 - 1. Structural integrity of element.
 - 2. Integrity of weather-exposed or moisture-resistant elements.
 - 3. Efficiency, maintenance, or safety of element.
 - 4. Visual qualities of sight-exposed elements.
 - 5. Work of Owner or separate contractor.
 - C. Execute cutting, fitting, and patching including excavation and fill to complete Work and to:
 - 1. Fit the several parts together, to integrate with other Work.
 - 2. Uncover Work to install or correct ill-timed Work.
 - 3. Remove and replace defective and nonconforming Work.
 - 4. Remove samples of installed Work for testing.
 - 5. Provide openings in elements of Work for penetrations of mechanical and electrical Work.
 - D. Execute Work by methods to avoid damage to other Work and to provide proper surfaces to receive patching and finishing.
 - E. Cut masonry and concrete materials using masonry saw or core drill.
 - F. Restore Work with new products according to requirements of Contract Documents.
 - G. Fit Work tight to pipes, sleeves, ducts, conduits, and other penetrations through surfaces.
 - H. Maintain integrity of wall, ceiling, or floor construction; completely seal voids.
 - I. Refinish surfaces to match adjacent finishes. For continuous surfaces, refinish to nearest intersection; for assembly, refinish entire unit.
 - J. Identify hazardous substances or conditions exposed during the Work to Engineer for decision or remedy.

3.5 PROTECTING INSTALLED CONSTRUCTION

- A. Protect installed Work and provide special protection where specified in individual Specification Sections.
- B. Provide temporary and removable protection for installed products. Control activity in immediate Work area to prevent damage.
- C. Prohibit traffic from landscaped areas.

3.6 FINAL CLEANING

- A. Execute final cleaning prior to final Project assessment.1. Employ experienced personnel or professional cleaning firm.
- B. Clean interior and exterior glass and surfaces exposed to view; remove temporary labels, stains, and foreign substances; polish transparent and glossy surfaces.
- C. Clean equipment and fixtures to sanitary condition with appropriate cleaning materials.
- D. Replace filters of operating equipment.
- E. Clean debris from drainage systems.
- F. Clean Site; sweep paved areas, rake clean landscaped surfaces.
- G. Remove waste and surplus materials, rubbish, and construction facilities from Site.

END OF SECTION

SECTION 10 14 53

TRAFFIC SIGNAGE

PART 1 - GENERAL

1.1 SUMMARY

- A. General: This Section includes requirements for furnishing and installing trafficsignage.
- B. All traffic sign related products and/or materials used in the construction of traffic infrastructure improvements shall comply with the following:
 - 1. Manual on Uniform Traffic Control Devices (MUTCD).
 - 2. Florida Department of Transportation Standard Specifications for Road and Bridge Construction (latest edition.)
 - 3. Florida Department of Transportation Design Standards.
 - 4. Florida Building Code 'Chapter 11 Florida Accessibility Code for Building Construction'.
 - 5. The City-Approved Site Development Plans.

1.2 REFERENCE STANDARDS

- A. American Association of State Highway and Transportation Officials (AASHTO)
 - 1. AASHTO M 268 Standard Specification for Retroreflective Sheeting for Flat and Vertical Traffic Control Applications.
 - 2. AASHTO LTS Specifications for Structural Supports for Highway Signs, Luminaires, and Traffic Signals.
- B. ASTM International
 - 1. ASTM A1011 Standard Specification for Steel Sheet and Strip, Hot-Rolled, Carbon, Structural, High-Strength Low-Alloy, High-Strength Low-Alloy with Improved Formability, and Ultra-High Strength.
 - 2. ASTM A123 Standard Specification for Zinc (Hot-Dip Galvanized) Coatings on Iron and Steel Products
 - 3. ASTM A320 Standard Specification for Alloy-Steel and Stainless Steel Bolting for Low-Temperature Service.
 - 4. ASTM A36 Standard Specification for Carbon Structural Steel.
 - 5. ASTM A499 Standard Specification for Steel Bars and Shapes, Carbon Rolled from "T" Rails.
 - 6. ASTM A500 Standard Specification for Cold-Formed Welded and Seamless Carbon Steel Structural Tubing in Rounds and Shapes.
 - 7. ASTM A563 Standard Specification for Carbon and Alloy Steel Nuts.
 - 8. ASTM A653 Standard Specification for Steel Sheet, Zinc-Coated (Galvanized) or Zinc-Iron Alloy-Coated (Galvannealed) by the Hot-Dip Process.

- 9. ASTM B209 Standard Specification for Aluminum and Aluminum-Alloy Sheet and Plate.
- 10. ASTM B221 Standard Specification for Aluminum and Aluminum-Alloy Extruded Bars, Rods, Wire, Profiles, and Tubes.
- 11. ASTM C94 Standard Specification for Ready-Mixed Concrete.
- 12. ASTM D4956 Standard Specification for Retroreflective Sheeting for Traffic Control.
- 13. ASTM F3125 Standard Specification for High Strength Structural Bolts, Steel and Alloy Steel, Heat Treated, 120 ksi and 150 ksi Minimum Tensile Strength, Inch and Metric Dimensions.
- 14. ASTM F436 Standard Specification for Hardened Steel Washers Inch and Metric Dimensions.
- C. Federal Highway Administration
 - 1. FHWA SHS Standard Highway Signs.
 - 2. MUTCD Manual on Uniform Traffic Control Devices.
- 1.3 PREINSTALLATION MEETINGS
 - A. Section 01 30 00 Administrative Requirements: Requirements for preinstallation meeting.
 - B. Convene minimum one week prior to commencing Work of this Section.
- 1.4 SUBMITTALS
 - A. Section 01 33 00 Submittal Procedures: Requirements for submittals.
 - B. Product Data: Submit manufacturer information regarding all materials to be furnished under this Section as required for completion of the Work.
 - C. The Contractor shall submit certificates of inspection from the manufacturer that the materials to be supplied have been inspected at the plant and meet the requirements of the Contract Documents. These certificates shall be submitted prior to beginning Work.
 - D. Field Quality-Control Submittals: Indicate results of Contractor-furnished tests and inspections.
 - E. Qualifications Statements:
 - 1. Submit qualifications for manufacturer and installer.
 - F. Shop Drawings:
 - 1. Include plans, elevations, sections, and mounting details.
 - 2. Include details of assemblies. Indicate dimensions, weights, loads, required clearances, method of field assembly, components, and location and size of each field connection.
 - 3. Detail fabrication and assembly of equipment.

- 1.5 CLOSEOUT SUBMITTALS
 - A. Section 01 70 00 Execution and Closeout Requirements: Requirements for submittals.
 - B. Project Record Documents: Record actual locations of all traffic signs.
 - C. Identify and describe unexpected variations to the Contract Documents.
- 1.6 QUALITY ASSURANCE
 - A. All construction and installation of traffic signs for both public and private infrastructure improvements shall comply with the following:
 - 1. Manual on Uniform Traffic Control Devices (MUTCD).
 - 2. Florida Department of Transportation Standard Specifications for Road and Bridge Construction (latest edition.)
 - 3. Florida Department of Transportation Design Standards.
 - 4. City-Approved Site Development Plans.
 - B. All materials and equipment shall be free from defects impairing strength, durability, and operation and be of the best commercial quality for the purpose specified.
 - C. Manufacturer: Company specializing in manufacturing products specified in this Section with a minimum five (5) years of documented experience.
 - D. Installer: Company specializing in performing Work of this Section with a minimum five (5) years of documented experience in installation of liner materials.
- 1.7 DELIVERY, STORAGE, AND HANDLING
 - A. Section 01 60 00 Product Requirements: Requirements for transporting, handling, storing, and protecting products.
 - B. Inspection: Accept materials on Site in manufacturer's original packaging and inspect for damage.
 - C. Storage:
 - 1. Store materials according to manufacturer instructions.
 - 2. Do not place materials on private property or in areas obstructing pedestrian or vehicle traffic.
 - D. Protection:
 - 1. Provide protection according to manufacturer instructions.
- 1.8 WARRANTY
 - A. Section 01 70 00 Execution and Closeout Requirements: Requirements for warranties.

PART 2 - PRODUCTS

2.1 TRAFFIC SIGNS

- A. Street Name Signs:
 - 1. General: The City is divided into four sections designated as northeast (NE), northwest (NW), southeast (SE) and southwest (SW). Silver Springs Boulevard and Fort King Street represents the north/south dividing line. Magnolia Avenue represents the east/west dividing line.
 - 2. Sizing and Location:
 - a Two Lane Roadway: Standard size sign shall be 30" x 9" or 36" x 9" in accordance with section 2D.43 of the MUTCD. Street name signs shall include ¹/₂" border that contrasts with the background color. Street name signs shall be double bladed, bolted on both ends and mounted on a 2" square perforated steel tube inserted between the sign blanks. Refer to City Standard Detail T-3 & T-5.
 - b. Four and Six Lane Roadways: Standard size sign shall be 30" x 12", 36" x 12", or 42" x 12", per section 2D.43 of the MUTCD. The major street name sign shall be mounted below the minor street name sign. Refer to City Standard Detail T-3 & T-5.
 - c. Advance Street Name Signing: Advance street name signs shall be installed on roadways in advance of major streets providing the street meets the following conditions:
 - 1) Posted speed limit on the roadway of the Advance sign to be installed is 35 miles per hour of greater.
 - 2) The intersection roadway is dedicated to public use and maintained by a government agency.
 - 3) The intersecting roadway to be signed has an annual average daily traffic volume of 9,000 or more.
 - 3. Public Roads:
 - a. Street name signs for public roads shall be green background with white legend or, for the historic districts, brown background with white legend in accordance with section 2D.43 of the MUTCD and City Standard Detail T-3 & T-5.
 - 4. Private Roads:
 - a Street name signs for private roads shall be white background with green legend in accordance with section 2D.43 of the MUTCD and City Standard Detail T-3.
- B. Overhead Signs:
 - 1. Overhead signs shall consist of a single 60" x 18" or 72" x 24" blank in accordance with City Standard Detail T-4.
- C. Stop and Speed Limit Signs:
 - 1. Stop Signs: thirty inches (30") "STOP" signs shall be required at every two-lane street intersection (un-signalized) and thirty-six inch (36") at intersections with four

and six-lane roadways. All-way stop intersections shall have 36" stop signs installed on all approaches, with all-way plates measuring 18" x 6" as appropriate.

- a. Sign Placement: STOP sign shall be placed in accordance with section 2B.10 of the MUTCD.
- b. Stop Ahead Sign: A "STOP AHEAD" sign is intended for use on approaches to STOP signs that are not visible for a sufficient distance to permit the driver to bring his vehicle to a stop at the stop bar. Stop Ahead Signs shall be:
 - 1) 30" "Stop Ahead Symbol" sign (W3-1).
 - 2) Placed in accordance with MUTCD Table 2C-4.
- 2. Speed Limit Signs: Speed limit signs in residential areas in the City of Ocala shall be 30 miles per hour. The speed limit on local streets may be reduced to 25 miles per hour after an investigation determines that such a limit is reasonable. Refer to section 2B.13 of the MUTCD.
- D. School Signs:
 - 1. School signs shall be in accordance with part 7 of the MUTCD, FDOT Manual on Speed Zoning for Highways, Roads and Streets in Florida and Florida Department of Transportation Standard Specifications for Road and Bridge Construction (latest edition) Index 711-001. All school warning signs and supplemental plaques shall be reflective with fluorescent yellow-green background, black letters or symbols.
- E. Historic District Signs:
 - 1. All signs, posts, finials, decorative bases, and bracket assemblies shall be powder coated satin black. Posts shall be round 2-3/8" outside diameter (OD). Finials shall be standard acorn sign post cap. Decorative short base, 4-1/2" tall x 7" wide at the base, shall be installed for any sign assembly installed in concrete or asphalt. Back of signs shall be powder coated satin black. For street name signs, appropriate vector graphic for each respective historic district shall be installed on the left-hand side of each sign face. All historic district street name signs shall be high intensity diamond grade VIP reflective sheeting with brown background and vector graphic with white letters. Refer to City Standard Detail T-6.
- F. Downtown District Decorative Signs:
 - 1. All signs, posts, finials, decorative bases, and bracket assemblies shall be powder coated satin black. Posts shall be round 2-3/8" outside diameter (OD). Finials shall be standard acorn sign post cap. Decorative short base, 4-1/2" tall x 7" wide at the base, shall be installed for any sign assembly installed in concrete or asphalt. Back of signs shall be powder coated satin black. Refer to City Standard Detail T-6.
- G. Horizontal Alignment Warning Signs:
 - 1. Horizontal alignment warning signs shall conform to section 2C.06 of the MUTCD. Advisory Speed Plaques (W13-1P) should supplement Turn signs (W1-1R or W1-1L) and Curve signs (W1-2R or W1-2L).
 - 2. Advisory speed shall be based on a safe curve speed study in accordance with FDOT's Manual on Uniform Traffic Studies.

- H. Date of Birth Stickers:
 - 1. Street name signs shall have the month and year the sign was fabricated embedded in the lower right corner of the sign legend.
 - 2. All other signs shall have a City standard date of birth sticker affixed to the lower right corner on the back of the sign. Refer to City Standard Detail T-7.

2.2 RETROREFLECTIVE SHEETING

- A. Reflective sheeting material shall consist of the following 3M® Brand pressure sensitive adhesive and liner brand materials.
 - 1. Type IV High Intensity Grade Prismatic Reflective Sheeting Series 3930
 - 2. Type XI Diamond Grade DG3 Reflective Sheeting Series 4000
- B. The type of sheeting to be used per sign application is listed in the table below.

SIGN APPLICATION	TYPE OF SHEETING	
	IV	XI
Regulatory Signs	X	
Guide Signs (Green, Blue, or Brown)	X	
Orange Fluorescent Maintenance Signs	X	
Orange Fluorescent Maintenance Rollup Signs	X	
Barricades & Other Work Zone Devices	X	
Object Markers & Delineators	X	
Adopt-A-Street & Memorial Signs	X	
Destination & Facilities Signs	X	
Miscellaneous Information Signs	X	
Warning Signs	X	
Stop & Yield Signs		X
School & Pedestrian Signs (Fluorescent Yellow-Green)		X
Street Quadrant Signs		X

2.3 SIGN BLANK

- A. Sign blanks shall be aluminum alloy 6061-T6 sheet, 0.080 gauge in accordance with section 700 of the Florida Department of Transportation Standard Specifications for Road and Bridge Construction (latest edition.)
- B. All corners shall be rounded with a 1-1/2-inch or ³/₄-inch radius and shall be provided with standard perforated holes.

2.4 SIGN POSTS

- A. Square Post shall be/have: (Refer to City Standard Detail T-5)
 - 1. Manufactured from high-tensile steel with a yield strength of 50,000 psi (min.) and a tensile strength of 55,000 psi (min.).
 - 2. Galvanized both inside and outside per ASTM Standard A-123. Final finish by aluminum oxide dip (gloss).
 - 3. 2" x 2" square, 14 gauge section.
 - 4. Wall thickness: 0.065 inch.
 - 5. A minimum of 1.64 pounds per lineal foot.
 - 6. A minimum of thirty-two (32) 3/8-inch holes, one-inch-on-center.
 - 7. Fully perforated.
- B. Round (Tubular) Post, if approved by the City Traffic Engineer, shall be/have:
 - 1. Manufactured from high-tensile steel with a minimum yield strength of 50,000 psi and a minimum tensile strength of 55,000 psi.
 - 2. Galvanized both inside and outside per ASTM Standard A-123. Final finish by aluminum oxide dip (gloss).
 - 3. Outside diameter: 2-3/8 inches.
 - 4. Wall thickness: 0.065 inch.
 - 5. A minimum weight of 1.605 pounds per lineal foot.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Section 01 70 00 Execution and Closeout Requirements: Requirements for installation examination.
- B. Contractor shall contact Sunshine 811 for location of existing utilities at 811 or 1-800-432-4770 a minimum of 48 hours prior beginning Work.

3.2 PREPARATION

- A. Contractor shall examine the Site to determine if any conflicts exist between proposed signage location(s) and any existing utility or feature.
 - 1. Contractor shall notify Engineer immediately if conflicts exist that require alternate signage location.
- 3.3 INSTALLATION
 - A. All traffic sign installations shall comply with the following:
 - 1. Manual on Uniform Traffic Control Devices (MUTCD).
 - 2. Florida Department of Transportation Standard Specifications for Road and Bridge Construction (latest edition.)
- 3. Florida Department of Transportation Design Standards.
- 4. Florida Building Code 'Chapter 11 Florida Accessibility Code for Building Construction'.
- 5. The City-Approved Site Development Plans.
- B. Post shall be installed a minimum of three feet (3') in the ground.
- C. If sign post is to be installed in concrete, Contractor shall cut an eight-inch (8") round hole large enough to fit a standard pair of post hole diggers.
- D. Mounting height shall be in accordance with section 2A.18 of the MUTCD.
- E. All signs shall be mounted using a minimum of two bolts in accordance with City Standard Detail T-3.
- 3.4 FIELD QUALITY CONTROL
 - A. Section 01 70 00 Execution and Closeout Requirements: Requirements for testing, adjusting, and balancing.
 - B. Remove and replace any sign, post, or hardware damaged during execution of the Work.

SECTION 31 05 13

SOILS FOR EARTHWORK

PART 1 - GENERAL

1.1 SUMMARY

- A. Section Includes:
 - 1. Subsoil materials.
 - 2. Granular materials.
 - 3. Topsoil materials.
- B. Related Requirements:
 - 1. Section 31 23 16 Excavation.
 - 2. Section 31 23 23 Fill.

1.2 REFERENCE STANDARDS

- A. American Association of State Highway and Transportation Officials:
 - 1. AASHTO T 180 Standard Method of Test for Moisture-Density Relations of Soils Using a 4.54-kg Rammer and a 457-mm Drop.
- B. ASTM International:
 - 1. ASTM D698 Standard Test Methods for Laboratory Compaction Characteristics of Soil Using Standard Effort (12,400 ft-lbf/ft3).
 - 2. ASTM D1557 Standard Test Methods for Laboratory Compaction Characteristics of Soil Using Modified Effort (56,000 ft-lbf/ft3).
 - 3. ASTM D2487 Standard Practice for Classification of Soils for Engineering Purposes (Unified Soil Classification System).
 - 4. ASTM D6938 Standard Test Methods for In-Place Density and Water Content of Soil and Soil-Aggregate by Nuclear Methods (Shallow Depth).

1.3 SUBMITTALS

- A. Section 01 33 00 Submittal Procedures: Requirements for submittals.
- B. Product Data: Submit name of imported materials source.
- C. Samples: Submit, in airtight containers, 10-lb. sample of each type of fill to testing laboratory.
- D. Supplier's Certificate: Certify that products meet or exceed specified requirements.

- E. Source Quality-Control Submittals: Indicate results of testing data demonstrating compliance with the Contract Documents.
- 1.4 QUALITY ASSURANCE
 - A. Furnish each subsoil material from single source throughout Work.
 - B. Perform Work according to Florida Department of Transportation standards.

PART 2 - PRODUCTS

- 2.1 MATERIALS
 - A. Subsoil:
 - 1. Type S1 Select Fill:
 - a. Type S1 Select Fill shall be AASHTO M 145 Class A-1 or A-3 and as specified in the Florida Department of Transportation Standard Specifications for Road and Bridge Construction (latest edition.)
 - 2. Type S2 Excavated Onsite Fill:
 - a. Excavated onsite fill may be used upon approval of the Engineer.
 - b. Excavated onsite fill shall be free of lumps larger than 3 inches, rocks larger than 2 inches, debris, and organic matter.
 - c. Liquid Limit < 45.
 - d. Plasticity Index < 25.
 - B. Granular Fill:
 - 1. Type S3 Granular Fill shall comply with Section 204 of the Florida Department of Transportation Standard Specifications for Road and Bridge Construction (latest edition.)
 - C. Topsoil:
 - 1. Type S4 Imported Topsoil: Comply with the Florida Department of Transportation Standard Specifications for Road and Bridge Construction (latest edition.)
 - 2. Type S5 Onsite Topsoil:
 - a. Excavated and reused onsite topsoil material may be used upon approval by the Engineer.
 - b. If approved, onsite topsoil shall be stockpiled with appropriate erosion and sediment control measures.
 - c. Onsite topsoil shall be graded and single screened.
 - d. Free of roots, rocks larger than 1/2 inch, subsoil, debris, large weeds, and foreign matter.

2.2 SOURCE QUALITY CONTROL

A. Section 01 40 00 - Quality Requirements: Requirements for testing, inspection, and analysis.

- B. Testing and Analysis:
 - 1. Subsoil Material: Comply with AASHTO T180.
 - 2. Topsoil Material: Comply with AASHTO T180.
 - 3. If tests indicate materials do not meet specified requirements, change material and retest.
- C. Owner Inspection:
 - 1. Make subsoil and topsoil available for inspection at source prior to packaging for shipment.
 - 2. Notify Owner at least seven days before inspection is allowed.

PART 3 - EXECUTION

3.1 INSTALLATION

- A. Excavation:
 - 1. Excavate subsoil and topsoil from designated areas.
 - 2. Strip topsoil to full depth of topsoil in designated areas.
 - 3. Remove excess excavated materials, subsoil, and topsoil not intended for reuse from Site.
 - 4. Remove excavated materials not meeting requirements for subsoil and topsoil materials from Site.
- B. Stockpiling:
 - 1. Stockpile excavated material meeting requirements for subsoil and topsoil materials.
 - 2. Stockpile materials on Site only in locations where they will not interfere with the progress of the work. Offsite stockpiling, if necessary, shall be the responsibility of the Contractor.
 - 3. Stockpile in sufficient quantities to meet Project schedule and requirements.
 - 4. Separate differing materials with dividers or stockpile apart to prevent intermixing of soil types or contamination.
 - 5. Stockpile topsoil maximum 8 feet high.
 - 6. Direct surface water away from stockpile to prevent erosion or deterioration of materials.
- 3.2 CLEANING
 - A. Section 01 70 00 Execution and Closeout Requirements: Requirements for cleaning.
 - B. Stockpile:
 - 1. Remove stockpile and leave area in clean and neat condition.
 - 2. Grade Site surface to prevent freestanding surface water.

SECTION 31 10 00

SITE CLEARING

PART 1 - GENERAL

1.1 SUMMARY

- A. Section Includes:
 - 1. Removing surface debris.
 - 2. Removing designated paving, curbs, sidewalks, and other existing features.
 - 3. Removing designated trees, shrubs, and other plant life.
 - 4. Removing abandoned utilities.
 - 5. Excavating topsoil.

1.2 SUBMITTALS

- A. Section 01 33 00 Submittal Procedures: Requirements for submittals.
- B. Product Data: Submit data for herbicide. Indicate compliance with applicable codes for environmental protection.
- 1.3 QUALITY ASSURANCE
 - A. Conform to applicable code for environmental requirements and disposal of debris.
 - B. Perform Work in accordance with Florida Department of Transportation Standard Specifications for Road and Bridge Construction (latest edition) and as shown and specified herein.

PART 2 - PRODUCTS (NOT USED)

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Section 01 30 00 Administrative Requirements: Verification of existing conditions before starting work.
- B. Verify existing plant life designated to remain is tagged or identified.
- C. Identify waste area and salvage area for placing removed materials.

3.2 PREPARATION

- A. Contractor shall contact Sunshine 811 for location of existing utilities at 811 or 1-800-432-4770 a minimum of 48 hours prior beginning Work.
 - 1. Request underground utilities to be located and marked within and surrounding construction areas.

3.3 **PROTECTION**

- A. Locate, identify, and protect utilities indicated to remain, from damage.
- B. Protect trees, plant growth, and features designated to remain.
- C. Protect bench marks, survey control points, and existing structures from damage or displacement.
- 3.4 CLEARING
 - A. Remove trees and shrubs within the clearing limits shown. Remove stumps and main root ball.
 - B. Clear undergrowth and deadwood, without disturbing subsoil.
 - C. Apply herbicide to remaining stumps to inhibit growth.

3.5 REMOVAL

- A. Remove debris, rock, and extracted plant life from Site.
- B. Remove paving, curbs, sidewalks, and other existing features as indicated on Drawings. Neatly saw cut concrete edges at right angle to surface.
- C. Remove abandoned utilities as shown. Indicated removal termination point for underground utilities on Record Documents.
- D. Continuously clean-up and remove waste materials from site. Do not allow materials to accumulate on site.
 - . Do not burn or bury materials on site. Leave site in clean condition.

3.6 TOPSOIL EXCAVATION

- A. Excavate topsoil from areas as shown to be further excavated, landscaped, or regraded, without mixing with foreign materials for use in finish grading.
- B. Do not excavate wet topsoil.

- C. Stockpile topsoil in storage piles in areas shown, or where otherwise approved by Engineer. Construct storage piles to freely drain surface water. Cover storage piles to prevent windblown dust.
- D. Remove excess topsoil not intended for reuse from Site.

SECTION 31 23 16

EXCAVATION

PART 1 - GENERAL

1.1 SUMMARY

- A. Section includes general requirements for excavation activities as shown and specified.
- B. Related Requirements:1. Section 31 23 23 Fill.
- 1.2 REFERENCE STANDARDS
 - A. Florida Department of Transportation Standard Specifications for Road and Bridge Construction (latest edition.)
- 1.3 DEFINITIONS
 - A. Rock: Material encountered in excavation that cannot be dislodged by a track-type hydraulic excavator, equipped with a 42-inch wide short-tip radius rock bucket, rated at not less than 120 horsepower flywheel power with bucket-curling force of not less than 25,000 lbs. and stick-crowd force of not less than 18,000 lbs.
 - 1. Rock shall not include materials such as hardpan, loose rock, concrete or other materials that can be removed by means other than drilling, but which for reasons of economy in excavating the Contractor chooses to remove by drilling or other means.

1.4 SUBMITTALS

- A. Section 01 33 00 Submittal Procedures: Requirements for submittals.
- B. Shop Drawings:
 - 1. Excavation Protection Plan:
 - a. Describe sheeting, shoring, and bracing materials and installation, as required, to protect excavations and adjacent structures and property.
 - b. Submit signed and sealed Shop Drawings with design calculations and assumptions to support plan.
- C. Field Quality-Control Submittals: Indicate results of Contractor-furnished tests and inspections.
- D. Qualifications Statement:
 - 1. Submit qualifications for licensed professional.

- 1.5 QUALITY ASSURANCE
 - A. Perform Work according to the Florida Department of Transportation Standard Specifications for Road and Bridge Construction (latest edition.)
- 1.6 QUALIFICATIONS
 - A. Licensed Professional: Professional engineer experienced in design of specified Work and licensed in State of Florida.

PART 2 - PRODUCTS (NOT USED)

PART 3 - EXECUTION

- 3.1 PREPARATION
 - A. Section 01 70 00 Execution and Closeout Requirements: Requirements for installation preparation.
 - B. Utility Service Locator:
 - 1. Contractor shall contact Sunshine 811 for location of existing utilities at 811 or 1-800-432-4770 a minimum of 48 hours prior beginning Work.
 - 2. Request that underground utilities be located and marked within and immediately surrounding construction areas.
 - 3. Identify required lines, levels, contours, and data.
 - 4. Locate existing underground utilities in areas of work. If utilities are to remain in place, provide adequate means of support and protection during earthwork operations.
 - 5. Should uncharted, or incorrectly charted, piping or other utilities be encountered during excavation, consult utility Owner immediately for directions. Coordinate with Owner and utility companies in keeping respective services and facilities in operation. Repair damaged utilities to satisfaction of utility Owner.
 - C. Existing Utilities:
 - 1. Notify utility companies and coordinate protection or relocation of utilities.
 - 2. Protect from damage utilities not indicated to be removed.
 - 3. Do not interrupt existing utilities serving facilities occupied and used by Owner or others, during occupied hours, except when permitted in writing by Engineer and then only after acceptable temporary utility services have been provided.
 - 4. Provide minimum of 48-hour notice to Engineer, and receive written notice to proceed before interrupting any utility.
 - 5. Demolish and completely remove from site existing under-ground utilities indicated to be removed. Coordinate with utility Owner for shut-off of services if lines are active.

- 6. In the event that an existing utility is broken Contractor shall contact utility owner, Owner, and Engineer immediately. Coordinate repair with utility owner at their direction. The Contractor shall be responsible for all costs associated with damaged utilities.
- 7. Utility Poles: Contractor shall communicate directly with utility companies when performing work around utility poles. Contractor shall bear all costs associated with work, including expense of temporarily supporting poles.
- D. When performing trench excavation in excess of 5-feet in depth, comply with OSHA requirements for trench safety standards, 29 CFR 1926, subpart b, and all subsequent revisions or updates adopted by the Department of Labor. Submission of bid and subsequent execution of Contract will serve as certification that all excavation in excess of 5-feet in depth will be in compliance with section 553. 62, Florida Statutes.
- . Use of explosives is not allowed.
- F. Protect structures, utilities, sidewalks, pavements, and other facilities from damage caused by settlement, lateral movement, undermining, washout and other hazards created by earthwork operations.
 - . Protect plant life, lawns, and other features designated to remain as portion of final landscaping.
 - . Protect benchmarks, survey control points, existing structures, fences, sidewalks, paving, curbs, and other existing facilities and objects from excavating equipment and vehicular traffic.
 - . Do not close or obstruct driveways, roadways, sidewalks, or hydrants without permits.
- . Erect and maintain temporary barriers and security devices, including warning signs, warning lights, and similar measures, for protection of public, Owner, and existing improvements indicated to remain.
 - 1. Temporary barriers shall be installed and maintained in compliance with authorities having jurisdiction.

3.2 EXCAVATION

- A. Underpin adjacent structures which may be damaged by excavation Work.
- B. Excavate subsoil to accommodate slabs on grade, paving, Site structures, and construction operations.
- C. Compact disturbed load-bearing soil in direct contact with foundations to original bearing capacity, as specified in Section 31 23 23 Fill.
- D. Slope banks with machine to angle of repose or less until shored.

- E. . Do not interfere with 45-degree bearing splay of foundations.
- F. Grade top perimeter of excavation to prevent surface water from draining into excavation.
- G. . Trim excavation and remove loosematter.
- H. . Removal of Deleterious (harmful or damaging) Materials: All coarse aggregates shall be reasonably free of clay lumps, soft and friable particles, salt, alkali, organic matter, adherent coatings, and other substances not defined which may possess undesirable characteristics. The weight of deleterious substances shall not exceed the following percentages:

Coal and lignite (AASHTO T 113)1.00
Soft and friable particles (AASHTO T 112)2.00*
Clay lumps (AASHTO T 112) 2.00*
Plant root matter (visual inspection in
AASHTO T 27)
Wood and wood matter (visual inspection in AASHTO T 27)
Cinders and clinkers0.50
Free shell
Total Material passing the No. 200 sieve (FM 1-T 011)
At Source with Los Angeles Abrasion less than or equal
to 302.50
At Source with Los Angeles Abrasion greater than
30
At Point of Use
Fine-Grained Organic Matter (AASHTO 194)0.03
Chert (less than 2.40 specific gravity SSD)
(AASHTO T-113)

*The maximum percent by weight of soft and friable particles and clay lumps together shall not exceed 3.00.

**Aggregates to be used in asphalt concrete may contain up to 5% free shell. Free shell is defined as that portion of the coarse aggregate retained on the No. 4 sieve consisting of loose, whole, or broken shell, or the external skeletal remains of other marine life, having a ratio of the maximum length of the particle to the shell wall thickness exceeding five to one. Coral, molds, or casts of other shells, and crushed clam and oyster shell indigenous to the formation will not be considered as free shell.

***This limitation applies only to coarse aggregates in which chert appears as an impurity. It is not applicable to aggregates which are predominantly chert.

****Plant root matter, and wood and wood matter shall be considered deleterious when any piece exceeds two inches in length or 1/2 inch in width.

- I. . Remove excess and unsuitable material from Site.
- J. . Notify Engineer of unexpected subsurface conditions.
- K. . No payment will be made for correction of unauthorized excavation. Correct overexcavated areas as directed by Engineer.

- L. . Remove excavated material from Site.
- M. . Stockpile excavated material in area designated on Site as specified in Section 31 05 13 Soils for Earthwork.
- N. . Repair or replace items indicated to remain that have been damaged by excavation.
- O. Except where otherwise authorized, shown or specified, all materials excavated below the bottom of concrete walls, footings, slabs on grade and foundations shall be replaced by, and at the expense of, the Contractor, with concrete placed at the same time and monolithic with the concrete above.

3.3 ROCK REMOVAL

- A. Excavate and remove rock by mechanical method.1. Drill holes and use expansive tools or wedges to fracture rock.
- B. Cut away rock at bottom of excavation to form level bearing.
- C. Remove shaled layers to provide sound and unshattered base.
- D. In utility trenches, excavate to twelve (12) inches below invert elevation of pipe and twenty-four (24) inches wider than pipe diameter.
- E. Remove excavated materials from site.
- F. Correct unauthorized rock removal in accordance with backfilling and compacting requirements of Section 31 23 23 unless otherwise directed by the Engineer. No payment will be made for unauthorized rock removal or correction thereof

3.4 FIELD QUALITY CONTROL

- A. Section 01 40 00 Quality Requirements: Requirements for inspecting and testing.
- B. Inspecting: Request visual inspection of bearing surfaces by Engineer before installing subsequent Work.

3.5 **PROTECTION**

- A. Section 01 70 00 Execution and Closeout Requirements: Requirements for protecting finished Work.
- B. Prevent displacement or loose soil from falling into excavation, and maintain soil stability.

- C. Protect bottom of excavations and soil adjacent to and beneath foundation from freezing.
- D. Protect structures, utilities, sidewalks, pavements, and other facilities from damage caused by settlement, lateral movement, undermining, washout and other hazards created by earthwork operations.

SECTION 31 23 19 DRAINAGE AND DEWATERING:

- 1. Contractor shall provide and maintain adequate drainage and dewatering equipment to remove and dispose of all surface water and groundwater entering excavations, or other parts of the Work. Each excavation shall be kept dry during subgrade preparation and continually thereafter until the pipe or structure to be built, therein is inspected by the Engineer and backfill operations have been completed and approved.
 - a. The different working areas on the Site shall be kept free of surface water at all times. Contractor shall install drainage ditches and dikes and shall perform all pumping and other Work necessary to divert or remove rainfall and all other accumulations of surface water from the excavations and fill areas. The diversion and removal of surface water shall be performed in a manner that will prevent the accumulation of water behind temporary structures or at any other locations within the construction area where it may be detrimental.
 - b. Water used for working or processing, resulting from dewatering operations, or containing oils or sediments that will reduce the quality of the water downstream of the point of discharge, shall not be directly discharged. Such waters shall be diverted through a settling basin or filter before being discharged.
 - c. Contractor will be held responsible for the condition of any pipe, conduit, or channel used for drainage purposes and all such pipes, conduits, or channels shall be left clean and free of sediment.
 - d. Remove water from excavations as fast as itcollects.
- 2. Contractor shall provide, install and operate sufficient trenches, sumps, pumps, hose, piping, well points, deep wells, etc., necessary to depress and maintain the ground water level below the base of the excavations during all stages of construction operations. The groundwater table shall be lowered in advance of excavation, for a sufficient period of time to permit dewatering of fine grain soils, and maintained two feet below the lowest subgrade excavation made until the structure has sufficient strength and weight to withstand horizontal and vertical soil and water pressures from natural ground water.
 - a. Design of dewatering system, including both drawings and calculations, shall be performed by a Registered Professional Engineer in theState of Florida and shall be employed by Contractor. Dewatering system shall be designed to avoid settlement or damage to existing structures and utilities.
 - b. The system shall be operated on a 24-hour basis and standby pumping facilities and personnel shall be provided to maintain the continued effectiveness of the system.
 - c. If, in the opinion of the Engineer, the water levels are not being lowered or maintained as required, Contractor shall install additional or alternate dewatering devices as necessary, at no additional cost to the Owner.
 - d. Elements of the system shall be located to allow a continuous dewatering operation without interfering with the construction of the permanent Work. Where portions of the dewatering system are located in the area of permanent

construction, Contractor shall submit details of the methods proposed to construct the permanent Work in this location for the approval of the Engineer.

- e. Controls of groundwater shall continue until the permanent construction provides sufficient dead load to withstand the hydrostatic uplift of the normal groundwater, until concrete has attained sufficient strength to withstand earth and hydrostatic loads, and until all waterproofing Work has been completed.
- f. Dispose of all water removed from the excavation in a manner that does not endanger any portion of the Work under construction or completed.
- g. Disposal of water removed shall comply with all State and Federal regulations.
- h. Before discontinuing dewatering operations or permanently permitting the rise of the ground water level, computations shall be made to show that any structure affected by the water level rise is protected by backfill or other means to sustain uplift. Use a safety factor of 1.25 when making these computations.
- i. Dewatering operations shall not be discontinued without the prior authorization of the Engineer.

SECTION 31 23 23.00

FILL

PART 1 - GENERAL

1.1 SUMMARY

- A. Section includes general requirements for backfill activities as shown and specified.
- B. Related Requirements:
 - 1. Section 31 05 13 Soils for Earthwork.
 - 2. Section 31 23 16 Excavation.

1.2 REFERENCE STANDARDS

- A. American Association of State Highway and Transportation Officials:
 - 1. AASHTO T 180 Standard Method of Test for Moisture-Density Relations of Soils Using a 4.54-kg Rammer and a 457-mm Drop.
- B. ASTM International:
 - 1. ASTM D698 Standard Test Methods for Laboratory Compaction Characteristics of Soil Using Standard Effort (12,400 ft-lbf/ft3).
 - 2. ASTM D1556/D1556M Standard Test Method for Density and Unit Weight of Soil in Place by Sand-Cone Method.
 - 3. ASTM D1557 Standard Test Methods for Laboratory Compaction Characteristics of Soil Using Modified Effort (56,000 ft-lbf/ft3).
 - 4. ASTM D2167 Standard Test Method for Density and Unit Weight of Soil in Place by the Rubber Balloon Method.
 - 5. ASTM D6031/D6031M Standard Test Method for Logging In Situ Moisture Content and Density of Soil and Rock by the Nuclear Method in Horizontal, Slanted, and Vertical Access Tubes.
 - 6. ASTM D6938 Standard Test Method for In-Place Density and Water Content of Soil and Soil-Aggregate by Nuclear Methods (Shallow Depth).

1.3 SUBMITTALS

- A. Section 01 33 00 Submittal Procedures: Requirements for submittals.
- B. Product Data: Submit manufacturer information for geotextile fabric, indicating fabric and construction.
- C. Samples: Submit, in airtight containers, one10-lb. sample of each type of fill to testing laboratory.

- D. Materials Source: Submit name of imported materials suppliers.
- E. Manufacturer's Certificate: Certify that products meet or exceed specified requirements.
- F. Field Quality-Control Submittals: Indicate results of Contractor-furnished tests and inspections.
- 1.4 QUALITY ASSURANCE
 - A. Perform Work according to the Florida Department of Transportation Standard Specifications for Road and Bridge Construction (latest edition.)

PART 2 - PRODUCTS

2.1 MATERIALS

- A. Select Fill: Type S1, as specified in Section 31 05 13 Soils for Earthwork.
- B. Granular Fill: Type S3, as specified in Section 31 05 13 Soils for Earthwork.
- C. Concrete:
 - 1. Description:
 - a. Structural, as specified in the Florida Department of Transportation Standard Specifications for Road and Bridge Construction (latest edition.)
 - b. Compressive Strength: 4,000 psi.

2.2 ACCESSORIES

A. Geotextile Fabric: As specified in Florida Department of Transportation Standard Specifications for Road and Bridge Construction (latest edition.)

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Section 01 70 00 Execution and Closeout Requirements: Requirements for installation examination.
- B. Verify that sub-drainage, damp-proofing, and waterproofing installations have been inspected.
- C. Verify that underground structures are properly anchored to avoid flotation after backfilling.

3.2 PREPARATION

- A. Section 01 70 00 Execution and Closeout Requirements: Requirements for installation preparation.
- B. Compact subgrade to specified density requirements for subsequent backfill materials.
- C. Soft Subgrade:
 - 1. Cut out soft areas of subgrade not capable of compaction in place.
 - 2. Backfill with granular fill and compact to density equal to or greater than specified requirements for subsequent fill material.
- D. Scarify subgrade surface to depth of 6 inches.
- 3.3 BACKFILLING
 - A. Backfill areas to contours and elevations.
 - B. Systematically backfill to allow maximum time for natural settlement.
 - C. Do not backfill over porous, wet, frozen, or spongy subgrade surfaces, and do not backfill with frozen materials.
 - D. Geotextile: Place geotextile fabric prior to placing subsequent fill materials.
 - E. Maximum Compacted Depths:
 - 1. Place material in continuous layers to following depths:
 - a. Subsoil Fill: 6 inches.
 - b. Granular Fill: 6 inches.
 - 2. The Engineer may grant permission to increase lift depth to 12 inches upon proof of successful compaction to the specified densities at the lift depths specified.
 - F. Compaction:
 - 1. Pipe Trench Backfill:
 - a. Lowest Zone: Undercuts to within 4 inches of pipe bottom, compact to match soil in trench.
 - b. Bedding Zone: Above Lowest Zone, usually 4 inches below pipe.
 - 1) No Undercut: Loosen soil.
 - 2) Undercut: Leave loose below middle third of pipe and compact outside portions to 100% T99 Standard Proctor Density
 - c. Cover Zone: Extends from Bedding Zone to 12 inches above top of pipe. Compact to 95% T99 Standard Proctor Density
 - d. Top Zone: Extends from Cover Zone to base or final grade. Compact to 100% T99 Standard Proctor Density.
 - 2. Embankment: Compact to 100% Florida Method-1 (FM-1) T99 Standard Proctor Density, Method C.
 - 3. Subgrade: Compact to 98% FM-1 T180 Modified Proctor Density, Method D.

- 4. Rock Base:
 - a. Roadways: Compact to 98% FM-1 T180 Modified Proctor Density.
 - b. Shoulders, Bike Paths, and Shared Use Paths: Compact to 95% FM-1 T180 Modified Proctor Density.
- G. Use placement method that does not disturb or damage foundation perimeter drainage or utilities in trench.
- H. Maintain optimum moisture content of fill materials to attain required compaction density.
- I. Structures:
 - 1. Backfill against supported foundation walls.
 - 2. Backfill simultaneously on each side of unsupported foundation walls until supports are in place.
 - 3. Slope grade away from building minimum 5 percent slope for minimum distance of 10 feet.
- J. Make gradual grade changes and blend slope into level areas.
- K. Remove surplus backfill materials from Site.
- L. Leave fill material stockpile areas free of excess fill materials.

3.4 TOLERANCES

- A. Section 01 40 00 Quality Requirements: Requirements for tolerances.
- B. Top Surface of Backfilling under Paved Areas: Plus or minus 1 inch from required elevations.
- C. Top Surface of General Backfilling: Plus or minus 1 inch from required elevations.
- 3.5 FIELD QUALITY CONTROL
 - A. Section 01 70 00 Execution and Closeout Requirements: Requirements for testing, adjusting, and balancing.
 - B. Inspecting: Request visual inspection of bearing surfaces by Engineer before installing subsequent Work.
 - C. Testing:
 - 1. Laboratory Material Testing: Comply with AASHTO T99 and FM-1 T180 as specified.
 - 2. In-Place Compaction Testing:
 - a. Density Tests: Comply with ASTM D6938.
 - b. Moisture Tests: Comply with ASTM D6031/D6031M.

- 3. If tests indicate that Work does not meet specified requirements, remove Work, replace, compact, and retest.
- 4. Testing Frequency:
 - a. Roadway: Minimum of one (1) moisture and one (1) density test per lift for each 500 feet along the alignment shown or as specified by the Engineer.
 - b. Utility Trench: Minimum of two (2) moisture and two (2) density tests per lift per run of pipe spaced as shown on the detailed drawings or as specified by the Engineer.
 - c. Area Fill: As specified by the Engineer.
- 5. Proof-roll compacted fill surfaces under slabs on grade and paving.
- D. The Contractor shall be responsible for all settlement of backfill, fills, and embankments which may occur within the correction period stipulated in the General Conditions.
- E. The Contractor shall make, or cause to be made, all repairs or replacements made necessary by settlement within 30 days after notice from the Engineer or Owner.

3.6 **PROTECTION**

- A. Section 01 70 00 Execution and Closeout Requirements: Requirements for protecting finished Work.
- B. Reshape and recompact fills subjected to vehicular traffic during construction.

SECTION 31 25 00

EROSION AND SEDIMENTATION CONTROLS

PART 1 - GENERAL

1.1 SUMMARY

A. Section includes requirements for furnishing and installing erosion and sedimentation controls.

B. Related Sections:

- 1. Section 31 23 23 Fill.
- 2. Section 33 05 61 Concrete Manholes.
- 3. Section 33 14 13 Public Water Utility Distribution Piping.
- 4. Section 33 15 00 Reclaimed Water Distribution System.
- 5. Section 33 31 11 Public Sanitary Sewerage Gravity Piping.
- 6. Section 33 31 23 Sanitary Sewerage Force Main Piping.
- 7. Section 33 32 11 Field-Erected Wastewater Pumping Stations.

1.2 REFERENCES

- A. American Association of State Highway and Transportation Officials:
 - 1. AASHTO T88 Standard Specification for Particle Size Analysis of Soils.
 - 2. AASHTO T180 Standard Specification for Moisture-Density Relations of Soils Using a 4.54-kg (10-lb) Rammer and a 457-mm (18-in.) Drop.
- B. American Concrete Institute:
 - 1. ACI 301 Specifications for Structural Concrete.
- C. ASTM International:
 - 1. ASTM C127 Standard Test Method for Density, Relative Density (Specific Gravity), and Absorption of Coarse Aggregate.
 - 2. ASTM D698 Standard Test Method for Laboratory Compaction Characteristics of Soil Using Standard Effort (12,400 ft-lbf/ft3).
 - 3. ASTM D1557 Standard Test Methods for Laboratory Compaction Characteristics of Soil Using Modified Effort (56,000 ft-lbf/ft3).
 - 4. ASTM D2922 Standard Test Method for Density of Soil and Soil-Aggregate in Place by Nuclear Methods (Shallow Depth).
 - 5. ASTM D3017 Standard Test Method for Water Content of Soil and Rock in Place by Nuclear Methods (Shallow Depth).

1.3 SUBMITTALS

A. Section 01 33 00 - Submittal Procedures: Requirements for submittals.

- B. Product Data: Submit data on geotextile.
- C. Samples:
 - 1. Submit two samples or rock, minimum 5 tons each or one half total project quantity, whichever is smaller. Provide one sample in place at construction site and provide other sample at quarry. Construction site sample may be incorporated into the Work. Samples will be used as reference for judging size, and graduation of rock supplied and placed.
- D. Test Reports: Indicate certified tests results for precast concrete at manufacturing facility, cast-in-place concrete in field, and granular backfill.
- E. Manufacturer's Certificate: Certify Products meet or exceed specified requirements.
- 1.4 CLOSEOUT SUBMITTALS
 - A. Section 01 70 00 Execution and Closeout Requirements: Requirements for submittals.
- 1.5 QUALITY ASSURANCE
 - A. Perform Work according to Florida Department of Transportation and Florida Department of Environmental Protection standards.
- 1.6 PRE-INSTALLATION MEETINGS
 - A. Section 01 30 00 Administrative Requirements: Pre-installation meeting.
 - B. Convene minimum one (1) week prior to commencing work of this section.
- 1.7 ENVIRONMENTAL REQUIREMENTS
 - A. Section 01 60 00 Product Requirements: Environmental conditions affecting products on site.
 - B. Do not place grout when air temperature is below freezing.
 - C. Do not place concrete when base surface temperature is less than 40 degrees F, or surface is wet or frozen.

PART 2 - PRODUCTS

2.1 ROCK AND GEOTEXTILE MATERIALS

A. Furnish rock and geotextile materials according to Florida Department of Transportation Standard Specifications for Road and Bridge Construction (latest edition.)

2.2 CONCRETE MATERIALS AND REINFORCEMENT

- A. Furnish cement, aggregate, admixtures, and reinforcement in per Florida Department of Transportation Standard Specifications for Road and Bridge Construction (latest edition.)
- B. Water: Clean and not detrimental to concrete.
- 2.3 BLOCK, STONE, AGGREGATE, AND SOIL MATERIALS
 - A. Furnish block, stone, aggregate, and soil materials according to Florida Department of Transportation Standard Specifications for Road and Bridge Construction (latest edition.)
- 2.4 PLANTING MATERIALS
 - A. Seeding, Soil Supplements, and Mulch: Furnish according to Florida Department of Transportation standards.
- 2.5 PIPE MATERIALS
 - A. Pipe: Furnish according to Florida Department of Transportation standards.

2.6 ACCESSORIES

- A. Furnish the following accessories in accordance with Florida Department of Transportation standards:
 - 1. Joint Sealers.
 - 2. Joint Fillers.
 - 3. Building Paper.
 - 4. Grout.
 - 5. Steel Plate Vortex Device.
 - 6. Welding Material.
 - 7. Anti-Seep Collar.
 - 8. Trash Racks.

2.7 MIXES

- A. Concrete: Furnish according to Florida Department of Transportation standards.
- 2.8 SOURCE QUALITY CONTROL (AND TESTS)
 - A. Section 01 40 00 Quality Requirements: Testing, inspection and analysis requirements.
 - B. Perform tests on cement, aggregates, and mixes to ensure conformance with specified requirements.
 - C. Test samples in accordance with ACI 301.

- D. Make rock available for inspection at producer's facility prior to shipment. Notify Engineer at least seven days before inspection is allowed.
- E. Allow witnessing of inspections and test at manufacturer's test facility. Notify Engineer at least seven days before inspections and tests are scheduled

PART 3 - EXECUTION

3.1 EXAMINATION

- . Section 01 30 00 Administrative Requirements: Verification of existing conditions before starting work.
- . Verify compacted material is acceptable and ready to support devices and imposed loads.
- . Verify gradients and elevations of base or foundation for other work are correct.

3.2 INSTALLATION OF EROSION AND SEDIMENT CONTROL

- A. Erosion Control:
 - 1. All erosion and sediment controls shall be installed as shown and in accordance with Florida Department of Transportation Standard Specifications for Road and Bridge Construction (latest edition.)
 - 2. In general, the construction procedures outlined herein shall be implemented to assure minimum damage to the environment during construction. Contractor shall take any and all additional measures required to conform to the requirements of applicable codes and regulations.
 - 3. Whenever possible, access and temporary roads shall be located and constructed to avoid environmental damage. Provisions shall be made to regulate drainage, avoid erosion, and minimize damage to vegetation.
 - 4. Where areas must be cleared for storage of materials or temporary structures, provisions shall be made for regulating drainage and controlling erosion, subject to the Engineer's approval.
 - 5. Temporary measures shall be applied to control erosion and to minimize the silting of the existing waterways, and natural ponding areas. Such measures shall include, but are not limited to, the use of berms, silt barriers, gravel or crushed stone, mulch, slope drains and other methods. These temporary measures shall be applied to erodible materials exposed by any activities associated with the Work.
 - a. Special care shall be taken to eliminate depressions that could serve as mosquito pools.
 - b. Temporary measures shall be coordinated with the construction of permanent drainage facilities and other Work to the extent practicable to assure economical, effective, and continuous erosion and silt control.
 - c. Contractor shall provide special care in areas with steep slopes. Disturbance of vegetation shall be kept to a minimum to maintain stability.

- 6. Remove only those shrubs and grasses that must be removed for construction. Protect the remainder to preserve their erosion-controlvalue.
- 7. Install erosion and sediment control practices where shown on the Drawings and according to applicable standards, codes, and specifications. The practices shall be maintained in effective working condition during construction and until the drainage area has been permanentlystabilized.
- 8. After stabilization, remove all silt barriers, debris, etc., from the Site.
- 9. In the event of any temporary Work stoppage, Contractor shall take steps to stabilize the Site and prevent erosion.
- 10. In the event Contractor repeatedly fails to satisfactorily control erosion and siltation, the Owner reserves the right to employ outside assistance or to use its own forces to provide the corrective measures indicated. The Contractor shall be responsible for all costs associated with such corrective measures.
- 11. Contractor shall prevent blowing and movement of dust from exposed soilsurfaces and access roads to reduce on and off-site damage and health hazards. Control may be achieved by irrigation in which the Site shall be sprinkled with water until the surface is moist. The process shall be repeated, as required.

3.3 SITE STABILIZATION

- A. Incorporate erosion control devices indicated on the Drawings into the Project at the earliest practicable time.
- B. Construct, stabilize, and activate erosion controls before site disturbance within tributary areas of those controls.
- C. Stockpile and waste pile heights shall not exceed 35 feet. Slope stockpile sides at 2: 1 or flatter.
- D. Stabilize any disturbed area of affected erosion control devices on which activity has ceased and which will remain exposed for more than 20 days.
 - 1. During non-germinating periods, apply mulch at recommended rates.
 - 2. Stabilize disturbed areas which are not at finished grade and which will be disturbed within one year with temporary seeding.
 - 3. Stabilize disturbed areas which are either at finished grade or will not be disturbed within one year with permanent seeding and/or sodding as shown and specified.
- E. Stabilize diversion channels, sediment traps, and stockpiles immediately.

3.4 FIELD QUALITY CONTROL

- A. Inspect erosion control devices on a weekly basis and after each runoff event. Make necessary repairs to ensure erosion and sediment controls are in good working order.
- B. Field test concrete in accordance with Florida Department of Transportation standards.

- C. Compaction Testing: As specified in Section 31 23 23 Fill.
- D. When tests indicate Work does not meet specified requirements, remove Work, replace and retest.
- E. Frequency of Compaction Testing: As specified in Section 31 23 23 Fill.
- 3.5 CLEANING
 - A. Section 01 70 00 Execution and Closeout Requirements: Requirements for cleaning.
 - B. When sediment accumulation in sedimentation structures has reached a point one-third depth of sediment structure or device, remove and dispose of sediment.
 - C. Do not damage structure or device during cleaning operations.
 - D. Do not permit sediment to erode into construction or site areas or natural waterways.
 - E. Clean channels when depth of sediment reaches approximately one half channel depth.
- 3.6 **PROTECTION**
 - A. Section 01 70 00 Execution and Closeout Requirements: Requirements for protecting finished Work.
 - B. Immediately after placement, protect paving from premature drying, excessive hot or cold temperatures, and mechanical injury.
 - C. Do not permit construction traffic over paving until 75 percent design strength of concrete has been achieved.
 - D. Protect paving from elements, flowing water, or other disturbance until curing is completed.

SECTION 32 12 16

ASPHALT PAVING

PART 1 - GENERAL

1.1 SUMMARY

- A. Section general requirements for asphalt paving.
- B. Related Requirement:
 - 1. Section 31 23 16 Excavation.
 - 2. Section 31 23 23 Fill.
 - 3. Section 33 05 13 Manholes.
 - 4. Section 32 17 13 Parking Bumpers
 - 5. Section 32 17 23 Pavement Markings

1.2 REFERENCE STANDARDS

- A. American Association of State Highway and Transportation Officials:
 - 1. AASHTO M17 Standard Specification for Mineral Filler for Bituminous Paving Mixtures.
 - 2. AASHTO M29 Standard Specification for Fine Aggregate for Bituminous Paving Mixtures.
 - 3. AASHTO M140 Standard Specification for Emulsified Asphalt.
 - 4. AASHTO M208 Standard Specification for Cationic Emulsified Asphalt.
 - 5. AASHTO M288 Standard Specification for Geotextile Specification for Highway Applications.
 - 6. AASHTO M320 Standard Specification for Performance-Graded Asphalt Binder.
 - 7. AASHTO M324 Standard Specification for Joint and Crack Sealants, Hot Applied, for Concrete and Asphalt Pavements.
 - 8. AASHTO MP1a Standard Specification for Performance-Graded Asphalt Binder.
- B. ASTM International:
 - 1. ASTM C1371 Standard Test Method for Determination of Emittance of Materials Near Room Temperature Using Portable Emissometers.
 - 2. ASTM C1549 Standard Test Method for Determination of Solar Reflectance Near Ambient Temperature Using a Portable Solar Reflectometer.
 - 3. ASTM D242 Standard Specification for Mineral Filler For Bituminous Paving Mixtures.
 - 4. ASTM D692 Standard Specification for Coarse Aggregate for Bituminous Paving Mixtures.
 - 5. ASTM D946 Standard Specification for Penetration-Graded Asphalt Cement for Use in Pavement Construction.
 - 6. ASTM D977 Standard Specification for Emulsified Asphalt.

- 7. ASTM D1073 Standard Specification for Fine Aggregate for Bituminous Paving Mixtures.
- 8. ASTM D1188 Standard Test Method for Bulk Specific Gravity and Density of Compacted Bituminous Mixtures Using Coated Samples
- 9. ASTM D2027 Standard Specification for Cutback Asphalt (Medium-Curing Type).
- 10. ASTM D2397 Standard Specification for Cationic Emulsified Asphalt.
- 11. ASTM D2726 Standard Test Method for Bulk Specific Gravity and Density of Non-Absorptive Compacted Bituminous Mixtures.
- 12. ASTM D2950 Standard Test Method for Density of Bituminous Concrete in Place by Nuclear Methods.
- 13. ASTM D3381 Standard Specification for Viscosity-Graded Asphalt Cement for Use in Pavement Construction.
- 14. ASTM D3515 Standard Specification for Hot-Mixed, Hot-Laid Bituminous Paving Mixtures.
- 15. ASTM D3549 Standard Test Method for Thickness or Height of Compacted Bituminous Paving Mixture Specimens.
- 16. ASTM D3910 Standard Practices for Design, Testing, and Construction of Slurry Seal.
- 17. ASTM D6690 Standard Specification for Joint and Crack Sealants, Hot Applied, for Concrete and Asphalt Pavements.
- 18. ASTM E408 Standard Test Methods for Total Normal Emittance of Surfaces Using Inspection-Meter Techniques.
- 19. ASTM E903 Standard Test Method for Solar Absorptance, Reflectance, and Transmittance of Materials Using Integrating Spheres.
- 20. ASTM E1918 Standard Test Method for Measuring Solar Reflectance of Horizontal and Low-Sloped Surfaces in the Field.
- 21. ASTM E1980 Standard Practice for Calculating Solar Reflectance Index of Horizontal and Low-Sloped Opaque Surfaces.

1.3 SUBMITTALS

- A. Section 01 33 00 Submittal Procedures: Requirements for submittals.
- B. Product Data:
 - 1. Submit data for milling and paving equipment to be used.
 - 2. Submit product information for asphalt and aggregate materials.
 - 3. Submit mix design with laboratory test results supporting design.seed
- C. Manufacturer's Certificate: Certify Products meet or exceed specified requirements.

1.4 QUALITY ASSURANCE

- A. Mixing Plant: Certified by Florida Department of Transportation.
- B. Obtain materials from same source throughout.

- C. Perform Work in accordance with Florida Department of Transportation Standard Specifications for Road and Bridge Construction (latest edition.)
- 1.5 QUALIFICATIONS
 - A. Installer: Company specializing in performing Work of this section with minimum five (5) years of documented experience.
- 1.6 AMBIENT CONDITIONS
 - A. Section 01 50 00 Temporary Facilities and Controls: Ambient conditions control facilities for product storage and installation.
 - B. Do not place asphalt mixture when ambient air or base surface temperature is less than Florida Department of Transportation Standard Specifications for Road and Bridge Construction (latest edition) requirements.

PART 2 - PRODUCTS

- 2.1 ASPHALT PAVING
 - A. Performance / Design Criteria:
 - 1. Pavement Design: Superpave Type SP-9.5 or Type SP-12.5 as shown or specified and in accordance with Florida Department of Transportation Standard Specifications for Road and Bridge Construction (latest edition.)
 - B. Asphalt Materials:
 1. Materials for asphalt paving shall comply with Florida Department of Transportation Standard Specifications for Road and Bridge Construction (latest edition.)

2.2 MIXES

- A. Asphalt Paving Mixtures:
 - 1. Asphalt Paving Mixtures shall comply with Florida Department of Transportation Standard Specifications for Road and Bridge Construction (latest edition.)
- B. Use dry material to avoid foaming. Mix uniformly.
- 2.3 ACCESSORIES
 - A. Geotextile Fabric: AASHTO M288; non-woven, polypropylene.
- 2.4 SOURCE QUALITY CONTROL
 - A. Section 01 40 00 Quality Requirements: Testing, inspection and analysis requirements.
 - B. Submit proposed mix design of each class of mix for review prior to beginning of Work.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Section 01 70 00 Execution and Closeout Requirements: Requirements for installation examination.
- B. Verify utilities indicated under paving are installed with excavations and trenches backfilled and compacted.
- C. Verify compacted subbase is dry and ready to support paving and imposed loads.
 - 1. Proof roll subbase with a vibratory roller weighing a minimum of eight (8) tons or a sheepsfoot roller, where appropriate, exerting a compression of at least 250 pounds psi on the tamper foot for at least five (5) passes in minimum two (2) perpendicular passes to identify soft spots.
 - 2. Remove soft subbase and replace with compacted fill as specified in Section 31 23 23.
- D. Verify gradients and elevations of base are correct.
- E. Verify manhole frames and drainage structures are installed in correct position and elevation.
- 3.2 PREPARATION
 - A. Prepare subbase in accordance with Florida Department of Transportation standards.
- 3.3 DEMOLITION
 - A. Saw cut and notch existing paving as indicted on Drawings.
 - B. Clean existing paving to remove foreign material, excess joint sealant and crack filler from paving surface.
 - C. Repair surface defects in existing paving to provide uniform surface to receive new paving.
 - D. Remove demolished asphalt from Site and dispose of properly.
- 3.4 MILLING OF EXISTING ASPHALT PAVEMENT
 - A. Perform all milling operations in accordance with Florida Department of Transportation standards.
 - B. Remove existing raised pavement markers prior to milling.
 - C. Do not disfigure adjacent Work.

- D. Provide a milling machine capable of maintaining a depth of cut and cross slope that will achieve the results specified in the Contract Documents.
 - 1. Milling machine shall have a minimum overall length (out to out measurement excluding the conveyor) of eighteen (18) feet and a minimum cutting width of six (6) feet.
 - 2. Milling machine shall be equipped with a built-in automatic grade control system that can control the transverse slope and the longitudinal profile to produce the specified results.
 - 3. The Engineer will approve any commercially manufactured milling machine that meets the above requirements. If it becomes evident after starting milling that the milling machine cannot consistently produce the specified results, the Engineer will reject the milling machine for further use.
 - 4. The Contractor may use a smaller milling machine when milling to lower the grade adjacent to existing curb or other areas where it is impractical to use the above described equipment.
 - 5. Milling machine shall be equipped with means to effectively limit the amount of dust escaping during the removal operation.
 - 6. For complete pavement removal, the Engineer may approve the use of alternate removal and crushing equipment.
- E. Execute removal to depth not less than the depth(s) shown on the Drawing(s) at each point across full width of surface without detrimental aggregate degradation.
- F. Remove milled asphalt from Site and dispose of properly.
- 3.5 INSTALLATION
 - A. Subbase: Prepare subbase in accordance with Florida Department of Transportation standards.
 - B. Prime Coat and Tack Coat: Install in accordance with Florida Department of Transportation standards.
 - C. Single Course Asphalt Paving:
 - 1. Install Work in accordance with Florida Department of Transportation standards.
 - 2. Place asphalt within 24 hours of applying primer or tack coat.
 - 3. Place asphalt wearing course to thickness indicated on Drawings.
 - 4. Compact paving by rolling to specified density. Do not displace or extrude paving from position. Hand compact in areas inaccessible to rolling equipment.
 - 5. Perform rolling with consecutive passes to achieve even and smooth finish without roller marks.
 - D. Double Course Asphalt Paving:
 - 1. Install Work in accordance with Florida Department of Transportation standards.
 - 2. Place asphalt binder course within 24 hours of applying primer or tack coat.
 - 3. Place binder course to thickness indicated on Drawings.

- 4. Place wearing course within 24 hours of placing and compacting binder course.
- 5. When binder course is placed more than 24 hours before placing wearing course, clean surface and apply tack coat before placing wearing course.
- 6. Place wearing course to thickness indicated on Drawings.
- 7. Compact each course by rolling to specified density. Do not displace or extrude paving from position. Hand compact in areas inaccessible to rolling equipment.
- 8. Perform rolling with consecutive passes to achieve even and smooth finish, without roller marks.
- E. Asphalt Paving Overlay
 - 1. Install Work in accordance with Florida Department of Transportation standards.
 - 2. Apply tack coat to existing paving surface at rate recommended by geotextile fabric manufacturer.
 - 3. Place wearing course to thickness indicated on Drawings.
 - 4. Compact overlay by rolling to specified density. Do not displace or extrude paving from position. Hand compact in areas inaccessible to rolling equipment.
 - 5. Perform rolling with consecutive passes to achieve even and smooth finish, without roller marks.
- F. Place asphalt mixture when temperature is not more than 15 degrees F less than initial mixing temperature.
- G. Curbs
 - 1. Install extruded asphalt curbs of profile as indicated on Drawings.
- 3.6 TOLERANCES
 - A. Section 01 40 00 Quality Requirements: Tolerances.
 - B. Flatness: Maximum variation of 1/4 inch measured with 10-foot straight edge.
 - C. Scheduled Compacted Thickness: Within 3/16 inch.
 - D. Variation from Indicated Elevation: Within 1/2 inch.
- 3.7 FIELD QUALITY CONTROL
 - A. Section 01 70 00 Execution and Closeout Requirements: Requirements for testing, adjusting, and balancing.
 - B. Asphalt Paving Mix Temperature: Measure temperature at time of placement.
 - C. Asphalt Paving Thickness: ASTM D3549; test one core sample from every 1,000square yards compacted paving.

D. Asphalt Paving Density: Monitor the roadway density per Florida Department of Transportation Standard Specifications for Road and Bridge Construction (latest edition.) with either 6- inch diameter roadway cores, a nuclear density gauge, or other density measuring device, at a minimum frequency of once per 1,500 feet of pavement.

3.8 **PROTECTION**

- A. Section 01 70 00 Execution and Closeout Requirements: Requirements for protecting finished Work.
- B. Immediately after placement, protect paving from mechanical injury until surface temperature is less than 160 degrees F.
- C. Keep sections of newly compacted asphalt concrete, which are to be covered by additional courses, clean until the successive course is laid.
- D. Do not dump embankment or base material directly on the pavement. Dress shoulders before placing the friction course on adjacent pavement.

SECTION 32 13 13

CONCRETE PAVING

PART 1 - GENERAL

1.1 SUMMARY

- A. Section Includes:
 - 1. Aggregate subbase.
 - 2. Concrete paving for:
 - a. Concrete sidewalks.
 - b. Concrete integral curbs and gutters.
 - c. Concrete parking areas and roads.
 - 3. Brick roads.
- B. Related Requirements:
 - 1. Section 31 23 23 Fill.
 - 2. Section 32 12 16 Asphalt Paving.

1.2 REFERENCE STANDARDS

- A. American Association of State Highway and Transportation Officials:
 - 1. AASHTO M324 Standard Specification for Joint and Crack Sealants, Hot Applied, for Concrete and Asphalt Pavements.
- B. American Concrete Institute:
 - 1. ACI 301 Specifications for Structural Concrete.
 - 2. ACI 304 Guide for Measuring, Mixing, Transporting, and Placing Concrete.
- C. ASTM International:
 - 1. ASTM A184 Standard Specification for Fabricated Deformed Steel Bar Mats for Concrete Reinforcement.
 - 2. ASTM A185 Standard Specification for Steel Welded Wire Fabric, Plain, for Concrete Reinforcement.
 - 3. ASTM A497 Standard Specification for Steel Welded Wire Fabric, Deformed, for Concrete Reinforcement.
 - 4. ASTM A615 Standard Specification for Deformed and Plain Billet-Steel Bars for Concrete Reinforcement.
 - 5. ASTM A706 Standard Specification for Low-Alloy Steel Deformed and Plain Bars for Concrete Reinforcement.
 - 6. ASTM A767 Standard Specification for Zinc-Coated (Galvanized) Steel Barsfor Concrete Reinforcement.
 - 7. ASTM A775 S Standard Specification for Epoxy-Coated Steel ReinforcingBars.

- 8. ASTM A884 Standard Specification for Epoxy-Coated Steel Wire and Welded Wire Reinforcement.
- 9. ASTM A934 Standard Specification for Epoxy-Coated Prefabricated Steel Reinforcing Bars.
- 10. ASTM C31 Standard Practice for Making and Curing Concrete Test Specimens in the Field.
- 11. ASTM C33 Standard Specification for Concrete Aggregates.
- 12. ASTM C39 Standard Test Method for Compressive Strength of Cylindrical Concrete Specimens.
- 13. ASTM C94 Standard Specification for Ready-Mixed Concrete.
- 14. ASTM C143 Standard Test Method for Slump of Hydraulic Cement Concrete.
- 15. ASTM C150 Standard Specification for Portland Cement.
- 16. ASTM C172 Standard Practice for Sampling Freshly Mixed Concrete.
- 17. ASTM C173 Standard Test Method for Air Content of Freshly Mixed Concrete by the Volumetric Method.
- 18. ASTM C231 Standard Test Method for Air Content of Freshly Mixed Concrete by the Pressure Method.
- 19. ASTM C260 Standard Specification for Air-Entraining Admixtures for Concrete.
- 20. ASTM C309 Standard Specification for Liquid Membrane-Forming Compounds for Curing Concrete.
- 21. ASTM C494 Standard Specification for Chemical Admixtures for Concrete.
- 22. ASTM C595 Standard Specification for Blended Hydraulic Cements.
- 23. ASTM C618 Standard Specification for Coal Fly Ash and Raw or Calcined Natural Pozzolan for Use as a Mineral Admixture in Concrete.
- 24. ASTM C979 Standard Specification for Pigments for Integrally Colored Concrete.
- 25. ASTM C989 Standard Specification for Ground Granulated Blast-Furnace Slag for Use in Concrete and Mortars.
- 26. ASTM C1017 Standard Specification for Chemical Admixtures for Use in Producing Flowing Concrete.
- 27. ASTM C1064 Standard Test Method for Temperature of Freshly Mixed Hydraulic-Cement Concrete.
- 28. ASTM C1116 Standard Specification for Fiber-Reinforced Concrete and Shotcrete.
- 29. ASTM C1315 Standard Specification for Liquid Membrane-Forming Compounds Having Special Properties for Curing and Sealing Concrete.
- 30. ASTM C1371 Standard Test Method for Determination of Emittance of Materials Near Room Temperature Using Portable Emissometers.
- 31. ASTM C1549 Standard Test Method for Determination of Solar Reflectance Near Ambient Temperature Using a Portable Solar Reflectometer.
- 32. ASTM D1751 Standard Specification for Preformed Expansion Joint Filler for Concrete Paving and Structural Construction (Non-extruding and Resilient Bituminous Types).
- 33. ASTM D1752 Standard Specification for Preformed Sponge Rubber and Cork Expansion Joint Fillers for Concrete Paving and Structural Construction.

- 34. ASTM D6690 Standard Specification for Joint and Crack Sealants, Hot Applied, for Concrete and Asphalt Pavements.
- 35. ASTM E408 Standard Test Methods for Total Normal Emittance of Surfaces Using Inspection-Meter Techniques.
- 36. ASTM E903 Standard Test Method for Solar Absorptance, Reflectance, and Transmittance of Materials Using Integrating Spheres.
- 37. ASTM E1918 Standard Test Method for Measuring Solar Reflectance of Horizontal and Low-Sloped Surfaces in the Field.
- 38. ASTM E1980 Standard Practice for Calculating Solar Reflectance Index of Horizontal and Low-Sloped Opaque Surfaces.

1.3 PRE-INSTALLATION MEETINGS

- A. Section 01 30 00 Administrative Requirements: Pre-installation meeting.
- B. Convene minimum one week prior to commencing work of this section.

1.4 SUBMITTALS

A. Section 01 33 00 - Submittal Procedures: Requirements for submittals.

B. Product Data:

1. Submit data on concrete materials, joint filler, admixtures, and curing compounds.

C. Design Data:

- 1. Submit concrete mix design for each concrete strength. Submit separate mix designs when admixtures are required for the following:
 - a. Hot and cold weather concrete work.
- 2. Identify mix ingredients and proportions, including admixtures.
- 3. Identify chloride content of admixtures and whether or not chloride was added during manufacture.
- D. Source Quality Control Submittals: Indicate results of factory tests and inspections.

1.5 QUALITY ASSURANCE

- A. Perform Work according to Perform Work according to ACI 325.9R (supplemented by sections 11r through 19r) and in accordance with Florida Department of Transportation Standard Specifications for Road and Bridge Construction (latest edition). Incase of conflict follow Florida Department of Transportation Standard Specifications for Road and Bridge Construction (latest edition).
- B. Obtain cementitious materials from same source throughout. If material shortage occurs alternate materials may be used in accordance with Florida Department of Transportation Standard Specifications for Road and Bridge Construction (latest edition).
- 1.6

QUALIFICATIONS

A. Manufacturer: Producer/Contractor specializing in manufacturing Products specified in this section with minimum five (5) years documented experience.
- B. Installer: Company specializing in performing work of this section with minimum five (5) years documented experience.
- 1.7 AMBIENT CONDITIONS
 - A. Section 01 50 00 Temporary Facilities and Controls: Ambient conditions control facilities for product storage and installation.
 - B. Do not place concrete when base surface temperature is less than 40 degrees F, or surface is wet or frozen.

PART 2 - PRODUCTS

- 2.1 AGGREGATE SUBBASE
 - A. Aggregate Subbase: As specified in Florida Department of Transportation Standard Specifications for Road and Bridge Construction (latest edition).
- 2.2 CONCRETE PAVING
 - A. Performance / Design Criteria:
 - 1. Pavement shall be designed for the intended service as shown on the Drawings in accordance with the Florida Department of Transportation Standard Specifications for Road and Bridge Construction (latest edition).
 - B. All concrete, reinforcement, and formwork shall conform to the Florida Department of Transportation Standard Specifications for Road and Bridge Construction (latest edition).
 - C. Brick roadways shall comply with the requirements of the City Standard DetailT-18.
- 2.3 FABRICATION
 - A. Fabricate reinforcing according to Florida Department of Transportation standards.
 - B. Form standard hooks for 180-degree bends, 90-degree bend, and seismic hooks as indicated on Drawings.
- 2.4 MIXES
 1. Concrete mix shall be in accordance with the Florida Department of Transportation Standard Specifications for Road and Bridge Construction (latest edition).
- 2.5 CONCRETE CURB AND GUTTER
 - A. Concrete curb and gutter shall be in accordance with Florida Department of Transportation Standard Specifications for Road and Bridge Construction (latest edition).
- 2.6 CONCRETE MATERIALS
 - A. Concrete:
 - 1. All concrete shall be Class I (Pavement) as specified in Florida Department of Transportation Standard Specifications for Road and Bridge Construction (latest

edition), Section 346, "Portland Cement Concrete".

- B. Forms:
 - 1. Description: Forms shall be either wood or metal.
 - 2. Forms shall be straight, free from warps or bends, and of sufficient strength and rigidity to resist the pressure of the concrete without distortion.
 - 3. Height: Equal to full depth of finished sidewalk.
 - 4. Flexible forms shall be used for all headers constructed on a radius.
- C. Steel Reinforcement:
 - 1. Deformed Reinforcing:
 - a. Steel: Comply with ASTM A615/A615M.
 - b. Yield Grade: 60 ksi.
 - c. Billet Bars: Deformed.
 - d. Finish: Uncoated.
 - 2. Deformed Bar Mats:
 - a. Description: Steel bars.
 - b. Comply with ASTM A184/A184M.
 - c. Fabrication: Comply with ASTM A615 or ASTM A706.
 - d. Yield Strength: 60 ksi.
 - e. Finish: Uncoated.
 - 3. Welded Plain-Wire Fabric:
 - a. Comply with ASTM A1064/A1064M.
 - b. Finish: Uncoated.
 - 4. Dowels:
 - a. Description: Plain steel bars.
 - b. Comply with ASTM A615.
 - c. Yield Strength: 60 ksi.
 - d. Length: As indicated on Drawings.
 - e. Ends: Square, with burrs removed.
 - f. Finish: Uncoated.
 - 5. Tie Wire:
 - a. Type: Annealed.
 - b. Minimum Size: 16 gauge.
 - c. Finish: Uncoated.
- D. Glass-Fiber Reinforcement:
 - 1. Description: Alkali-resistant, glass-fiber rovings specifically formulated for use in concrete.
 - 2. Length: Varying from 1-1/2 to 2 inches.
- 2.7 ACCESSORIES
 - A. Joint materials, curing compounds, liquid surface sealers, surface retarders, and joint sealers shall comply with Florida Department of Transportation Standard Specifications for Road and Bridge Construction (latest edition.)
- 2.8 SOURCE QUALITY CONTROL

- A. Section 014000 Quality Requirements: Testing and Inspection Services.
- B. Submit all proposed mix designs to appointed firm for review prior to commencement of Work.
- C. Tests on cement, aggregates, and mixes will be performed to ensure conformance with specified requirements.
- D. Test samples according to ACI 301.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Section 01 70 00 Execution and Closeout Requirements: Requirements for installation examination.
- B. Verify compacted subbase is dry and ready to support paving and imposed loads.
- C. Verify gradients and elevations of base are correct.

3.2 PREPARATION

- A. Section 01 70 00 Execution and Closeout Requirements: Requirements for installation preparation.
- B. Moisten (wet slightly) substrate to minimize absorption of water from fresh concrete.
- C. Coat surfaces of manhole, catch basin, and inlet frames with any oil to prevent bond with concrete paving.
- D. Notify Engineer minimum 48 hours prior to commencement of concreting operations.

3.3 INSTALLATION

- A. Base Course:
 - 1. Prepare base course according to Florida Department of Transportation Standard Specifications for Road and Bridge Construction (latest edition.)

B. Forms:

- 1. Place and secure forms and screeds to correct location, dimension, profile, and gradient.
- 2. Assemble formwork to permit easy stripping and dismantling without damaging concrete.
- C. Reinforcement:
 - 1. Place reinforcing as indicated on Drawings.
 - 2. Interrupt reinforcing at expansion joints.
 - 3. Place dowels to achieve paving and curb alignment as detailed.
 - 4. Provide doweled joints as shown on the Drawings

- 5. Repair damaged reinforcement finish to match shop finish.
- D. Placing Concrete:
 - 1. Place concrete according to Section 350 of the Florida Department of Transportation Standard Specifications for Road and Bridge Construction (latest edition).
 - 2. Ensure reinforcing, inserts, embedded parts, and formed joints are not disturbed during concrete placement.
 - 3. Place concrete continuously over the full width of the panel and between predetermined construction joints. Do not break or interrupt successive pours such that cold joints occur.
 - 4. Place concrete to pattern indicated.
- E. Joints
 - 1. Place expansion joints at 20 foot intervals unless otherwise shown. Align curb, gutter, and sidewalk joints.
 - 2. Place joint filler between paving components and building or other appurtenances. Recess top of filler 1/4 inch for sealant installation.
 - 3. Provide scored joints at 3 feet intervals between sidewalks and curbs, and between curbs and paving.
 - 4. Provide keyed joints as indicated.
 - 5. Seal joints as indicated on Drawings.
- F. Exposed Aggregate:
 - 1. Apply surface retarder where exposed aggregate finish is required.
 - 2. Wash exposed aggregate surface with clean water and scrub with stiff bristle brush exposing aggregate.
- G. Finishing:
 - 1. Concrete finish shall be as shown on the Drawings.
- H. Curing and Protection
 - 1. Immediately after placement, protect concrete from premature drying, excessively hot or cold temperatures, and mechanical injury.
 - 2. Maintain concrete with minimal moisture loss at relatively constant temperature for period necessary for hydration of cement and hardening of concrete.
- 3.4 TOLERANCES
 - A. Section 01 40 00 Quality Requirements: Tolerances.
 - B. Maximum Variation of Surface Flatness: 1/4 inch in 10 ft.
 - C. Maximum Variation from True Position: 1/4 inch.
- 3.5 FIELD QUALITY CONTROL
 - A. Section 01 40 00 Quality Requirements: Requirements for inspecting, testing.

- B. Perform field inspection and testing according to Florida Department of Transportation Standard Specifications for Road and Bridge Construction (latest edition.)
- C. Inspect reinforcing placement for size, spacing, location, support.
- D. Testing firm will take cylinders and perform slump, temperature, and air entrainment tests according to ACI 301.
- E. Strength Test Samples:
 - 1. Sampling Procedures: ASTM C172.
 - 2. Cylinder Molding and Curing Procedures: ASTM C31/C31M, cylinder specimens, standard cured.
 - 3. Sample concrete and make one set of three cylinders for every 50 cu yds or less of each class of concrete placed each day and for every 2,000 sf of surface area paving, as applicable.
 - 4. Make one additional cylinder during cold weather concreting, and field cure.
- F. Field Testing:
 - 1. Slump Test Method: ASTM C143.
 - 2. Air Content Test Method: ASTM C173/.
 - 3. Temperature Test Method: ASTM C1064.
 - 4. Measure slump and temperature for each compressive strength concrete sample.
 - 5. Measure air content in air entrained concrete for each compressive strength concrete sample.
- G. Cylinder Compressive Strength Testing:
 - 1. Test Method: ASTM C39.
 - 2. Test Acceptance: Florida Department of Transportation Standard Specifications for Road and Bridge Construction (latest edition).
 - 3. Test one (1) cylinder at 7 days.
 - 4. Test three (3) cylinders at 28 days.
 - 5. Dispose remaining cylinders when testing is not required.
- H. Maintain records of placed concrete items. Record date, location of pour, quantity, air temperature, and test samples taken.

3.6 **PROTECTION**

- A. Section 01 70 00 Execution and Closeout Requirements: Requirements for protecting finished Work.
- B. Immediately after placement, protect paving from premature drying, excessive hot or cold temperatures, and mechanical injury.
- C. Do not permit traffic over paving until75 percent design strength of concrete has been achieved.

- D. Line and Grade for Forms: 1/8 inch in any 10-foot-long section.
- 3.5 FIELD QUALITY CONTROL
 - A. Section 01 40 00 Quality Requirements: Requirements for inspecting and testing.
 - B. Inspection and Testing:
 - 1. Comply with Florida Department of Transportation standards.
 - 2. Cylinder Compressive Strength:
 - a. Comply with ASTM C39/C39M.
 - b. Acceptance: According to Florida Department of Transportation standards.
 - c. Dispose of remaining cylinders if testing is not required.
 - 3. Slump, Temperature, and Air Content:
 - a. Measure for each compressive-strength concrete sample.
 - b. Slump: Comply with ASTM C143.
 - c. Air Content: Comply with ASTM C173.
 - d. Temperature: Comply with ASTM C1064.
 - 4. Records:
 - a. Maintain records of placed concrete items.
 - b. Record date, location of pour, quantity, air temperature, and number of test samples taken.

3.6 **PROTECTION**

- A. Section 01 70 00 Execution and Closeout Requirements: Requirements for protecting finished Work.
- B. Immediately after placement, protect concrete from premature drying, excessively hot or cold temperatures, rain and flowing water, and mechanical injury.
- C. Do not permit traffic over paving until 75 percent design strength of concrete has been achieved.
- D. Damaged Concrete:
 - 1. Remove and reconstruct concrete that has been damaged for entire length between scheduled joints.
 - 2. Refinishing damaged portion is not acceptable.
 - 3. Dispose of damaged portions.

END OF SECTION

SECTION 32 17 23

PAVEMENT MARKINGS

PART 1 - GENERAL

1.1 SUMMARY

- A. Section Includes:
 - 1. Traffic lines and markings.
 - 2. Legends.
 - 3. Paint.
 - 4. Glass beads.
- B. Related Requirements:
 - 1. Section 32 12 16 Asphalt Paving.
 - 2. Section 32 13 13 Concrete Paving.
- 1.2 REFERENCE STANDARDS
 - A. American Association of State Highway and Transportation Officials:
 - 1. AASHTO M247 Standard Specification for Glass Beads Used in Pavement Markings.
 - B. ASTM International:
 - 1. ASTM D34 Standard Guide for Chemical Analysis of White Pigments.
 - 2. ASTM D126 Standard Test Methods for Analysis of Yellow, Orange, and Green Pigments Containing Lead Chromate and Chromium Oxide Green.
 - 3. ASTM D562 Standard Test Method for Consistency of Paints Measuring Krebs Unit (KU) Viscosity Using a Stormer-Type Viscometer.
 - 4. ASTM D711 Standard Test Method for No-Pick-Up Time of Traffic Paint.
 - 5. ASTM D713 Standard Practice for Conducting Road Service Tests on Fluid Traffic Marking Materials.
 - 6. ASTM D1301 Standard Test Methods for Chemical Analysis of White Lead Pigments.
 - 7. ASTM D1394 Standard Test Methods for Chemical Analysis of White Titanium Pigments.
 - 8. ASTM D1475 Standard Test Method for Density of Liquid Coatings, Inks, and Related Products.
 - 9. ASTM D1640 Standard Test Methods for Drying, Curing, or Film Formation of Organic Coatings.
 - 10. ASTM D2202 Standard Test Method for Slump of Sealants.
 - 11. ASTM D2371 Standard Test Method for Pigment Content of Solvent-Reducible Paints.

- 12. ASTM D2621 Standard Test Method for Infrared Identification of Vehicle Solids From Solvent-Reducible Paints.
- 13. ASTM D2743 Standard Practices for Uniformity of Traffic Paint Vehicle Solids by Spectroscopy and Gas Chromatography.
- 14. ASTM D4280 Standard Specification for Extended Life Type, Non-plowable, Raised Retroreflective Pavement Markers.
- 15. ASTM D4505 Standard Specification for Preformed Retroreflective Pavement Marking Tape for Extended Service Life.
- 1.3 SUBMITTALS
 - A. Section 01 33 00 Submittal Procedures: Requirements for submittals.
 - B. Product Data: Submit paint formulation for each type of paint.
 - C. Samples:
 - 1. Plates:
 - a. Submit four samples of each color of material.
 - b. Prepare two without glass beads and two with glass beads for each different batch of material.
 - c. After approval, Owner will retain these plates for field comparisons of applied paint.
 - 2. Paint:
 - a. Submit two one-gallon and four one-quart paint samples accompanied by properly executed test reports.
 - 3. Glass Beads: Submit samples according to AASHTO M247.
 - D. Manufacturer's Certificate: Certify that products meet or exceed specified requirements.
 - E. Test and Evaluation Reports: Indicate source and acceptance test results according to AASHTO M247.
 - F. Manufacturer Instructions:
 - 1. Submit instructions for application temperatures, eradication requirements, application rate, line thickness, type of glass beads, and bead embedment and application rate.
 - 2. Submit detailed instructions on installation requirements, including storage and handling procedures.
 - G. Source Quality-Control Submittals: Indicate results of factory tests and inspections.
 - H. Field Quality-Control Submittals: Indicate results of Contractor-furnished tests and inspections.

- I. Qualifications Statements:
 - 1. Submit qualifications for manufacturer and applicator.
 - 2. Submit manufacturer's approval of applicator.

1.4 QUALITY ASSURANCE

- A. Perform Work according to the following:
 - 1. Florida Department of Transportation Standard Specifications for Road and Bridge Construction (latest edition)
 - 2. Manual on Uniform Traffic Control Devices (MUTCD).
 - 3. Florida Building Code, "Chapter 11 Florida Accessibility Code for Building Construction."
 - 4. City of Ocala, "Standard Details for Traffic Pavement Markings."

1.5 QUALIFICATIONS

- A. Manufacturer: Company specializing in manufacturing products specified in this Section with minimum five (5) years of documented experience.
- B. Applicator: Company specializing in performing Work of this Section with minimum five (5) years of documented experience.

1.6 DELIVERY, STORAGE, AND HANDLING

- A. Section 01 60 00 Product Requirements: Requirements for transporting, handling, storing, and protecting products.
- B. Inspection: Accept materials on Site in manufacturer's original packaging and inspect for damage.

C. Storage:

- 1. According to manufacturer instructions.
- 2. Paint:
 - a. Invert containers several days prior to use if paint has been stored more than two months.
 - b. Minimize exposure to air when transferring paint.
 - c. Seal drums and tanks when not in use.

D. Protection:

- 1. Protect materials from moisture and dust by storing in clean, dry location remote from construction operations areas.
- 2. Provide additional protection according to manufacturer instructions.

1.7 AMBIENT CONDITIONS

- A. Section 01 50 00 Temporary Facilities and Controls: Requirements for ambient condition control facilities for product storage and installation.
- B. Do not apply materials if surface and ambient temperatures are outside temperature ranges required by paint product manufacturer.
- C. Do not apply exterior coatings during rain or snow if relative humidity is outside range required by paint manufacturer, or if moisture content of surfaces exceeds that required by paint manufacturer.
- D. Minimum Conditions: Do not apply paint if temperatures are expected to fall below 60 deg. F within 24 hours after application.
- E. Thermoplastic Compound: Do not apply unless pavement surface temperature is minimum 40 deg. F and rising.
- F. Maximum VOCs: Do not exceed limit required by State or Environmental Protection Agency.
- 1.8 WARRANTY
 - A. Section 01 70 00 Execution and Closeout Requirements: Requirements for warranties.
 - B. Furnish three-year manufacturer's warranty for pavement markings.

PART 2 - PRODUCTS

2.1 SPEED CUSHIONS

A. Installation of speed cushions shall be approved by the City Traffic Engineer in accordance with the City Traffic Hump Guidelines. Approved speed cushions shall be RubberForm's C-1010-1-K 78" x 80" with one arrow speed in accordance with the manufacturer specifications. Refer to City Standard Detail T-8. All speed cushions installation shall have signs and pavement markings in accordance with the MUTCD.

2.2 PAINTED PAVEMENT MARKINGS

- A. Furnish materials according to Florida Department of Transportation Standard Specifications for Road and Bridge Construction (latest edition).
- B. Performance and Design Criteria:
 - 1. Paint Adhesion: Adhere to road surface, forming smooth continuous film one minute after application.

- 2. Paint Drying: Tack free by touch as not to transfer by vehicle tires within two minutes after application.
- C. Paint:
 - 1. Traffic Paint shall be fast-dry water based in accordance with Section 971 of Florida Department of Transportation Standard Specifications for Road and Bridge Construction (latest edition.)
 - 2. Description: Ready mixed, conventional, fast-dry, waterborne traffic paints.
 - 3. Lead-free and nontoxic.
 - 4. Minimum Retroreflectance: 300 mcd/lx-m².
 - 5. Durability Rating: 6 or more, after in place for nine months.
 - 6. Properties:
 - a. Pigment Percent by Weight: Minimum 57%.
 - b. Vehicle Percent by Weight: Minimum 40%.
 - c. Volatile Organic Content: Maximum 150 g/L.
 - d. Minimum Density: 13.5 lb./gal.
 - e. Viscosity: 80 to 100 Kreb Units at 77 deg. F.
 - 7. Grind:
 - a. Fineness of Grind: 3 HS.
 - 8. Wet Film Thickness: Minimum 25 mils at 90 percent relative humidity and 72 deg. F or in accordance with the manufacturer's recommendation.
 - a. Comply with ASTM D1640/D1640M.
- D. Glass Spheres:
 - 1. Glass spheres shall be a single drop of Type 1 glass spheres in accordance with Section 971 of Florida Department of Transportation Standard Specifications for Road and Bridge Construction (latest edition.)
 - 2. Coating: Enhance embedment and adherence with paint.
- E. Thermoplastic Compound:
 - 1. Thermoplastic Compounds shall comply with Section 711 and Section 971 of Florida Department of Transportation Standard Specifications for Road and Bridge Construction (latest edition.)
- F. Raised Pavement Markers (RPM):
 - 1. Raised Pavement Markers shall be installed with lane lines, centerlines, and transitions on all public streets and roads.
 - 2. All RPMs shall be Class B in accordance with Section 706 and Section 970 of the Florida Department of Transportation Standard Specifications for Road and Bridge Construction (latest edition.)
 - 3. Blue RPMs shall be used for marking fire hydrant locations.
 - 4. RPMs shall be installed with the use of bituminous hot melt adhesive.
- 2.3 APPLICATION EQUIPMENT
 - A. Application equipment for all pavement markings shall be of the type and quality specified in the Florida Department of Transportation Standard Specifications for Road and Bridge Construction (latest edition.)

- 2.4 SOURCE QUALITY CONTROL
 - A. Section 01 40 00 Quality Requirements: Requirements for testing, inspection, and analysis.
 - B. Test and analyze traffic paints according to Florida Department of Transportation Standard Specifications for Road and Bridge Construction (latest edition).
 - C. Certificate of Compliance:
 - 1. If manufacturer is approved by authorities having jurisdiction, submit certificate of compliance indicating Work performed at manufacturer's facility conforms to Contract Documents.

PART 3 - EXECUTION

- 3.1 PREPARATION
 - A. Section 01 70 00 Execution and Closeout Requirements: Requirements for application preparation.
 - B. Do not apply paint to concrete surfaces until concrete has cured for 28 days.
 - C. Agitate paint for 1 to 15 minutes prior to application to ensure even distribution of pigment.
 - D. Maintenance and Protection of Traffic:
 - 1. Provide short-term traffic control as specified in Section 01 50 00 Temporary Facilities and Controls.
 - 2. Prevent interference with marking operations and prevent traffic on newly applied markings before dry.
 - 3. Maintain travel lanes between as directed by the Engineer.
 - 4. Maintain access to existing businesses, residences, and other properties requiring access.
 - E. Surface Preparation.
 - 1. Prepare surfaces according to Florida Department of Transportation Standard Specifications for Road and Bridge Construction (latest edition.)

3.2 DEMOLITION

- A. Existing thermoplastic or water base paint pavement markings shall be removed only by water blasting, grinding, or blacking-out the pavement marking with driveway sealant.
 - 1. Existing markings removed by grinding shall utilize the 'block or circle' method to avoid the shape of the old markings.
 - 2. The driveway sealant shall be provided with a three-year warranty.

- B. Repair pavement or surface damage caused by removal methods.
- C. Clean and repair existing, remaining, or reinstalled lines and legends.

3.3 APPLICATION

- A. Pavement Markings shall be applied as follows:
 - 1. All pavement markings shall be a minimum of 6-inch wide.
 - a. All pavement markings within City Rights-of-Way shall be Thermoplastic.
 - b. Pavement markings on private property may be either paint or Thermoplastic.
 - 2. Intersection Pavement Markings:
 - a. For typical pavement marking at intersections, refer to City Standard Detail T-9 & T-10.
 - b. All crosswalks shall be of the STANDARD OR SPECIAL EMPHASIS type, in accordance with Florida Department of Transportation Standard Specifications for Road and Bridge Construction (latest edition) Index No. 711-001.
 - 3. School Pavement Markings:
 - a. All school pavement markings shall conform to Florida Department of Transportation Standard Specifications for Road and Bridge Construction (latest edition) Index No. 711-001.
 - 4. ADA Pavement Markings:
 - All ADA pavement markings shall conform to the applicable provisions of the Florida Department of Transportation Standard Specifications for Road and Bridge Construction (latest edition) and Florida State Building Code 'Chapter 11 – Florida Accessibility Code for Building Construction'.
 - 5. Off-Street Parking Stall Pavement Markings:
 - a. Passenger car parking stalls shall comply with the following:
 - 1) ADA compliant parking stalls shall comply with the requirements of City Standard Detail T-11.
 - 6. On-Street Parking Pavement Markings:
 - a. All on-street parking pavement markings shall conform to the following:
 - 1) No parking is permitted within 15 feet of a fire hydrant. Refer to City Standard Details T-12 & T-13.
 - 2) No parking is permitted within 20 feet of a crosswalk.
 - 3) No parking is permitted within 30 feet of a traffic signal or traffic control sign (stop, yield, etc.).
 - 4) No parking is permitted within 50 feet of any railroad crossing.
 - 5) No parking is permitted in any alley, lane or other roadway that does not provide a minimum of 10 feet clearance.
- B. Application Rate:
 - 1. Application rates shall be in accordance with Florida Department of Transportation Standard Specifications for Road and Bridge Construction (latest edition) for each material being applied.
- C. Painting:
 - 1. Apply paint pneumatically, using guidelines and templates as necessary to control application.

- 2. Manually paint numbers, letters, and symbols.
- 3. Prevent splattering and overspray when applying markings.
- 4. Paint Guns: Simultaneously apply paint binder at uniform specified rates.
- 5. Dispense at ambient temperature.
- D. Reflective Media:
 - 1. Immediately follow paint application.
 - 2. Bead Guns:
 - a. Dispense glass beads simultaneously at specified rate.
 - b. Check guns by dispensing glass beads into gallon container for predetermined fixed period of time.
 - c. Verify weight of glass beads.
- E. Thermoplastic Compound:
 - 1. Place on dry pavement.
 - 2. Apply centerline, skip line, edge line, and other longitudinal type markings with mobile applicator.
 - 3. Place special markings, crosswalks, stop bars, legends, arrows, and similar patterns with portable applicator.
- F. Raised Pavement Markers:
 - 1. Align prefabricated markers and permanently fix in place by means of epoxy adhesives.
 - 2. Prior to applying adhesive, thoroughly clean area by water blasting and by compressed air.
- G. Dimensions and Locations: As indicated on Drawings.
- H. Installation Standards: Install Work according to Florida Department of Transportation Standard Specifications for Road and Bridge Construction (latest edition.)
- 3.4 TOLERANCES
 - A. Section 01 40 00 Quality Requirements: Requirements for tolerances.
 - B. Tolerances shall be in accordance with Florida Department of Transportation Standard Specifications for Road and Bridge Construction (latest edition.)
- 3.5 FIELD QUALITY CONTROL
 - A. Section 01 40 00 Quality Requirements: Requirements for inspecting and testing.
 - B. Inspect for incorrect location, insufficient thickness, line width, coverage, retention, uncured or discolored material, and insufficient bonding.

- C. Acceptance:
 - 1. Repair lines and markings which after application and curing do not meet following criteria:
 - a. Incorrect location.
 - b. Insufficient thickness, width, coverage, or retention.
 - c. Uncured or discolored material.
 - d. Insufficient bonding.

3.6 CLEANING

- A. Section 01 70 00 Execution and Closeout Requirements: Requirements for cleaning.
- B. Collect and legally dispose of residues from painting operations.
- 3.7 **PROTECTION**
 - A. Section 01 70 00 Execution and Closeout Requirements: Requirements for protecting finished Work.
 - B. Protect painted pavement markings from vehicular and pedestrian traffic until paint is dry and track free.
 - C. Unless material is track free at end of paint application convoy, use traffic cones to protect markings from traffic until track free.
 - D. If vehicle crosses a marking and tracks it, or if splattering or overspray occurs, eradicate affected marking and resultant tracking and apply new markings.
 - E. Follow manufacturer instructions or use minimum of 30 minutes of dry time.
 - F. Barrier cones are satisfactory protection for materials being dried.

3.8 MAINTENANCE

- A. Section 01 70 00 Execution and Closeout Requirements: Requirements for maintenance service.
- B. Provide service and maintenance of traffic paints for three years from date of Substantial Completion.

END OF SECTION

SECTION 32 31 13

CHAIN LINK FENCES AND GATES

PART 1 - GENERAL

1.1 SUMMARY

- A. Section Includes:
 - 1. Fence framework, fabric, and accessories.
 - 2. Excavation for post bases.
 - 3. Concrete foundation for posts.
 - 4. Manual gates and related hardware.
 - 5. Privacy slats.

1.2 REFERENCES

- A. ASTM International:
 - 1. ASTM A121 Standard Specification for Metallic-Coated Carbon Steel Barbed Wire.
 - 2. ASTM A123 Standard Specification for Zinc (Hot-Dip Galvanized) Coatings on Iron and Steel Products.
 - 3. ASTM A153 Standard Specification for Zinc Coating (Hot-Dip) on Iron and Steel Hardware.
 - 4. ASTM A392 Standard Specification for Zinc-Coated Steel Chain-Link Fence Fabric.
 - 5. ASTM A491 Standard Specification for Aluminum-Coated Steel Chain-Link Fence Fabric.
 - 6. ASTM A817 Standard Specification for Metallic-Coated Steel Wire for Chain-Link Fence Fabric and Marcelled Tension Wire.
 - 7. A1011/ Standard Specification for Steel, Sheet and Strip, Hot-Rolled, Carbon, Structural, High-Strength Low-Alloy, High-Strength Low-Alloy with Improved Formability, and Ultra-High Strength
 - 8. ASTM B429 Standard Specification for Aluminum-Alloy Extruded Structural Pipe and Tube.
 - 9. ASTM C94 Standard Specification for Ready-Mixed Concrete.
 - 10. ASTM F552 Standard Terminology relating to Chain Link Fencing.
 - 11. ASTM F567 Standard Practice for Installation of Chain-Link Fence.
 - 12. ASTM F626 Standard Specification for Fence Fittings.
 - 13. ASTM F668 Standard Specification for Polyvinyl Chloride (PVC) and Other Organic Polymer-Coated Steel Chain-Link Fence Fabric.
 - 14. ASTM F900 Standard Specification for Industrial and Commercial Swing Gates.
 - 15. ASTM F934 Standard Specification for Standard Colors for Polymer-Coated Chain Link Fence Materials.

- 16. ASTM F1043 Standard Specification for Strength and Protective Coatings on Metal Industrial Chain Link Fence Framework.
- 17. ASTM F1083 Standard Specification for Pipe, Steel, Hot-Dipped Zinc-Coated (Galvanized) Welded, for Fence Structures.
- ASTM F1183 Standard Specification for Aluminum Alloy Chain Link Fence Fabric.
- 19. ASTM F1184 Standard Specification for Industrial and Commercial Horizontal Slide Gates.
- 20. ASTM F1345 Standard Specification for Zinc 5% Aluminum Mischmetal Alloy-Coated Steel Chain-Link Fence Fabric.
- B. Chain Link Fence Manufacturers Institute:1. CLFMI Product Manual.
- 1.3 SYSTEM DESCRIPTION
 - A. Fence Height: as indicated on Drawings.
 - B. Line Post Spacing: At intervals not exceeding 10 feet.
 - C. Fence Post and Rail Strength: Conform to ASTM F1043 Light Industrial Fencequality.

1.4 SUBMITTALS

- A. Section 01 33 00 Submittal Procedures: Requirements for submittals.
- B. Shop Drawings: Indicate plan layout, spacing of components, post foundation dimensions, hardware anchorage, gates, and schedule of components.
- C. Product Data: Submit data on fabric, posts, accessories, fittings and hardware.
- D. Samples: Submit two 12x12 inch samples of fence fabric.
- E. Manufacturer's Installation Instructions: Submit installation requirements.

1.5 CLOSEOUT SUBMITTALS

- A. Section 01 70 00 Execution and Closeout Requirements: Closeout procedures.
- B. Project Record Documents: Accurately record actual locations of property perimeter posts relative to property lines and easements.
- C. Operation and Maintenance Data: Procedures for submittals.

1.6 QUALITY ASSURANCE

- A. Perform Work according to Florida Department of Transportation Standard Specifications for Road and Bridge Construction (latest edition.)
- 1.7 QUALIFICATIONS
 - A. Manufacturer: Company specializing in manufacturing Products specified in this section with minimum five (5) years of documented experience.
 - B. Installer: Company specializing in performing work of this section with minimum five (5) years of documented experience.

1.8 DELIVERY, STORAGE AND HANDLING

- A. Section 01 60 00 Product Requirements: Requirements for transporting, handling, storing, and protecting products.
- B. Deliver fence fabric and accessories in packed cartons or firmly tied rolls.
- C. Identify each package with manufacturer's name.
- D. Store fence fabric and accessories in secure and dry place.

PART 2 - PRODUCTS

2.1 MATERIALS AND COMPONENTS

A. Materials and Components: Conform to Florida Department of Transportation Standard Specifications for Road and Bridge Construction (latest edition.)

2.2 COMPONENTS

A. Line posts, corner and terminal posts, gate posts, top and brace rails, gate frames, fabric, tension wires, tension bands, tension straps and tire wire shall be in accordance with Florida Department of Transportation Standard Specifications for Road and Bridge Construction (latest edition.)

2.3 ACCESSORIES

A. Caps, fittings, extension arms, and gate hardware shall be in accordance with Florida Department of Transportation Standard Specifications for Road and Bridge Construction (latest edition.)

2.4 GATES

- A. General:
 - 1. Gate Types, Opening Widths and Directions of Operation: As indicated on Drawings.
 - 2. Factory assemble gates.
 - 3. Gates shall conform to Florida Department of Transportation Standard Specifications for Road and Bridge Construction (latest edition.)
- 2.5 FINISHES
 - A. Chain link fencing finishes shall be in accordance with Florida Department of Transportation Standard Specifications for Road and Bridge Construction (latest edition.)

PART 3 - EXECUTION

- 3.1 INSTALLATION
 - A. Install framework, fabric, accessories and gates according to Florida Department of Transportation Standard Specifications for Road and Bridge Construction (latest edition.)
 - B. Set intermediate, terminal, and gate posts plumb, in concrete footings with top of footing 2 inches above finish grade. Slope top of concrete for water runoff.
 - C. Line Post Footing Depth Below Finish Grade: As shown on the Drawings.
 - D. Corner, Gate and Terminal Post Footing Depth Below Finish Grade: As shown on the Drawings.
 - E. Brace each gate and corner post to adjacent line post with horizontal center brace rail and diagonal truss rods. Install brace rail one bay from end and gate posts.
 - F. Install top rail through line post tops and splice with 6-inch long rail sleeves.
 - G. Install center and bottom brace rail on corner gate leaves.
 - H. Place fabric on outside of posts and rails.
 - I. Stretch fabric between terminal posts or at intervals of 100 feet maximum, whichever is less.
 - J. Position bottom of fabric 2 inches above finished grade.

- K. Fasten fabric to top rail, line posts, braces, and bottom tension wire with tie wire at maximum 15 inches on centers.
- L. Attach fabric to end, corner, and gate posts with tension bars and tension bar clips.
- M. Install bottom tension wire stretched taut between terminal posts.
- N. Install support arms sloped outward and attach barbed wire; tension and secure.
- O. Support gates from gate posts. Do not attach hinged side of gate from building wall.
- P. Install gate with fabric and barbed wire overhang to match fence. Install three hinges on each gate leaf.
- Q. Connect to existing fence as shown on the Drawings.
- R. Install posts with 6 inches maximum clear opening from end posts to buildings, fences and other structures.
- S. Excavate holes for posts to diameter and spacing indicated on Drawings without disturbing underlying materials.
- T. Center and align posts. Place concrete around posts, and vibrate or tamp for consolidation. Verify vertical and top alignment of posts and make necessary corrections.
- U. Extend concrete footings 2 inches above grade, and trowel, forming crown to shed water.
- V. Allow footings to cure minimum 7 days before installing fabric and other materials attached to posts.
- 3.2 ERECTION TOLERANCES
 - A. Section 01 40 00 Quality Requirements: Tolerances.
 - B. Maximum Variation From Plumb: 1/4 inch.
 - C. Maximum Offset From Indicated Position: 1 inch.
 - D. Minimum distance from property line: 6 inches.

END OF SECTION

SECTION 32 92 19 SODDING & SEEDING

PART I-GENERAL 1.1 SUMMARY

- A. The requirements for seeding and sodding shall conform and be governed by the latest Florida Department of Transportation Standard Specifications for Road and Bridge Construction (latest edition) section 570 for Performance Turf with the following exceptions and clarifications for specific portions of that specification. Unless otherwise specified in the project bid documents, seeding and sodding is considered incidental to the project and is to be included in the pay item for pipe or roadway measurement and payment item.
- 1.2 Replace Florida Department of Transportation Standard Specifications for Road and Bridge Construction (latest edition) Specification 570-1 Description with the following:
 - A. Establish a growing, healthy turf over all areas designated in the Plans within 90 days of finished construction. Use sod in areas designated in the Plans to be sodded. Use seed, hydroseed, bonded fiber matrix, or sod in all other areas. Maintain performance turf areas until final acceptance of all Contract work.
- 1.3 Florida Department of Transportation Standard Specifications for Road and Bridge Construction (latest edition) Specification 570-3 Construction Methods Modified as follows.
 - A. Replace 570-3.1 General with the following: Remove all construction debris in performance turf areas. Install performance turf at the earliest practical time for erosion control and establishment. Shape the areas to be planted to the plan typical sections and lines and grade shown in the Plans. All of the permanent performance turf material shall be in place prior to final acceptance. The City will only pay for replanting as necessary due to factors determined by the Engineer to be beyond control of the Contractor. Install all performance turf on shoulder areas prior to the placement of the friction course on adjacent pavement.
 - B. Replace 570-3.2 Seeding with the following: Seed must produce visible seedlings within 45 days of planting. Use of compost meeting the requirements of Section 987 as mulch is acceptable unless otherwise specified.
 - C. Replace 570-3.3 Sod with the following: Place the sod on the prepared surface, with edges in close contact. Do not use sod which has been cut for more than 48 hours. Place the sod to the edge of all landscape areas as shown in the Plans and the Standard Plans. Place rolled sod parallel with the roadway and cut any exposed netting even with the sod edge. Monitor placed sod for growth of exotic or invasive pest plants and noxious weeds. If exotic or invasive pest plants and/or noxious weeds manifest themselves within 30 days of placement of the sod during the months April through October, within 60 days of placement of the sod during the months of November through March treat affected areas by means acceptable to the City at no expense to the City. If pest plants and/or noxious weeds manifest themselves after the time frames described above from date of placement of sod, the Engineer, at his sole option, will determine if treatment is required and whether the Contractor will be compensated (through change orders) for such treatment.

- D. Replace 570-3.4 Hydroseeding with the following: Use equipment specifically designed for mixing the mulch, seed, fertilizer, tackifier and dye, and applying the slurry uniformly over the areas to be hydroseeded. Use mulch that does not contain reprocessed wood or paper fibers. Mix fertilizer as required into the hydroseeding slurry. Ensure that the dye does not contain growth or germination inhibiting chemicals. When polyacrylamide is used as part of hydroseeding mix, only anionic polymer formulation with free acrylamide monomer residual content of less than 0.05% is allowed. Cationic polyacrylamide shall not be used in any concentration. Do not spray polyacrylamide containing mixtures onto pavement. These may include tackifiers, flocculants or moisture-holding compounds.
- 1.4 Replace Florida Department of Transportation Standard Specifications for Road and Bridge Construction (latest edition) Specification 570-4 Turf Establishment with the following:
 - A. Perform all work necessary, including watering and fertilizing, to sustain an established turf, free of noxious weeds, at no additional expense to the City. Provide the filling, leveling, and repairing of any washed or eroded areas, as necessary. Established turf is defined as follows:
 - 1. An established root system (leaf blades break before seedlings or sod can be pulled from the soil by hand).
 - 2. No bare spots larger than one square foot.
 - 3. No continuous sod seams running perpendicular to the face of the slope.
 - 4. No deformation of the performance turf areas caused by mowing or other Contractor equipment.
 - 5. No exposed sod netting.
 - 6. No competing vegetation, exotic or invasive pest plants or noxious weeds.

Monitor turf areas and remove all competing vegetation, exotic or invasive pest plants, and noxious weeds (as listed by the Florida Exotic Pest Plant Council, Category I "List of Invasive Species", Current Edition, https://www.fleppc.org). Remove such vegetation regularly by manual, mechanical, or chemical control means, as necessary. When selecting herbicides, pay particular attention to ensure use of chemicals that will not harm desired turf or wildflower species. Use herbicides in accordance with Florida Department of Transportation Standard Specifications for Road and Bridge Construction (latest edition) Specification 7-1.7.

If at the time that all other work on the project is completed, but all turf areas have not met the requirements for established turf set forth in Florida Department of Transportation Standard Specifications for Road and Bridge Construction (latest edition) Specification 570-4, continuously maintain all turf areas until the requirements for established turf set forth in Florida Department of Transportation Standard Specifications for Road and Bridge Construction (latest edition) Specification 570-4 have been met.

During establishment and until the performance turf is established in accordance with this Section, continue the inspection, maintenance, and documentation of erosion and

sedimentation control items in accordance with Florida Department of Transportation Standard Specifications for Road and Bridge Construction (latest edition) Specification Section 104. Remove and dispose of all erosion and sedimentation control items after the performance turf has been established.

Notify the Engineer, with a minimum of seven calendar days advance notice, to conduct inspections of the performance turf at approximate 90-day intervals during the establishment period to determine establishment. Results of such inspections will be made available to the Contractor within seven calendar days of the date of inspection. Determination of an established turf will be based on the entire project and not in sections.

Upon the determination by the Engineer that the requirements of Florida Department of Transportation Standard Specifications for Road and Bridge Construction (latest edition) Specification 570-4 have been met and an established turf has been achieved and all erosion and sedimentation control items have been removed, the Engineer will release the Contractor from any further responsibility provided for in this Specification.

The Contractor's establishment obligations of this specification will not apply to deficiencies due to the following factors, if found by the Engineer to be beyond the control of the Contractor, his subcontractors, vendors or suppliers:

- 1. Determination that the deficiency was due to the failure of other features of the Contract.
- 2. Determination that the deficiency was the responsibility of a third-party performing work not included in the Contract or its actions.

The City will only pay for replanting as necessary due to factors determined by the City to be beyond the control of the Contractor.

- 1.5 Replace Florida Department of Transportation Standard Specifications for Road and Bridge Construction (latest edition) Specification 570-9 Basis of Payment with the following:
 - A. Payment for this item shall be per specification 01 22 00 for Measurement and Payment which states that unless provided by specific bid items in the Schedule of Prices Bid, the work covered in this section shall be considered incidental or appurtenant and no measurement or payment will be made.
 - B. If the project specific schedule of prices bid specify a separate item for work covered under this section, then payment will be made under that pay item on a per square yard basis.

END OF SECTION

SECTION 02000{PRIVATE} CONSTRUCTION LAYOUT AND TOPOGRAPHIC AS-BUILT SURVEY

PART 1 - GENERAL

1.1 **DESCRIPTION**

The work covered by this section includes:

- A. Verification Survey: Surveying engineer provided benchmarks and control points and performing spot checks on pavements and grades (cut or fill). Surveyor has the responsibility of reporting any known problems or discrepancies in field data. The Engineer has established control points for the Contractor. The Contractor shall take all necessary precautions to prevent the loss or damage of primary control points.
- **B. Construction Staking:** Involves the establishment of horizontal alignment and vertical alignments, proposed grades on all pipes, foundations, pavement markings, and slopes. If identified in the plan sheet notes or scope of work, the surveyor may be required to verify milled surface elevations for contractor or engineer to develop a pavement overlay plan or establish areas of pavement leveling. Surveyor may also be required to perform approach surveys or obstruction surveys for the installation of new airfield navigational aids.

Contractor shall establish a sufficient number of benchmarks and cut/fill stakes for the engineer's instrument and/or visual checking.

As-built topographic survey shall be provided to the engineer with closeout documents. Limits of As-Built shall be the project limits or the construction limits as identified on the plans. When no projects are indicated on the drawings, the contractor shall assume the limits to include all disturbed areas.

PART 2 - PRODUCTS (Not Used)

PART 3 - EXECUTION

- **3.1** Topographic survey for controlling milling depths, leveling and asphalt overlay thicknesses shall be on a grid spacing that can be easily followed either by electronic grade control measures or establishing stringlines for the contractors machines to follow. If the engineer deems proper control is not being maintained, he has the authority to instruct the contractor to decrease the topographic grid spacing and provide tighter controls on the vertical work without additional compensation to the contractor.
- **3.2** Since accurate topographic as-built information is required for closing out all stormwater permits, for the owners Airport Layout Plan, and for engineers general verification of finished grades, the contractor shall be required to provide as-built topographic surveys signed and sealed by a registered surveyor in the State of Florida. When the project is substantially complete, the contractor shall begin the field survey work for as-built drawings. As-built topographic survey shall include all above ground features within the project area with special focus on the following:

- 1. Horizontal and vertical locations of underground utilities (water, sewer, power, etc.), conduits, handholes, pull boxes, hydrants and other various appurtenances, referenced to established project datum and coordinate system (state plane most likely). Sewer lines must have all inverts and pipe slopes labeled. Label all pipe and conduit sizes.
- 2. All pavements at an acceptable grid to verify pavement cross slopes and longitudinal grades.
- **3.** All ponds at an acceptable grid to accurately calculated pond volumes for permit as built certifications to be submitted by the engineer.
- 4. Ground elevations at an acceptable grid to verify earthwork volumes.
- 5. Painted centerlines and edges. Label radii.
- **6.** Storm drainage system construction:
 - **a.** Exact distance between all catch basins, manholes, points of intersection, and line terminals or headwalls.
 - **b.** The invert elevation of the end of all pipes, stubouts, and headwalls.
 - **c.** The rim (top of frame) or top of grate and invert elevations of all manholes, catch basins, and other structures.
 - d. Elevation and size of all weirs, orifices, and skimmers.
- 7. Finished floor elevations.
- 8. Sign sizes and text.
- 9. Electrical construction identification:
 - **a.** Exact distance between all manholes and points of intersection.
 - **b.** Exact size and location of duct bank or cable run and what circuits it feeds.
 - c. Exact location of any lines abandoned in place.
 - **d.** Exact location, type, and size of runway and taxiway edge lights, centerline lights, and/or touchdown zone lights.
 - e. Rim and invert elevation of all manholes and duct banks.
 - **f.** Depth of cover on direct burial lines.
 - g. Locations of cable splices.
- **10.** Finished floor elevations.
- **11.** Street sign and airfield guide signs and text descriptions.
- **12.** Water and Sewer in accordance with notes on utility plans.
- **13.** All horizontal control shall be in accordance with state statutes but no greater than tenth of a foot for horizontal data and one-hundredth of a foot for vertical.
- 14. Set one (1) Concrete Benchmark and document location and elevation data.

All documents provided to the engineer must be submitted by a licensed professional survey in the **State of Florida**. Sealed drawings and original signatures shall be provided when requested. Electronic files in AutoCAD format shall also be sent to the engineer at his request.

3.3 PAYMENT:

A. The contractor shall be eligible for partial payments of the **lump sum** item, Construction Layout and Topographic As-Built Survey. Payment will be made based on the percent complete of the dollar amount of the contract.

END OF SECTION 02000

Item S-100

FDOT Standard Specifications

The construction details which will govern the prosecution of the work as set out in the proposal and/or shown on the plans shall conform in their entirety to Divisions II and III of the Florida Department of Transportation Standard Specification for Road and Bridge Construction, latest edition, including all FDOT Supplements and as modified hereinafter. The construction details contained in the Divisions which are not required to accomplish the work set out in proposal and/or shown on the plans will have no application to these specifications.

In the event of any conflict(s) between the Contract Documents and the FDOT Standard Specifications, the precedence in resolving such conflict(s) shall be as follows:

- 1. Bidding and Contract requirements, and Technical Specifications for the East Employee Parking Lot Project as located in this bid package shall govern over FDOT Bid and Contract Requirements.
- 2. Greater quantities shall govern over lesser.
- 3. Higher quality and/or more stringent requirements as adjudged by the Engineer shall govern over lesser.

Where FDOT Specifications refer to the "Engineer", "Engineer of Tests", or "Division of Tests", it shall be understood to mean the Engineer of the Owner as stated in the CONTRACT.

These standard specifications can be obtained from the Florida Department of Transportation at http://www.dot.state.fl.us/programmanagement/specs.shtm or call Area Code (850) 414-4130.

Specifications pertinent to this project from the Standard Specifications for Road and Bridge Construction are as follows:

FDOT Section	Description
101	Mobilization
102	Maintenance of Traffic
104	Prevention, Control and Abatement of Erosion and Water Pollution
105	Contractor Quality Control General Requirements
110	Clearing and Grubbing
120	Excavation and Embankment
160	Stabilizing
230	Limerock Stabilized Base
300	Prime and Tack Coat
320	Hot Mix Asphalt- Plant Methods and Equipment
330	Hot Mix Asphalt – General Construction Requirements
334	Superpave Asphalt Concrete
350	Cement Concrete Pavement
425	Inlets, Manholes, and Junction Boxes
430	Pipe Culverts
449	Precast Concrete Drainage Products
550	Fencing
570	Performance Turf

700	Highway Signing
706	Raised Pavement Markers and Marker Adhesive
711	Thermoplastic Pavement Markings

FDOT Drawing	Description
102-600	Quick Reference Guide – 102 Series Tables
102-602	Teo-Lane and Multilane, Work on Shoulder
102-613	Multilane Roadway, Lane Closures
102-620	Multilane Roadway, Temporary Diversion

Specification sections not specified above but cross-referenced in the above individual sections are also included herewith and made a part of these Contract Documents.

Method of measurement and basis of payment for material and work performed in conformance with the above specifications shall be as indicated on the BID SCHEDULE. The unit cost bid shall be full compensation for labor, equipment, materials and incidentals necessary to complete the work in conformance with the Plans and Specifications to the satisfaction of the Owner. Incidentals include, but are not limited to, items which have specific DOT bid item numbers in the referenced specifications but are not included in the Bid Schedule.

SECTION 33 01 10.58

DISINFECTION OF WATER UTILITY PIPING SYSTEMS

PART 1 - GENERAL

1.1 SUMMARY

- A. The Contractor shall disinfect all parts of the Work, including but not being limited to: pipe, fittings, joints, valves, hydrants, service lines and any other incidentals and appurtenances.
- B. Section Includes:
 - 1. Disinfection of potable water distribution system.
 - 2. Testing and reporting of results.
- C. Related Requirements:
 1. Section 33 14 13 Public Water Utility Distribution Piping.

1.2 REFERENCE STANDARDS

- A. American Water Works Association:
 - 1. AWWA B300 Hypochlorites.
 - 2. AWWA C651 Disinfecting Water Mains.

1.3 SUBMITTALS

- A. Section 01 33 00 Submittal Procedures: Requirements for submittals.
- B. Disinfection Procedure:
 - 1. Submit description of procedure, including type of disinfectant and calculations indicating quantities of disinfectants required to produce specified chlorine concentration.
- C. Product Data: Submit manufacturer information for proposed chemicals and treatment doses.
- D. Manufacturer's Certificate: Certify that products meet or exceed specified requirements.
- E. Certify that final water complies with disinfectant quality standards of Florida Department of Environmental Protection.
- F. Test and Evaluation Reports: Indicate testing results comparative to specified requirements.
- G. Field Quality-Control Submittals: Indicate results of Contractor-furnished tests and

inspections.

- H. Qualifications Statements:1. Submit qualifications for manufacturer and applicator.
- 1.4 CLOSEOUT SUBMITTALS
 - A. Section 01 70 00 Execution and Closeout Requirements: Requirements for submittals.
 - B. Disinfection Report:
 - 1. Type and form of disinfectant used.
 - 2. Date and time of disinfectant injection start and completion.
 - 3. Test locations.
 - 4. Name of person collecting samples.
 - 5. Initial and 24-hour disinfectant residuals in treated water in ppm for each outlet tested.
 - 6. Date and time of flushing start and completion.
 - 7. Disinfectant residual after flushing for each outlet tested.

1.5 QUALITY ASSURANCE

- A. Perform Work according to AWWA C651 and Florida Department of Environmental Protection standards.
- 1.6 QUALIFICATIONS
 - A. Manufacturer: Company specializing in manufacturing products specified in this Section with minimum five (5) years of documented experience.
 - B. Company specializing in performing Work of this Section with minimum five (5) years of documented experience.

PART 2 - PRODUCTS

2.1 DISINFECTION CHEMICALS

- A. Chemicals:
 - 1. Hypochlorite: Comply with AWWA B300.
 - 2. The use of chlorine tablets shall not be allowed.

PART 3 - EXECUTION

- 3.1 EXAMINATION
 - A. Section 01 70 00 Execution and Closeout Requirements: Requirements for installation examination.

Exhibit D - Technical Specifications OCF - OCALA NORTH DEVELOPMENT ROAD DESIGN

- B. Verify that piping system has been cleaned, inspected, and pressure tested.
- C. Verify that access fittings have been installed under Section 33 14 13 Public Water Utility Distribution Piping.
- D. Perform scheduling and disinfecting activity with startup, water pressure testing, adjusting and balancing, and demonstration procedures, including coordination with related systems.
- 3.2 DISINFECTION
 - A. Provide required equipment to perform Work of this Section.
 - B. Disinfect pipeline installation according to AWWA C651.
 1. Maintain minimum 10 ppm residual after a contact period of not less than 24 hours.
 - C. Upon completion of retention period required for disinfection, flush pipeline until chlorine concentration in water leaving pipeline does not exceed 0.2 ppm.
 - D. Replace permanent system devices that were removed for disinfection.
 - E. Legally dispose of chlorinated water.
- 3.3 SAMPLING AND TESTING
 - A. Bacteriological Testing:
 - 1. After disinfection, samples of water for bacteriological analysis shall be collected and tested by an independent testing laboratory approved by the State of Florida and the Engineer.
 - 2. The Contractor shall employ an independent company, specializing in water sampling to collect the sample(s).
 - 3. Water being collected for testing shall not have chlorine residual higher than is normally maintained in other parts of the distribution system.
 - 4. Sworn certificates, in triplicate, of the tests shall be submitted to the Engineer.
 - 5. Samples shall be taken on two (2) consecutive days and in the presence of and as directed by the Engineer or as required by the Florida Department of Environmental Protection.
 - 6. All test results shall be submitted to the Florida Department of Environmental Protection for approval.
 - 7. Should these samples or subsequent samples prove to be unsatisfactory, the piping shall be disinfected until satisfactory samples are obtained.

END OF SECTION 33 01 10.58

SECTION 33 01 30.11

TELEVISION INSPECTION OF SEWERS

PART 1 - GENERAL

1.1 SUMMARY

- A. Section Includes:
 - 1. Pipeline flushing and cleaning.
 - 2. Television inspection of sewer pipelines.
 - 3. Audio-video recording of pipeline interior.
- B. Related Requirements:
 - 1. Section 01 50 00 Temporary Facilities and Controls.
 - 2. Section 33 31 11 Public Sanitary Sewerage Gravity Piping.
- 1.2 COORDINATION
 - A. Section 01 30 00 Administrative Requirements: Requirements for coordination.
 - B. Coordinate Work of this Section with Owner and Engineer.
- 1.3 SCHEDULING
 - A. Section 01 30 00 Administrative Requirements: Requirements for scheduling.
 - B. Furnish Work schedule for periods of time when sewer piping section is out of service.
- 1.4 SEQUENCING
 - A. Section 01 10 00 Summary: Requirements for sequencing.

1.5 SUBMITTALS

- A. Section 01 33 00 Submittal Procedures: Requirements for submittals.
- B. Portable Hard Drive:
 - 1. Submit portable hard drive with color video files and pipe inspection reports.
 - 2. Portable hard drive shall become property of Owner.
- C. Inspection Logs:
 - 1. Submit cleaning and television inspection logs for each section of sewer line to be constructed.
 - 2. Inspection Logs shall be coded per PACP standards and shall include, but may not be limited to the following information:
 - a. Stationing and location of lateral services, wyes, or tees.

Exhibit D - Technical Specifications OCF - OCALA NORTH DEVELOPMENT ROAD DESIGN

- b. Date and clock time references.
- c. Pipe joints.
- d. Infiltration/inflow defects.
- e. Cracks.
- f. Leaks.
- g. Offset joints.
- h. Obstructions.
- D. Submit specific detailed description of proposed bypass pumping system, including written description of plan addressing schedule, quantity, capacity, and location of pumping equipment.
- E. Submit spill plan to address any spills that might occur.
- F. Field Quality-Control Submittals: Indicate results of Contractor-furnished tests and inspections.
- G. Qualifications Statement:1. Submit qualifications for pipeline inspector.
- 1.6 QUALITY ASSURANCE
 - A. Perform Work according to Florida Department of Environmental Protection standards.
- 1.7 QUALIFICATIONS
 - A. Company specializing in performing Work of this Section with minimum five (5) years of documented experience.
 - B. The Contractor shall always employ a Pipeline Assessment and Certification Program (PACP) certified inspector during the Work.
 - 1. Submit evidence of current PACP certification.
 - C. The Contractor's field technicians shall be certified for Confined Space Entry as defined in OSHA regulations, 29CFR1910 and all amendments.
 - 1. The Contractor shall provide evidence of OSHA 10- or 30-hour Confined Space Entry certification for all field technicians.
- PART 2 PRODUCTS

2.1 CCTV EQUIPMENT

- A. CCTV System:
 - 1. The Contractor shall utilize CCTV system that is complete with closed circuit television camera, monitor, and computer system with video capture card or specialized video recording equipment capable of pausing and resuming live recordings, capable of entering a manhole cover with a minimum 18-inch diameter clearance, and all necessary equipment for successful completion of television inspection.

OCF - OCALA NORTH DEVELOPMENT ROAD DESIGN

- 2. The camera, monitor, and other components of the CCTV system shall be capable of producing a minimum 460-line resolution video.
- 3. The Contractor shall have capabilities to perform inspections as specified in areas where vehicle access to manholes is limited.
- B. Pipe Inspection Camera:
 - 1. Pipe Inspection Camera shall be designed for inspection of sanitary sewerpipes.
 - 2. Camera shall have pan and tilt capabilities:
 - a. Pan: 275 degrees.
 - b. Tilt: 360 degrees.
 - 3. The camera shall be solid-state color with remote control of pan and tilt functions.
 - 4. Cameras incorporating mirrors for viewing sides or using exposed rotating heads are not acceptable.
 - 5. The camera shall be capable of displaying on the video the City name, project name, Contractor name, date, pipe size and material, and line identification number. Information shall be shown at the beginning of the recording but shall not proceed throughout the recording.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Section 01 70 00 Execution and Closeout Requirements: Requirements for application examination.
- B. Verify location of sewer pipelines to be inspected.

3.2 PREPARATION

- A. Section 01 70 00 Execution and Closeout Requirements: Requirements for application preparation.
- B. Flush and clean pipeline to remove sludge, dirt, sand, stone, grease, and other materials to ensure clear view of interior conditions.
- C. Debris:
 - 1. Intercept flushed debris at next downstream manhole using weir or screening device.
 - 2. Remove and dispose of debris off Site and in accordance with all applicable regulations.
- D. Bypassing: NOT USED.

3.3 APPLICATION

- A. Closed-Circuit Television (CCTV) Camera System:
 - 1. Use cameras specifically designed and constructed for closed-circuit sewer line inspection.

Exhibit D - Technical Specifications OCF - OCALA NORTH DEVELOPMENT ROAD DESIGN

- 2. Use camera capable of moving both upstream and downstream with minimum 1,000 feet horizontal distance within one setup and using direct-reading cable position meter.
- B. Pipeline Inspection:
 - 1. Video record sections of sewer pipeline between designated manholes.
 - 2. Identify and record locations of flat grades, dips, deflected joints, open joints, broken pipe, protrusions into pipeline, and points of infiltration.
 - 3. Locate and record service connections.
 - 4. Record locations of pipeline defects, connection horizontal distance in feet, and direction from manholes.
 - 5. Video-record with pipe section plugged to view 100 percent of pipe ID.
- C. The Contractor shall utilize PACP coding methods for assessment of the pipe(s) and preparation of the inspection report(s).
- 3.4 FIELD QUALITY CONTROL
 - A. Section 01 70 00 Execution and Closeout Requirements: Requirements for testing, adjusting, and balancing.

END OF SECTION 33 01 30.11

SECTION 33 05 05.31

HYDROSTATIC TESTING

PART 1 - GENERAL

1.1 SUMMARY

- A. Section Includes: Hydrostatic testing of pressure piping.
- B. Related Requirements:
 - 1. Section 33 31 23 Sanitary Sewerage Force Main Piping.
 - 2. Section 33 14 13 Public Water Utility Distribution Piping.

1.2 REFERENCE STANDARDS

- A. American Water Works Association:
 - 1. AWWA C600 Installation of Ductile-Iron Water Mains and Their Appurtenances.
 - 2. AWWA C605 Underground Installation of Polyvinyl Chloride (PVC) and Molecularly Oriented Polyvinyl Chloride (PVCO) Pressure Pipe and Fittings

1.3 SUBMITTALS

A. Section 01 33 00 - Submittal Procedures: Requirements for submittals.

B. Submit following items prior to start of testing:

- 1. Testing procedures.
- 2. List of test equipment.
- 3. Testing sequence schedule.
- 4. Provisions for disposal of flushing and test water.
- 5. Certification of test gage calibration.
- C. Test and Evaluation Reports: Indicate results of piping tests.
- D. Qualifications Statement:
 - 1. Submit qualifications field personnel responsible for supervising hydrostatic testing.
- 1.4 QUALITY ASSURANCE
 - A. Perform Work according to Florida Department of Environmental Protection (FDEP) standards.
- 1.5 QUALIFICATIONS
A. Applicator: Company specializing in performing Work of this Section with minimum five
 (5) years of documented experience.

PART 2 - PRODUCTS

2.1 HYDROSTATIC TESTING

- A. Equipment:
 - 1. Pressure pump.
 - 2. Pressure hose.
 - 3. Water meter.
 - 4. Test connections.
 - 5. Pressure relief valve.
 - 6. Pressure Gage: Calibrated to 0.1 psi.

PART 3 - EXECUTION

- 3.1 EXAMINATION
 - A. Section 01 70 00 Execution and Closeout Requirements: Requirements for installation examination.
 - B. Verify that piping is ready for testing.
 - C. Verify that trenches are backfilled.
 - D. Verify that pressure piping thrust restraints have been installed.

3.2 FIELD QUALITY CONTROL

A. Section 01 70 00 - Execution and Closeout Requirements: Requirements for testing, adjusting, and balancing.

B. Testing of Pressure Piping:

1. Test system according to AWWA C600 and following:

- a. Test Pressure: Not less than 150 psig or 50 psi in excess of maximum static pressure, whichever is greater.
- b. Conduct hydrostatic test for a minimum of two (2) hours.
- c. Slowly fill section to be tested with water of approved quality; expel air from piping at high points. If hydrants, blow-offs, or other outlets are not available at high points for releasing air, the Contractor shall make the necessary taps at such points and shall plug said holes after completion of the test.
- d. Install corporation cocks at high points.
- e. Close air vents and corporation cocks after air is expelled.

- f. Raise pressure to specified test pressure.
- g. Observe joints, fittings, and valves under test.
- h. Remove and renew cracked pipes, joints, fittings, and valves showing visible leakage, and retest.
- i. Correct visible deficiencies and continue testing at same test pressure for additional two hours to determine leakage rate.
- j. Maintain pressure within plus or minus 5 psi of test pressure.
- k. Leakage is defined as quantity of water supplied to piping necessary to maintain test pressure during period of test.
- 1. Compute maximum allowable leakage using following formula:
 - 1) L = SD x sqrt(P)/C.
 - 2) L = testing allowance, gph.
 - 3) S =length of pipe tested, feet.
 - 4) D = nominal diameter of pipe, inches.
 - 5) P = average test pressure during hydrostatic test, psig.
 - 6) C = 133,200.
- m. If pipe under test contains sections of various diameters, calculate allowable leakage from sum of computed leakage for each size.
- n. Leakage:
 - 1) If test of pipe indicates leakage greater than allowed, locate source of leakage, make corrections, and retest until leakage is within allowable limits.
 - 2) Correct visible leaks regardless of quantity of leakage.
- 2. HDPE Pipe Testing:
 - a. In addition to the leakage requirements above, HDPE pipe shall not exceed the following allowable expansion rates:

HDPE Pipe Diameter	Allowable Expansion
2"	0.10 gallons/100 feet of pipe
3"	0.15 gallons/100 feet of pipe
4"	0.25 gallons/100 feet of pipe
6"	0.55 gallons/100 feet of pipe
8"	0.95 gallons/100 feet of pipe
10"	1.25 gallons/100 feet of pipe
12"	2.25 gallons/100 feet of pipe
14"	2.75 gallons/100 feet of pipe
16"	3.25 gallons/100 feet of pipe
18"	4.25 gallons/100 feet of pipe
20"	5.45 gallons/100 feet of pipe
24"	8.75 gallons/100 feet of pipe

- 3. If testing of piping indicates leakage greater than that allowed, locate source of leakage, make corrections, and retest until leakage is within acceptable limits.
- 4. Correct visible leaks regardless of quantity of leakage.

5. If, in the judgement of the Engineer, it is impractical to follow the foregoing procedures exactly for any reason, modifications to the procedure shall be made as required and approved by the Engineer. This shall not relieve the Contractor of the responsibility to meet the leakage and expansion requirements specified herein.

END OF SECTION 33 05 05.31

SECTION 33 05 05.33

INFILTRATION AND EXFILTRATION TESTING

PART 1 - GENERAL

1.1 SUMMARY

- A. Section Includes:
 - 1. Testing of Manholes: Exfiltration testing.
- B. Related Requirements:
 - 1. Section 33 05 61 Concrete Manholes.
 - 2. Section 33 31 11 Public Sanitary Sewerage Gravity Piping.

1.2 SUBMITTALS

- A. Section 01 33 00 Submittal Procedures: Requirements for submittals.
- B. Submit following items prior to start of testing:
 - 1. Testing procedures.
 - 2. List of test equipment.
 - 3. Testing sequence schedule.
 - 4. Provisions for disposal of flushing and test water.
 - 5. Certification of test gage calibration.
- C. Test and Evaluation Reports: Indicate results of manhole and piping tests.
- D. Qualifications Statement:
 - 1. Submit qualifications for applicator.

1.3 QUALITY ASSURANCE

- A. Perform Work according to Florida Department of Environmental Protection standards.
- 1.4 QUALIFICATIONS
 - A. Company specializing in performing Work of this Section with minimum five (5) years of documented experience.
- PART 2 PRODUCTS
- 2.1 EXFILTRATION TESTING
 - A. Equipment:
 - 1. Plugs.

- 2. Pump.
- 3. Measuring device.

PART 3 - EXECUTION

- 3.1 EXAMINATION
 - A. Section 01 70 00 Execution and Closeout Requirements: Requirements for installation examination.
 - B. Verify that manholes and piping are ready for testing.
 - C. Verify that trenches are backfilled.

3.2 PREPARATION

- A. Section 01 70 00 Execution and Closeout Requirements: Requirements for preparation.
- B. Plugs:
 - 1. Plug outlets, wye branches, and laterals.
 - 2. Brace plugs to resist test pressures.

3.3 FIELD QUALITY CONTROL

- A. Section 01 70 00 Execution and Closeout Requirements: Requirements for testing, adjusting, and balancing.
- B. Manhole Testing:
 - 1. Repair both outside and inside of joint to ensure permanent seal.
 - 2. Test manholes with manhole frame set in place.
 - 3. Plug pipes in manhole.
 - 4. Remove water from manhole.
 - 5. Observe plugs over period of not less than two hours to ensure that there is no leakage into manhole.
 - 6. Determine ground water level outside manhole.
 - 7. Fill manhole with water within 4 inches of top of cover frame.
 - 8. Prior to testing, allow manhole to soak from minimum of four hours to maximum of 72 hours.
 - 9. After soak period, adjust water level inside manhole to within 4 inches of top of cover frame.
 - 10. Measure water level from top of manhole frame.
 - 11. At end of four-hour testing period, again measure water level from top of manhole frame; compute drop in water level during testing period.
 - 12. Manhole exfiltration test is considered satisfactory when drop in water level is less than 0.1 percent (0.1%) of the water surface elevation within the manhole.

- 13. If unsatisfactory testing results are achieved, repair manhole and retest until result meets criteria.
- 14. Repair visible leaks regardless of quantity of leakage.

END OF SECTION 33 05 05.33

SECTION 33 05 05.36

VACUUM TESTING

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes: Vacuum testing of manholes.

B. Related Requirements:

- 1. Section 33 05 61 Concrete Manholes.
- 2. Section 33 05 76 Fiberglass Manholes.
- 3. Section 33 31 11 Public Sanitary Sewerage Gravity Piping.

1.2 REFERENCE STANDARDS

- A. ASTM International:
 - 1. ASTM C1244 Standard Test Method for Concrete Sewer Manholes by the Negative Air Pressure (Vacuum) Test Prior to Backfill.

1.3 SUBMITTALS

A. Section 01 33 00 - Submittal Procedures: Requirements for submittals.

B. Submit following items prior to start of testing:

- 1. Testing procedures.
- 2. List of test equipment.
- 3. Testing sequence schedule.
- 4. Provisions for disposal of flushing and test water.
- 5. Certification of test gage calibration.
- C. Test and Evaluation Reports: Indicate results of manhole tests.
- D. Qualifications Statement:
 - 1. Submit qualifications for applicator.

1.4 QUALIFICATIONS

A. Company specializing in performing Work of this Section with minimum five (5) years of documented experience.

PART 2 - PRODUCTS

- 2.1 VACUUM TESTING
 - A. Equipment:

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- 1. Vacuum pump.
- 2. Vacuum line.
- 3. Vacuum Tester Base:
 - a. Compression band seal.
 - b. Outlet port.
- 4. Shutoff valve.
- 5. Stopwatch.
- 6. Plugs.
- 7. Vacuum Gage: Calibrated to 0.1 in. Hg.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Section 01 70 00 Execution and Closeout Requirements: Requirements for installation examination.
- B. Verify that manholes are ready for testing.
- C. Verify that manholes are backfilled.

3.2 FIELD QUALITY CONTROL

- A. Section 01 70 00 Execution and Closeout Requirements: Requirements for testing, adjusting, and balancing.
- B. Manhole Testing:

1. Repair both outside and inside of joint to ensure permanent seal.

- 2. Test manholes with manhole frame set in place.
- 3. Vacuum Testing:
 - a. Comply with ASTM C1244.
 - b. Plug pipe openings; securely brace plugs and pipe.
 - c. Inflate compression band to create seal between vacuum base and structure.
 - d. Connect vacuum pump to outlet port with valve open, then draw vacuum to 10 in. Hg.
 - e. Close valve.
 - f. Manhole Test Duration in Seconds:
 - 1) Manhole Diameter of 4 Feet: 60.
 - 2) Manhole Diameter of 5 Feet: 75.
 - 3) Manhole Diameter of 6 Feet: 90.
 - g. Record vacuum drop during test period.
 - h. If vacuum drop is greater than 1 in. Hg during testing period, repair and retest manhole.
 - i. If vacuum drop of 1 in. Hg does not occur during test period, manhole is acceptable; discontinue testing.

- j. If vacuum test fails to meet 1-in. Hg drop in specified time after repair, repair and retest manhole.
- 4. If unsatisfactory testing results are achieved, repair manhole and retest until result meets criteria.
- 5. Repair visible leaks regardless of quantity of leakage.

END OF SECTION 33 05 05.36

SECTION 33 05 05.41

AIR TESTING

PART 1 - GENERAL

1.1 SUMMARY

- A. Section Includes: Low-pressure air testing of gravity sewer piping.
- B. Related Requirements:
 1. Section 33 31 11 Public Sanitary Sewerage Gravity Piping.

1.2 SUBMITTALS

- A. Section 01 33 00 Submittal Procedures.
- B. Submit following items prior to start of testing:
 - 1. Testing procedures.
 - 2. List of test equipment.
 - 3. Testing sequence schedule.
 - 4. Provisions for disposal of flushing and test water.
 - 5. Certification of test gage calibration.
- C. Test and Evaluation Reports: Indicate results of piping tests.
- D. Qualifications Statement:1. Submit qualifications for applicator.
- 1.3 QUALITY ASSURANCE
 - A. Perform Work according to ASTM F1417-11a Standard Practice for Installation Acceptance of Plastic Non-pressure Sewer Lines Using Low-Pressure Air.
- 1.4 QUALIFICATIONS
 - A. Company specializing in performing Work of this Section with minimum five (5) years of documented experience.

PART 2 - PRODUCTS

2.1 AIR TESTING

- A. Equipment:
 - 1. Air compressor.
 - 2. Air supply line.
 - 3. Shutoff valves.
 - 4. Pressure regulator.

- 5. Pressure relief valve.
- 6. Stopwatch.
- 7. Plugs.
- 8. Pressure Gage: Calibrated to 0.1 psi.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Section 01 70 00 Execution and Closeout Requirements: Requirements for installation examination.
- B. Verify that piping is ready for testing.
- C. Verify that trenches are backfilled.
- 3.2 PREPARATION
 - A. Section 01 70 00 Execution and Closeout Requirements: Requirements for preparation.
 - B. Lamping:
 - 1. Lamp gravity piping after flushing and cleaning.
 - 2. Perform lamping operation by shining light at one end of each pipe section between manholes.
 - 3. Observe light at the other end.
 - 4. Pipe not installed with uniform line and grade will be rejected.
 - 5. Remove and reinstall rejected pipe sections.
 - 6. Clean and lamp until pipe section is installed to uniform line and grade.
 - C. Plugs:
 - 1. Plug outlets, wye branches, and laterals.
 - 2. Brace plugs to resist test pressures.
- 3.3 FIELD QUALITY CONTROL
 - A. Section 01 70 00 Execution and Closeout Requirements: Requirements for testing, adjusting, and balancing.
 - B. Low-Pressure Air Testing:
 - 1. Test each reach of gravity sewer piping between manholes.
 - 2. Introduce air pressure slowly to approximately 4 psig.
 - 3. Determine ground water elevation above spring line of piping.
 - 4. For every foot of ground water above spring line of piping, increase starting air test pressure by 0.43 psi.
 - 5. Do not increase pressure above 10 psig.
 - 6. Allow pressure to stabilize for at least five minutes.
 - 7. Adjust pressure to 3.5 psig or to increased test pressure as determined above when ground water is present.

- 8. Do not make allowance for laterals.
- 9. Minimum Testing Duration in Minutes Per 100 Feet:
 - a. Pipe Size 3 Inches: 0.2.
 - b. Pipe Size 4 Inches: 0.3.
 - c. Pipe Size 6 Inches: 0.7.
 - d. Pipe Size 8 Inches: 1.2.
 - e. Pipe Size 10 Inches: 1.5.
 - f. Pipe Size 12 Inches: 1.8.
 - g. Pipe Size 15 Inches: 2.1.
 - h. Pipe Size 18 Inches: 2.4.
 - i. Pipe Size 21 Inches: 3.0.
 - j. Pipe Size 24 Inches: 3.6.
 - k. Pipe Size 27 Inches: 4.2.
 - l. Pipe Size 30 Inches: 4.8.
 - m. Pipe Size 33 Inches: 5.4.
 - n. Pipe Size 36 Inches: 6.0.
- 10. Record drop in pressure during testing period.
- 11. If air pressure drops more than 1.0 psi during testing period, piping has failed.
- 12. If 1.0-psi air pressure drop has not occurred during testing period, piping is acceptable; discontinue testing.
- 13. If piping fails, test reach of piping in incremental stages until leaks are isolated, repair leaks, and retest entire reach between manholes.
- 14. If unsatisfactory testing results are achieved, make necessary repairs and retest until result meets criteria.
- 15. Repair visible leaks regardless of quantity of leakage.

END OF SECTION 33 05 05.41

SECTION 33 05 05.43

MANDREL TESTING

PART 1 - GENERAL

1.1 SUMMARY

- A. Section Includes: Deflection testing of plastic sewer piping.
- B. Related Requirements:
 - 1. Section 33 31 11 Public Sanitary Sewerage Gravity Piping.

1.2 REFERENCE STANDARDS

- A. ASTM International:
 - 1. ASTM D2122 Standard Test Method for Determining Dimensions of Thermoplastic Pipe and Fittings.

1.3 SUBMITTALS

- A. Section 01 33 00 Submittal Procedures: Requirements for submittals.
- B. Submit following items prior to start of testing:
 - 1. Testing procedures.
 - 2. List of test equipment.
 - 3. Testing sequence schedule.
 - 4. Provisions for disposal of flushing and test water.
 - 5. Certification of test gage calibration.
 - 6. Deflection mandrel drawings and calculations.
- C. Test and Evaluation Reports: Indicate results of piping tests.

PART 2 - PRODUCTS

2.1 DEFLECTION TESTING

- A. Equipment:
 - 1. Go-No-Go mandrel.
 - 2. Pull/retrieval ropes.

PART 3 - EXECUTION

- 3.1 EXAMINATION
 - A. Section 01 70 00 Execution and Closeout Requirements: Requirements for installation examination.

ROAD DESIGN

- B. Verify that piping is ready for testing.
- C. Verify that trenches are backfilled.
- 3.2 PREPARATION
 - A. Section 01 70 00 Execution and Closeout Requirements: Requirements for preparation.
 - B. Lamping:
 - 1. Lamp gravity piping after flushing and cleaning.
 - 2. Perform lamping operation by shining light at one end of each pipe section between manholes.
 - 3. Observe light at the other end.
 - 4. Pipe not installed with uniform line and grade will be rejected.
 - 5. Remove and reinstall rejected pipe sections.
 - 6. Clean and lamp until pipe section is installed to uniform line and grade.
 - C. Plugs:
 - 1. Plug outlets, wye branches, and laterals.
 - 2. Brace plugs to resist test pressures.
- 3.3 FIELD QUALITY CONTROL
 - A. Section 01 70 00 Execution and Closeout Requirements: Requirements for testing, adjusting, and balancing.
 - B. Deflection Testing of Plastic Sewer Piping:
 - 1. Perform vertical ring deflection testing on PVC and ABS sewer piping after backfilling has been in place for at least 30 days, but not longer than 12 months.
 - 2. Allowable maximum deflection for installed plastic sewer pipe is no greater than five percent of original vertical internal diameter.
 - 3. Perform deflection testing using Go-No-Go mandrel.
 - 4. Mandrel Diameter:
 - a. Not less than 95 percent of base or average ID of pipe.
 - b. Pipe Diameter: Comply with ASTM D2122.
 - 5. Perform testing without mechanical pulling devices.
 - 6. Locate, excavate, replace, and retest piping that exceeds allowable deflection.

END OF SECTION 33 05 05.43

SECTION 33 05 61

CONCRETE MANHOLES

PART 1 - GENERAL

1.1 SUMMARY

- A. Section Includes:
 - 1. Modular precast concrete manholes, polymer concrete manholes, and structures with tongue-and-groove joints and transition to cover frame, covers, anchorage, and accessories.
 - 2. Doghouse manhole connections to existing sanitary sewer lines.
 - 3. Bedding and cover materials.
 - 4. Vertical adjustment of existing manholes and structures.
- B. Related Requirements:
 - 1. Section 33 05 05.33 Infiltration and Exfiltration Testing.
 - 2. Section 33 05 05.36 Vacuum Testing.
 - 3. Section 33 31 11 Public Sanitary Sewerage Gravity Piping.

1.2 REFERENCE STANDARDS

- A. American Association of State Highway Transportation Officials:
 - 1. AASHTO M91 Standard Specification for Sewer and Manhole Brick (Made from Clay or Shale).
 - 2. AASHTO M288 Standard Specification for Geotextile Specification for Highway Applications.
 - 3. AASHTO M306 Standard Specification for Drainage, Sewer, Utility, and Related Castings.
- B. American Concrete Institute:
 - 1. ACI 350/350-06 Code Requirements for Environmental Engineering Concrete Structures & Commentary.
 - 2. ACI440/440.1R-15 Guide for the Design and Construction of Structural Concrete Reinforced with Fiber-Reinforced Polymer (FRP) Bars.
 - 3. ACI 530/530.1 Building Code Requirements and Specification for Masonry Structures.
 - 4. ACI 548/548.6R-96 Polymer Concrete-Structural Applications State-of-the-Art Report.
- C. ASTM International:
 - 1. ASTM A48/A48M Standard Specification for Gray Iron Castings.
 - 2. ASTM C443 Standard Specification for Joints for Concrete Pipe and Manholes Using Rubber Gaskets.

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- 3. ASTM C478 Standard Specification for Circular Precast Reinforced Concrete Manhole Sections.
- 4. ASTM C497 Standard Test Methods for Concrete Pipe, Manhole Sections, or Tile.
- 5. ASTM C579 Standard Test Methods for Compressive Strength of Chemical-Resistant Mortars, Grouts, Monolithic, Surfacing, and Polymer Concretes.
- 6. ASTM C580 Standard Test Method for Flexural Strength and Modulus of Elasticity of Chemical-Resistant Mortars, Grouts, Monolithic Surfacing, and Polymer Concretes.
- 7. ASTM C857 Standard Practice for Minimum Structural Design Loading for Underground Utility Structures.
- 8. ASTM C877 Standard Specification for External Sealing Bands for Concrete Pipe, Manholes, and Precast Box Sections.
- 9. ASTM C913 Standard Specification for Precast Concrete Water and Wastewater Structures.
- 10. ASTM C923 Standard Specification for Resilient Connectors between Reinforced Concrete Manhole Structures, Pipes, and Laterals.
- 11. ASTM C990 Standard Specification for Joints for Concrete Pipe, Manholes, and Precast Box Sections Using Preformed Flexible Joint Sealants.
- 12. ASTM D648 Test Method for Deflection Temperature of Plastics Under Flexural Load in Edgewise Position.
- 13. ASTM D2584 Test Method for Ignition Loss of Cured Reinforced Resins.
- 14. ASTM D6783 Standard Specification for Polymer Concrete Pipe.
- 15. ASTM F593 Standard Specification for Stainless Steel Bolts, Hex Cap Screws, and Studs.
- 16. ASTM F1554 Standard Specification for Anchor Bolts, Steel, 36, 55, and 105-ksi Yield Strength.

1.3 COORDINATION

- A. Section 01 30 00 Administrative Requirements: Requirements for coordination.
- B. Coordinate Work of this Section with connection to existing sewer facilities.

1.4 SUBMITTALS

- A. Section 01 33 00 Submittal Procedures: Requirements for submittals.
- B. Product Data: Submit manufacturer information for manhole covers, component construction, features, configuration, materials, jointing methods, and dimensions.
- C. Shop Drawings:
 - 1. Indicate structure locations and elevations.
 - 2. Indicate sizes and elevations of piping, penetrations, and manhole inverts.
- D. Manufacturer's Certificate: Certify that products meet or exceed specified requirements.

- E. Manufacturer Instructions: Submit detailed instructions on installation requirements, including storage and handling procedures.
- F. Source Quality-Control Submittals: Indicate results of factory tests and inspections.
- G. Field Quality-Control Submittals: Indicate results of Contractor-furnished tests and inspections.
- H. Qualifications Statement:
 - 1. Submit qualifications for manufacturer.

1.5 CLOSEOUT SUBMITTALS

- A. Section 01 70 00 Execution and Closeout Requirements: Requirements for submittals.
- B. Project Record Documents: Record actual locations of manholes and connections, and record invert elevations. Record Documents shall be an As-built survey performed, signed and sealed by a Florida Licensed Surveyor. Record Documents shall be furnished in electronic GIS format with locations in Florida State Plane Coordinates, and elevations in NAVD 88.

1.6 QUALITY ASSURANCE

A. Perform Work as shown and specified and according to applicable FDEP and Florida Department of Transportation Standard Specifications for Road and Bridge Construction (latest edition.)

1.7 QUALIFICATIONS

A. Manufacturer: Company specializing in manufacturing products specified in this Section with minimum five (5) years of documented experience.

1.8 DELIVERY, STORAGE, AND HANDLING

- A. Section 01 60 00 Product Requirements: Requirements for transporting, handling, storing, and protecting products.
- B. Inspection: Accept materials on Site in manufacturer's original packaging and inspect for damage.
- C. Handling: Comply with precast concrete manufacturer instructions and ASTM C913 for unloading and moving precast manholes and drainage structures.
- D. Storage:
 - 1. Store materials according to manufacturer instructions.

- 2. Store precast concrete manholes and drainage structures to prevent damage to Owner's property or other public or private property.
- 3. Repair property damaged from materials storage.
- E. Protection:
 - 1. Protect materials from moisture and dust by storing in clean, dry location remote from construction operations areas.
 - 2. Provide additional protection according to manufacturer instructions.

1.9 AMBIENT CONDITIONS

- A. Section 01 50 00 Temporary Facilities and Controls: Requirements for ambient condition control facilities for product storage and installation.
- B. Maintain materials and surrounding air temperature to minimum 50 degrees F prior to, during, and 48 hours after completion of masonry Work.

1.10 EXISTING CONDITIONS

- A. Field Measurements:
 - 1. Verify field measurements prior to fabrication.
 - 2. Indicate field measurements on Shop Drawings.

1.11 WARRANTY

- A. Section 01 70 00 Execution and Closeout Requirements: Requirements for warranties.
- B. Furnish five (5) year manufacturer's warranty for concrete manholes.

PART 2 - PRODUCTS

2.1 CONCRETE MANHOLES

- A. Manhole Sections:
 - 1. General: Manholes shall be fabricated only from eccentric tapered sections or eccentric flat top sections and standard cylinder units with the proper internal diameter. Concrete manholes shall not be used for new construction within 400 linear feet of a wet well or the manhole into which a force main dumps.
 - 2. Materials:
 - a. Reinforced Precast Concrete: Comply with ASTM C478, with the exclusion of Section 10 (a) and as modified herein.
 - b. Cement shall meet the requirements of ASTM C150 for Portland Cement Type II.
 - c. Concrete shall meet the minimum requirements for Class III.
 - d. Minimum wall thickness shall be as shown on the Drawings.

- e. The required minimum strength of concrete and conformance to the design parameters shall be confirmed by testing in accordance with ASTM C14. Contractor shall be responsible for all testing.
- f. Use a minimum allowable steel hoop of No. 4 wire to be cast into each unit at adequate places as a precautionary measure for handling.
- 3. Gaskets: Comply with ASTM C923.
- 4. Joints:
 - a. Joint contact surfaces shall be formed exactly parallel with a 2-degree slope and nominal 1/16-inch clearance with the tongue equipped with a proper recess for the installation of an O-ring rubber gasket or pre-molded plastic joint sealer.
 - b. Pre-molded plastic joint sealer, if used, shall be Ramnek or approved equal and joints shall be pre-primed and wrapped on the exterior to provide a sealed manhole. Exterior wrap shall be elastomeric mastic tape (Boa-Tape or approved equal).
 - c. Comply with ASTM C913.
 - d. Maximum Leakage: 0.025 gal. per hour per foot of joint at 3 feet of head.
- 5. Manufacturers:
 - a. Del Zotto,
 - b. Taylor Precast,
 - c. or approved equal.
- B. Coatings and Liners:
 - 1. Coatings shall cover the interior and exterior surfaces of the manhole except the joint contact surfaces and the annular openings for pipe connections.
 - Exterior coating shall be bituminous coating as specified in Section 09 90 00
 Painting and Coating.
 - 2. For mildly corrosive environments, interior coating shall be coal tar epoxy as specified in Section 09 90 00 Painting and Coating.
 - 3. For highly corrosive environments, manholes shall include a polyurea or highdensity polyethylene liner as shown on the Drawings or specified.
 - a. HDPE Liner:
 - HDPE liner shall be embedded into pre-cast concrete with anchoring ribs during manufacturing process. Anchoring ribs shall be placed a minimum of 30 per square foot of liner in one piece with the HDPE sheet, and shall be of the same material.
 - Liner shall be 80 mils. thick minimum, with a minimum resistance to pull out of 125 pounds per square foot and withstand a back pressure of 30 psi.
 - The HDPE material shall have a maximum working temperature of 140° F, fire classification of V2 as defined by UL-94, density of 0.945 g/cc as defined in ASTM D792-86, and puncture resistance of 170 lbs. as defined by ASTM D4833.
 - The liner shall be flexible to elongate to bridge up to a 1/4-inch setting or expansion.
 - b. Polyurea Liner:

- Liner shall be a two component, 100% solids, zero (0) volatile organic compound, pure polyurea.
- Liner system shall be designed for highly corrosive wastewater environments.
- Liner system shall consist of the following:
 - a) Primer/Moisture Barrier: Minimum 30 to 100 mils dry film thickness (DFT)
 - b) Top Coat: Minimum 125 mils DFT.
- Primer/Moisture Barrier shall be designed specifically for the lining system.
- Surfaces shall be prepared in accordance with the manufacturer's requirements.
- Lining shall be applied in accordance with the manufacturer's requirements.
- Manufacturers:
 - a) GML Coatings, Inc. Green Monster Liner,
 - b) or approved equal.
- C. Mortar and Grout shall be Embeco 167 and 381 or approved equal.
 - 1. The Contractor shall apply Master Builders' Master Seal or approved equal membrane curing compound, conforming to ASTM C309, Type I, Class B, to interior and exterior finished grout.
- D. Clear Inside Dimensions shall be as indicated on Drawings.
 - 1. In no case shall the inside diameter be less than 48-inches.
- E. Design Depth shall be as indicated on Drawings.
- F. Clear Cover Opening:
 - 1. As indicated on Drawings.
- G. Pipe Entry:
 - 1. Furnish openings as indicated on Drawings.
 - 2. Pipes shall be connected to manholes with heavy duty flexible rubber connector boots conforming to ASTM C923 with stainless steel bands and hardware.

2.2 POLYMER CONCRETE MANHOLES

- A. Manhole Sections:
 - 1. General: Manholes shall be fabricated only from eccentric tapered sections or eccentric flat top sections and standard cylinder units with the proper internal diameter. Polymer concrete manholes shall only be used for new construction within 400 linear feet of a wet well and/or the manhole into which a force main dump.
 - 2. Materials:
 - a. Polymer Concrete: Comply with ASTM C478 with allowable compositional and sizing difference as designed by the polymer concrete manufacturer.

- b. Polymer Concrete Mix Design shall consist of thermosetting resin, sand, and aggregate. No Portland cement shall be allowed as part of the mix design matrix. All sand and aggregate shall be inert in an acidic environment.
- c. Reinforcement Shall use acid resistant reinforcement (FRP Bar) in accordance with ACI 440.1R-06 as applicable for polymer concrete design.
- d. The wall thickness of polymer concrete structures shall not be less than that prescribed by the manufacturer's design by less than 95% of stated design thickness.
- e. Thermosetting Resin The resin shall have a minimum deflection temperature of 158° F when tested at 264 psi (1.820 mPa) following Test Method D 648. The resin content shall not be less than 7% of the weight of the sample as determined by test method D 2584. Resin selection shall be suitable for applications in the corrosive conditions to which the polymer concrete manhole structures will be exposed.
- f. Each polymer concrete manhole component shall be free of all defects, including indentations, cracks, foreign inclusions and resin starved areas that, due to their nature and degree or extent, detrimentally affect the strength and serviceability of the component part. Cosmetic defect shall not be cause for rejection. The nominal internal diameter of manhole components shall not vary more than 2%. Variations in height of two opposite sides of risers and cones shall not be more the 5/8 inch. The under run in height of a riser or cone shall not be more than ¹/₄ in/ft of height with a maximum of ¹/₂ inch in any one section.
- g. Marking and Identification Each manhole shall be marked with the following information Manufacturer's name or trademark, Manufacturer's location and Production Date.
- h. The required minimum strength of concrete and conformance to the design parameters shall be confirmed by testing in accordance with ASTM C14. Contractor shall be responsible for all testing.
- i. Use a minimum allowable steel hoop of No. 4 wire to be cast into each unit at adequate places as a precautionary measure for handling.
- 3. Gaskets: Comply with ASTM C923.
- 4. Joints:
 - a. Manhole joints shall be assembled with a bell/spigot or shiplap butyl mastic and/or gasketed joint so that on assembly, manhole base, riser, and top section make a continuous and uniform manhole. Joint sealing surfaces shall be free of dents, gouges, and other surface irregularities that would affect joint integrity.
 - b. Minimum clearance between wall penetrations and joints shall be per manufacturer's design.
 - c. Construct invert channels to provide smooth flow transition with minimal disruption of flow at pipe-manhole connections. Invert slope through manhole is as indicated on drawings. All precast base sections to be cast monolithically. Polymer bench and channel are to be constructed with all polymer concrete material. Extended ballast slab requirements for buoyancy concerns can be addressed with cementitious concrete material.

- d. Provide resilient connectors conforming to requirements of ASTM C 923 or other options as available. All connectors are to be water tight. Install approved resilient connectors at each pipe entering and exiting manholes in accordance with manufacturer's instructions.
- e. Joint contact surfaces shall be formed exactly parallel with a 2-degree slope and nominal 1/16-inch clearance with the tongue equipped with a proper recess for the installation of an O-ring rubber gasket or pre-molded plastic joint sealer.
- f. Pre-molded plastic joint sealer, if used, shall be Ramnek or approved equal and joints shall be pre-primed and wrapped on the exterior to provide a sealed manhole.
- g. Comply with ASTM C913.
- h. Maximum Leakage: 0.025 gal. per hour per foot of joint at 3 feet of head.
- 5. Manufacturers:
 - a. Armorock LLC
- B. Coatings and Liners:
 - 1. Coatings shall cover the interior and exterior surfaces of the manhole except the joint contact surfaces and the annular openings for pipe connections.
 - a. Exterior coating shall be bituminous coating as specified in Section 09 90 00 – Painting and Coating.
 - 2. For mildly corrosive environments, interior coating shall be coal tar epoxy as specified in Section 09 90 00 Painting and Coating.
 - 3. For highly corrosive environments, manholes shall include a polyurea or high density polyethylene liner as shown on the Drawings or specified.
 - a. HDPE Liner:
 - 1) HDPE liner shall be embedded into polymer concrete with anchoring ribs during manufacturing process. Anchoring ribs shall be placed a minimum of 30 per square foot of liner in one piece with the HDPE sheet, and shall be of the same material.
 - 2) Liner shall be 80 mils. thick minimum, with a minimum resistance to pull out of 125 pounds per square foot, and withstand a back pressure of 30 psi.
 - 3) The HDPE material shall have a maximum working temperature of 140° F, fire classification of V2 as defined by UL-94, density of 0.945 g/cc as defined in ASTM D792-86, and puncture resistance of 170 lbs. as defined by ASTM D4833.
 - 4) The liner shall be flexible to elongate to bridge up to a 1/4-inch setting or expansion.
 - b. Polyurea Liner:
 - 1) Liner shall be a two component, 100% solids, zero (0) volatile organic compound, pure polyurea.
 - 2) Liner system shall be designed for highly corrosive wastewater environments.
 - 3) Liner system shall consist of the following:

- a) Primer/Moisture Barrier: Minimum 30 to 100 mils dry film thickness (DFT).
- b) Top Coat: Minimum 125 mils DFT.
- 4) Primer/Moisture Barrier shall be designed specifically for the lining system.
- 5) Surfaces shall be prepared in accordance with the manufacturer's requirements.
- 6) Lining shall be applied in accordance with the manufacturer's requirements.
- 7) Manufacturers:
 - a) GML Coatings, Inc. Green Monster Liner,
 - b) or approved equal.
- C. Grouting:
 - 1. All materials needed for grouting and patching will be a polyester mortar compound provided by the manufacturer or an approved equal by the manufacturer.
 - 2. The Contractor shall apply Master Builders' Master Seal or approved equal membrane curing compound, conforming to ASTM C309, Type I, Class B, to interior and exterior finished grout.
- D. Clear Inside Dimensions shall be as indicated on Drawings.
 - 1. In no case shall the inside diameter be less than 48-inches.
- E. Design Depth shall be as indicated on Drawings.
- F. Clear Cover Opening:
 - 1. As indicated on Drawings.
- G. Pipe Entry:
 - 1. Furnish openings as indicated on Drawings.
 - 2. Pipes shall be connected to manholes with heavy duty flexible rubber connector boots conforming to ASTM C923 with stainless steel bands and hardware.

2.3 FRAMES AND COVERS

- A. Standard Manhole Ring and Cover:
 - 1. Manhole frames and covers shall be constructed of close-grained gray iron, smooth, clean, free from blisters and defects.
 - 2. Material: Cast iron.
 - 3. Comply with the following:
 - a. ASTM A48/A48M, Class 30B.
 - b. Federal Specification RR-F-621-C.
 - 4. Manhole frames and covers shall meet or exceed requirements for AASHTOH-20 load rating and AASHTO M306.
 - 5. Surface: Machined flat bearing.
 - 6. Cover Design: Closed.
 - 7. All components shall be black epoxy coated.

- 8. Cover shall be molded and marked as shown on the Drawings.
- 9. Manufacturers:
 - a. U.S. foundry, USF 170CE (22-inch), USF 655CW-M (32-inch)
 - b. Vulcan Foundry V-1337-2 (22-inch),
 - c. or approved equal.
- B. Hinged Manhole Ring and Cover:
 - 1. Hinged manhole ring and cover shall be constructed of sound ductile iron, smooth, clean, free from blisters and defects.
 - 2. Frames shall be circular and incorporate a seating gasket.
 - 3. Cover hinge system shall include a 90-degree blocking system.
 - 4. Hinge box shall be self-cleaning with dual wiper infiltration plug.
 - 5. Covers shall include locks.
 - 6. Comply with the following:
 - a. ASTM A48/A48M, Class 30B.
 - b. Federal Specification RR-F-621-C.
 - c. ISO 1083.
 - 7. Manhole frames and covers shall meet or exceed requirements for AASHTOH-20 load rating and AASHTO M306.
 - 8. Cover Design: Closed.
 - 9. All components shall be black epoxy coated.
 - 10. Cover shall be molded and marked as shown on the Drawings.
 - 11. Manufacturers:
 - a. U.S. foundry, USF 750 (24-inch), USF 751 (32-inch)
 - b. East Jordan Iron Works, ERGO,
 - c. Pamrex,
 - d. or approved equal.
- C. Non-Metallic Manhole Cover and Frame:
 - 1. Manhole ring and cover shall be constructed of thermosetting resin matrix.
 - 2. Frames shall be circular and incorporate a seating gasket.
 - 3. Exposed locks, nuts, bolts, hooks, and other metallic attachments must be 316 Stainless Steel.
 - 4. Covers shall include locks.
 - 5. Comply with the following:
 - a. AASHTO M306 (Proof Testing H-20/25) b. ASTM G154, D790, C1028, D256
 - 6. Cover Design: Closed.
 - 7. Cover shall be molded and marked as shown on the Drawings.
 - 8. Manufacturers:
 - a. Composite Access Products (CAP),
 - b. or approved equal.

2.4 RISER RINGS

- A. Riser Rings:
 - 1. Precast adjusting rings shall have 22-inch or 32-inch access entrance diameter.
 - 2. Ring shall be constructed of 4,000 psi concrete, using 1/4-inch round steel ring, 1/4-inch diameter for reinforcing.
 - 3. Thickness of 2 Inches, 4-inches, or 6 Inches
 - 4. Comply with ASTM C478.
 - 5. Manufacturers:
 - a. Del Zotto,
 - b. Taylor Precast,
 - c. or approved equal.
- B. Accessories:
 - 1. Joint Sealant: Comply with ASTM C990.
 - 2. Bolts: Stainless steel; ASTM F593.

2.5 MATERIALS

- A. Cover, Bedding, and Backfill:
 - 1. Bedding, cover, and soil backfill materials shall be in accordance with Section125 of the Florida Department of Transportation Standard Specifications for Road and Bridge Construction (latest edition.)

2.6 ACCESSORIES

- A. Foundation Slab:
 - 1. Cast-in-place concrete as specified in Section 03 30 00 Cast-in-PlaceConcrete.
 - 2. Top Surface: Level.
- B. Joint Sealant: Comply with ASTM C990.
- C. Fasteners: Stainless steel; ASTM F593.
- D. Concrete: As specified in Section 03 30 00 Cast-in-Place Concrete.
- 2.7 SOURCE QUALITY CONTROL
 - A. Section 01 40 00 Quality Requirements: Requirements for testing, inspection, and analysis.
 - B. Provide shop inspection and testing of completed assembly.
 - C. Owner Inspection:
 - 1. Make completed manholes available for inspection at manufacturer's factory prior to packaging for shipment.
 - 2. Notify Owner at least seven days before inspection is allowed.
 - D. Owner Witnessing:

- 1. Allow witnessing of factory inspections and tests at manufacturer's test facility.
- 2. Notify Owner at least seven days before inspections and tests are scheduled.
- E. Certificate of Compliance:
 - 1. If manufacturer is approved by authorities having jurisdiction, submit certificate of compliance indicating Work performed at manufacturer's facility conforms to Contract Documents.
 - 2. Specified shop tests are not required for Work performed by approved manufacturer.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Section 01 70 00 Execution and Closeout Requirements: Requirements for installation examination.
- B. Verify that items provided by other Sections of Work are properly sized and located.
- C. Verify that built-in items are in proper location and are ready for roughing into Work.
- D. Verify that excavation base is ready to receive Work and excavations and that dimensions and elevations are as indicated on Drawings.

3.2 PREPARATION

- A. Section 01 70 00 Execution and Closeout Requirements: Requirements for installation preparation.
- B. Mark each precast structure by indentation or waterproof paint showing date of manufacture, manufacturer, and identifying symbols and numbers as indicated on Drawings to indicate its intended use.
- C. Coordinate placement of inlet and outlet pipe or duct sleeves as required by other Sections.
- D. Do not install manholes and structures where Site conditions induce loads exceeding structural capacity of manholes or structures.
- E. Inspect precast concrete manholes and structures immediately prior to placement in excavation to verify that they are internally clean and free from damage; remove and replace damaged units.

3.3 INSTALLATION

A. Manholes are considered confined spaces and the Contractor shall follow the requirements of the owner and all associated regulations for confined space entry.
1. Confined space is defined as large enough for a person to work with restricted

ROAD DESIGN means of entry and exit.

- 2. The Contractor is responsible for the safety of his/her personnel. The Contractor shall use a gas detector to measure the gases present. If no gases are present the structure may be entered. When gases are detected, fresh air shall be forced into the area until acceptable levels of air quality are obtained.
- 3. A tripod/hoist unit shall be set up and manned.
- B. Conduct operations not to interfere with, interrupt, damage, destroy, or endanger integrity of surface structures or utilities in immediate or adjacent areas.
- C. Correct over-excavation in accordance with Section 125 of the Florida Department of Transportation Standard Specifications for Road and Bridge Construction (latest edition.)
- D. Remove large stones or other hard matter impeding consistent backfilling or compaction.
- E. Protect manhole from damage or displacement while backfilling operation is in progress.
- F. Excavating:
 - 1. Excavation and backfill shall be performed in accordance with the Florida Department of Transportation Standard Specifications for Road and Bridge Construction (latest edition) to the locations and depths shown.
 - 2. Excavate undesirable material to a minimum depth of 12-inches below the proposed grade and backfill as specified.
 - 3. Place gravel under manholes located in wet soil conditions.
 - 4. Provide clearance around sidewalls of manhole or structure for construction operations.
 - 5. If ground water is encountered, prevent accumulation of water in excavations; place manhole or structure in dry trench.
 - 6. Where possibility exists of watertight manhole or structure becoming buoyant in flooded excavation, anchor manhole or structure to avoid flotation as approved by Engineer.
- G. Base and Alignment:
 - 1. Place foundation slab and trowel top surface level.
 - 2. Grout base of shaft sections to achieve slope to exit piping, trowel smooth, and contour as indicated on Drawings.
 - 3. Place manhole sections plumb and level, trim to correct elevations, and anchor to foundation slab.
- H. Attachments:
 - 1. Set cover frames and covers level to correct elevations without tipping.
- I. Backfilling:
 - 1. As specified in the Florida Department of Transportation Standard Specifications for Road and Bridge Construction (latest edition.)

- 2. Backfill around sides and to top of pipe with cover fill in minimum lifts of six (6) inches and compacted to the requirements specified in Section 31 23 23.00 Fill.
- J. Coating: All coating shall be factory applied.
- K. Precast Concrete Manholes:
 - 1. Precast manholes shall be installed in accordance with the manufacturer's recommendations.
 - 2. Lift precast components at lifting points designated by manufacturer.
 - 3. When lowering manholes and structures into excavations and joining pipe to units, take precautions to ensure that interior of pipeline and structure remains clean.
 - 4. Assembly:
 - a Assemble multi-section manholes and structures by lowering each section into excavation.
 - b. Install gasket joints between precast sections according to manufacturer recommendations.
 - c. Lower, set level, and firmly position base section before placing additional sections.
 - 5. Remove foreign materials from joint surfaces and verify that sealing materials are placed properly.
 - 6. Maintain alignment between sections by using guide devices affixed to lower section.
 - 7. Joint sealing materials may be installed on Site or at manufacturer's plant.
 - 8. Verify that installed manholes meet required alignment and grade.
 - 9. Remove knockouts or cut structure to receive piping without creating openings larger than required to receive pipe; fill annular spaces with mortar.
 - 10. Cut pipe flush with interior of structure.
- L. Doghouse Manholes and Structures:
 - 1. Stake out location and burial depth of existing sewer line in area of proposed manhole or structure.
 - 2. Carefully excavate around existing sewer line to adequate depth for foundation slab installation.
 - 3. Protect existing pipe from damage.
 - 4. Cut out soft spots and replace with granular fill compacted as specified in Section 31 23 23.00 Fill.
 - 5. Bear firmly and fully on compacted crushed stone bedding.
 - 6. Precast slabs must have keyways to connect walls to slab.
 - Formed-in-place slabs shall be a minimum of 12-inches thick.
 - a Concrete reinforcement shall be sized by the manufacturer.
 - 8. Grout pipe entrances per grout manufacturer's installation procedures.
 - 9. Coordinate with the Engineer to determine time of day for connections to existing facilities.
 - 10. Block upstream flow at existing manhole or structure with expandable plug.
 - 11. Use hydraulic saw to cut existing pipe at manhole or structure entrance and exit and along pipe length at a point halfway up OD on each side of pipe.
 - 12. Bottom half of pipe is to remain as manhole flow channel.

7.

OCF - OCALA NORTH DEVELOPMENT ROAD DESIGN

- 13. Saw cut to smooth finish with top half of pipe flush with interior of manhole or structure.
- 14. Grout base of manhole or structure to achieve slope to manhole or structure channel and trowel smooth.
- M. All grouting shall be performed in accordance with the grout manufacturer's recommended procedures so that there is zero leakage through openings or around pipes.
 - 1. The grout and/or mortar shall be finished smooth and flush with the adjoining interior and exterior manhole wall surfaces.
 - 2. Grout mixed on-site shall be used with potable water and masonry sand from concrete supplier. Dirty pond water and existing excavated sand shall not be used.
- N. Manhole Inverts:
 - 1. Manhole bases shall be formed of Class I concrete while the manholes are under construction.
 - a The Contractor shall not use fill, stone, brick, or other materials below concrete invert. The entire invert shall be constructed of concrete.
 - 2. Cut off pipes at inside face of the manhole and construct the invert to the shape and size of the pipe indicated.
 - 3. All inverts shall follow the grades of the pipe entering the manholes.
 - 4. Changes in direction of the sewer and entering branch or branches shall be laid out in smooth curves of the longest possible radius which is targeted to the centerlines of adjoining pipelines.
 - 5. Regardless of differences in entrance and exit elevations, flow channels for all pipes are to be formed to present a smooth transition of flow and shall be subject to the approval of the Engineer.
 - 6. Flow channels shall be constructed in accordance with the Drawings.
- O. Entire interior of manhole shall be coated with coal tar epoxy or liner as specified, including adjustment rings.
- P. Connect pipes to new manholes using pipe boots and clamps.
- Q. Connect pipes to lined manholes after liners have been completed and sealed.
- R. Sanitary Manhole Drop Connections:
 - 1. Bottom 90-degree bend shall be cast in place using concrete.
 - 2. Pipes shall be held firmly in place while concrete is being formed.
 - 3. Drop connections shall be constructed in accordance with the Drawings.
- S. Castings:
 - 1. Set frames using mortar and masonry to the elevations indicated on Drawings. If specified tolerances cannot be met, manhole shall be modified.
 - 2. Install radially laid concrete brick with 1/4-inch-thick, vertical joints at inside perimeter.
 - 3. If more than one course of concrete brick is required, stagger vertical joints.

- 4. The Contractor shall prepare the base for the manhole frame to a condition satisfactory to the Engineer. All loose, broken or cracked brick shall be removed along with excess grout to provide a smooth, solid, level surface to receive the new buildup of the manhole top.
- 5. Frame shall be set concentric with the masonry and in a full bed of grout or mortar so that the space between the top of the manhole masonry and the bottom flange of the frame shall be completely filled and made watertight.
 - a The frame shall be completely embedded and sealed to the manhole with grout or mortar.
 - b. Grout or mortar shall be applied so as to leave no air pockets or voids and shall cover the area from the top of the frame to the outside edge of the manhole.
- 6. Manhole frames and covers shall be set to conform accurately to the finished ground or pavement surface as established by the Contract Drawings, unless otherwise directed by the Engineer.
- 7. Only clean brick shall be used in brick adjustment. If required, the bricks shall be moistened prior to application of the grout or mortar.
 - a Each brick shall be laid in a full bed and joint of grout or mortar without requiring subsequent grouting, flushing, or filling, and shall be thoroughly bonded as directed.
 - b. Grout shall be one-part cement and two parts sand. Lime shall not be used.
 - c. Grout shall be coated with epoxy.
- 8. Outside faces of brick masonry or concrete adjusting rings shall be covered with grout or mortar from 3/8-inch to 1/2-inch thick. If required, brick concrete shall be properly moistened prior to application of the grout or mortar. The mortar or grout shall be carefully spread and troweled so that all cracks are thoroughly worked out. After hardening, the grout or mortar shall be thoroughly checked for bond and soundness by being tapped. Unbonded or unsound grout or mortar shall be removed and replaced.
- T. Unless otherwise directed by the Engineer, the Contractor may elect to remove the manhole top completely to facilitate construction or leave in place until the base course is constructed.
 - 1. The manhole shall be protected from damage if it is to be left in place until final adjustment.
 - 2. If the Contractor elects to remove the manhole top, he shall place sufficient covering over the manhole, to the satisfaction of the Engineer, to eliminate infiltration of dirt, Limerock, stone, brick, debris, etc., until the top is adjusted to grade.
 - 3. In either of the cases above, the Contractor will be responsible for any undesirable material entering the manhole or sewer system as a result of the Work.

3.4 FIELD QUALITY CONTROL

- A. Section 01 70 00 Execution and Closeout Requirements: Requirements for testing, adjusting, and balancing.
- B. Testing:

- 1. Cast-in-Place Concrete: As specified in Section 03 30 00 Cast-in-Place Concrete.
- 2. Concrete Manhole Sections: As specified in Section 33 05 05.33 Infiltration or Exfiltration Testing and Section 33 05 05.41 Air Testing.
- C. At least one compaction density test shall be made on the prepared base for each manhole. It is expressly agreed and understood that the Owner reserves the right to perform additional compaction tests on its own or to increase or decrease the frequency of compaction testing.
 - 1. Compaction tests shall be in accordance with the specifications. Should the test fail, the Contractor shall be required to take the appropriate action to satisfy the compaction requirement and at no time shall the manhole base be set in place without an approved compaction test or until satisfactory test is acquired.
- D. Equipment Acceptance: Adjust, repair, modify, or replace components failing to perform as specified and retest.
- 3.5 ADJUSTING
 - A. Section 01 70 00 Execution and Closeout Requirements: Requirements for starting and adjusting.
 - B. Vertical Adjustment of Existing Manholes and Structures:
 - 1. Manhole frame and covers shall be adjusted with brick masonry or precast concrete adjusting rings.
 - 2. Frames shall be adjusted to conform accurately to the grades shown on the Drawings and specified herein.
 - 3. The manhole shall be modified if tolerances cannot be met.
 - 4. Frames, Grates, and Covers:
 - a Remove frames, grates, and covers and clean of mortar fragments.
 - b. Reset to required elevation according to requirements specified for installation of castings.
 - 5. Reinforcing Bars:
 - a Remove concrete without damaging existing vertical reinforcing bars if removal of existing concrete wall is required.
 - b. Clean vertical bars of concrete and bend into new concrete top slab or splice to required vertical reinforcement as indicated on Drawings.
 - 6. Clean and apply sand-cement bonding compound on existing concrete surfaces to receive cast-in-place concrete as specified in Section 033000 Cast-in-Place Concrete.

END OF SECTION 33 05 61

SECTION 33 05 97

IDENTIFICATION AND SIGNAGE FOR UTILITIES

PART 1 - GENERAL

1.1 SUMMARY

- A. Section Includes:
 - 1. Plastic ribbon tape for placement above direct-buried utility.
 - 2. Trace wire for placement above direct-buried utility.

B. Related Requirements:

- 1. Section 33 14 13 Public Water Utility Distribution Piping.
- 2. Section 33 15 00 Public Reclaimed Water Distribution System Piping.
- 3. Section 33 31 11 Public Sanitary Sewerage Gravity Piping.
- 4. Section 33 31 23 Sanitary Sewerage Force Main Piping.
- 1.2 SUBMITTALS
 - A. Section 01 33 00 Submittal Procedures: Requirements for submittals.
 - B. Product Data: Submit manufacturer catalog information for each specified product.
 - C. Manufacturer's Certificate: Certify that products meet or exceed specified requirements.
 - D. Qualifications Statement:1. Submit qualifications for manufacturer.
- 1.3 CLOSEOUT SUBMITTALS
 - A. Section 01 70 00 Execution and Closeout Requirements: Requirements for submittals.
- 1.4 MAINTENANCE MATERIAL SUBMITTALS
 - A. Section 01 70 00 Execution and Closeout Requirements: Requirements for maintenance materials.
- 1.5 QUALITY ASSURANCE
 - A. Perform Work according to AWWA standards.
- 1.6 QUALIFICATIONS
 - A. Manufacturer: Company specializing in manufacturing products specified in this Section with minimum five (5) years of experience.

ROAD DESIGN

PART 2 - PRODUCTS

2.1 MARKING TAPE, DETECTABLE UNDERGROUND SYSTEM

A. Description:

- 1. All underground pipe shall have electronically detectable warning/path marking tape.
- The marking tape shall be made of polyethylene (or approved equivalent) material,
 6 inches wide and a minimum of 6 millimeters thick.
- 3. The marking tape shall have detectable markers embedded in the tape and spaced adequately to provide a near continuous path to allow for easy detection at any point along the pipe. The signal should be such that it will provide guidance on the direction of the signal
- 4. The marking tape shall be able to function and be detected without the need for a direct connection to an external power source (e.g., no access points needed).
- 5. Each detectable marker embedded in the path marking system shall function independently, so that even if a section of pipe is removed, the remaining marked sections will continue to function.
- 6. System must be able to provide a depth measurement using an underground cable/pipe locator
- 7. The path marking system should not require grounding
- 8. The tape shall be blue, green or purple in color and shall be marked with words "CAUTION (WATER, SEWER or RECLAIM) LINE BURIED BELOW" (or an approved equivalent wording). The wording shall be repetitive along the full length of the tape.
- 9. Path marking tape shall be detectable at a minimum of 48" below grade regardless of soil composition
- 10. Manufacturers:
 - a. 3M Electronic Marking System (EMS) Path Marking Tape
 - b. or approved equal.

2.2 TRACE WIRE

- A. Locating Wire for Bored Mains:
 - 1. Conductor: Magnetically detectable tracer wire shall be a #12 AWG (0.0808" diameter) fully annealed, high carbon 1055 grade steel, high strength solid copper clad steel conductor (HS-CCS).
 - 2. Covering: Tracer wire shall be insulated with a 30 mil, high-density, high molecular weight polyethylene (HDPE) insulation, and rated for direct burial use at 30 volts.
 - 3. Color:
 - a. Color shall be blue for water, green for sewage force mains, and purple for reuse mains.
 - 4. Manufacturers:
 - a. Copperhead Industries, SoloShot, Pro Trace HF-CCS PE45,
 - b. or approved equal.
- B. Locating Wire for Open Cut Mains:

- 1. Conductor: Magnetically detectable tracer wire shall be a #14 AWG (0.0641" diameter) fully annealed, low carbon 1010 grade steel, solid copper-clad steel (CCS) conductor.
- 2. Covering: Tracer wire shall be insulated with a 30 mil, high-density, high molecular weight polyethylene (HDPE) insulation, and rated for direct burial use at 30 volts.
- 3. Color:
 - a. Color shall be blue for water, green for sewage force mains and gravity sewer, and purple for reuse mains.
- 4. Manufacturers:
 - a. Copperhead Industries, SoloShot, Pro Trace HF-CCS 30,
 - b. or approved equal.

PART 3 - EXECUTION

- 3.1 INSTALLATION
 - A. The Contractor shall install Marking Tape 12 inches to 18 inches above the top of the pipe.
 - B. Trace Wire shall be installed on the top and bottom of all nonmetallic pipe.

END OF SECTION 33 05 97

SECTION 33 14 13

PUBLIC WATER UTILITY DISTRIBUTION PIPING

PART 1 - GENERAL

1.1 SUMMARY

- A. General: This section includes the minimum requirements for installing water systems, which includes the furnishing, installing, laying, jointing, and testing of all water lines, hydrants, fittings, valves and appurtenances, including necessary service connections required for a complete system as shown on the Drawings and specified herein. The Work shall also include such connections, reconnections, relocations, temporary services, abandonments, and all other provisions in regard to existing water service operations and modifications required to perform the Work.
- B. Section Includes:
 - 1. Pipe and fittings for public potable water lines.
 - 2. Tapping sleeves and valves.
 - 3. Positive-displacement meters.
 - 4. Pipe support systems.
 - 5. Bedding and cover materials.
- C. Related Requirements:
 - 1. Section 33 01 10 Disinfection of Water Utility PipingSystems
 - 2. Section 33 05 97 Identification and Signage for Utilities.

1.2 REFERENCE STANDARDS

- A. American Association of State Highway and Transportation Officials:
 - 1. AASHTO T 180 Standard Method of Test for Moisture-Density Relations of Soils Using a 4.54-kg (10-lb) Rammer and a 457-mm (18-in.) Drop.
- B. American Society of Mechanical Engineers:
 - 1. ASME B16.1 Gray Iron Pipe Flanges and Flanged Fittings: Classes 25, 125, and 250.
- C. ASTM International:
 - 1. ASTM A36/A36M Standard Specification for Carbon Structural Steel.
 - 2. ASTM A123.
 - 3. ASTM A307 Standard Specification for Carbon Steel Bolts, Studs, and Threaded Rod 60 000 PSI Tensile Strength.
 - 4. ASTM D698 Standard Test Methods for Laboratory Compaction Characteristics of Soil Using Standard Effort (12 400 ft-lbf/ft3 (600 kNm/m3).

- 5. ASTM D1557 Standard Test Methods for Laboratory Compaction Characteristics of Soil Using Modified Effort (56,000 ft-lbf/ft3 (2,700 kN-m/m3).
- 6. ASTM D1785 Standard Specification for Polyvinyl Chloride (PVC) Plastic Pipe, Schedules 40, 80, and 120.
- 7. ASTM D2241 Standard Specification for Polyvinyl Chloride (PVC) Pressure-Rated Pipe (SDR Series).
- 8. ASTM D3035 Standard Specification for Polyethylene (PE) Plastic Pipe (DR-PR) Based on Controlled Outside Diameter.
- 9. ASTM D3139 Standard Specification for Joints for Plastic Pressure Pipes Using Flexible Elastomeric Seals.
- 10. ASTM D6938 Standard Test Method for In-Place Density and Water Content of Soil and Soil-Aggregate by Nuclear Methods (Shallow Depth).
- 11. ASTM F477 Standard Specification for Elastomeric Seals (Gaskets) for Joining Plastic Pipe.
- 12. ASTM F 714-05 Standard Specification for Polyethylene (PE) Pipe (SDR-PR) Based on Outside Diameter.
- D. American Water Works Association:
 - 1. AWWA C104 Cement-Mortar Lining for Ductile-Iron Pipe and Fittings.
 - 2. AWWA C105 Polyethylene Encasement for Ductile-Iron Pipe Systems.
 - 3. AWWA C110 Ductile-Iron and Gray-Iron Fittings.
 - 4. AWWA C111 Rubber-Gasket Joints for Ductile-Iron Pressure Pipe and Fittings.
 - 5. AWWA C115 Flanged Ductile-Iron Pipe with Ductile-Iron or Gray-Iron Threaded Flanges.
 - 6. AWWA C151 Ductile-Iron Pipe, Centrifugally Cast.
 - 7. AWWA C153 Ductile-Iron Compact Fittings.
 - 8. AWWA C200 Steel Water Pipe, 6 In. (150 mm) and Larger.
 - 9. AWWA C203 Coal-Tar Protective Coatings and Linings for Steel Water Pipe.
 - 10. AWWA C205 Cement-Mortar Protective Lining and Coating for Steel Water Pipe 4 In. (100 mm) and Larger Shop Applied.
 - 11. AWWA C206 Field Welding of Steel Water Pipe.
 - 12. AWWA C207 Steel Pipe Flanges for Waterworks Service, Sizes 4 In. Through 144 In. (100 mm Through 3,600 mm).
 - 13. AWWA C208 Dimensions for Fabricated Steel Water Pipe Fittings.
 - 14. AWWA C213 Fusion-Bonded Epoxy Coatings and Linings for Steel Water Pipe and Fittings.
 - 15. AWWA C300 Reinforced Concrete Pressure Pipe, Steel-Cylinder Type.
 - 16. AWWA C301 Prestressed Concrete Pressure Pipe, Steel-Cylinder Type.
 - 17. AWWA C500 Metal-Seated Gate Valves for Water Supply Service.
 - 18. AWWA C600 Installation of Ductile-Iron Mains and Their Appurtenances.
 - 19. AWWA C605 Underground Installation of Polyvinyl Chloride (PVC) and Molecularly Oriented Polyvinyl Chloride (PVCO) Pressure Pipe and Fittings.
 - 20. AWWA C606 Grooved and Shouldered Joints.
 - 21. AWWA C700 Cold-Water Meters Displacement Type, Metal Alloy Main Case.
 - 22. AWWA C701 Cold-Water Meters Turbine Type, for Customer Service.
 - 23. AWWA C702 Cold-Water Meters Compound Type.
- 24. AWWA C707 Encoder-Type Remote-Registration Systems for Cold-Water Meters.
- 25. AWWA C900 Polyvinyl Chloride (PVC) Pressure Pipe and Fabricated Fittings, 4 In. Through 12 In. (100 mm Through 300 mm), for Water Transmission and Distribution.
- 26. AWWA C901 Polyethylene (PE) Pressure Pipe and Tubing, 1/2 In. (13 mm) Through 3 In. (76 mm), for Water Service.
- 27. AWWA C905 Polyvinyl Chloride (PVC) Pressure Pipe and Fabricated Fittings, 14 In. Through 48 In. (350 mm Through 1,200 mm), for Water Transmission and Distribution.
- 28. AWWA M6 Water Meters Selection, Installation, Testing, and Maintenance.
- E. National Fire Protection Association:
 - 1. NFPA 24 Standard for the Installation of Private Fire Service Mains and Their Appurtenances.
- F. NSF International:
 - 1. NSF 61 Drinking Water System Components Health Effects.
 - 2. NSF 372 Drinking Water System Components Lead Content.
- 1.3 COORDINATION
 - A. Section 01 30 00 Administrative Requirements: Requirements for coordination.
 - B. Coordinate Work of this Section with termination of water main connection at Site boundary, connection to municipal water utility service, and trenching.
- 1.4 PREINSTALLATION MEETINGS
 - A. Section 01 30 00 Administrative Requirements: Requirements for preinstallation meeting.
 - B. Convene minimum one (1) week prior to commencing Work of this Section.
- 1.5 SUBMITTALS
 - A. Section 01 33 00 Submittal Procedures: Requirements for submittals.
 - B. Product Data: Submit manufacturer information regarding pipe materials, pipe fittings, valves, hydrants, hangers, and supports as required for completion of the Work.
 - C. The Contractor shall submit certificates of inspection from the manufacturer that the pipe, valves, and fittings to be supplied have been inspected at the plant and meet the

requirements of the Contract Documents. These certificates shall be submitted prior to beginning Work.

- D. Field Quality-Control Submittals: Indicate results of Contractor-furnished tests and inspections.
- E. Preconstruction Photographs: Submit digital files of color photographs of Work areas and material storage areas, as specified in Section 01 70 00 Execution and Closeout Requirements.
- F. Qualifications Statements:1. Submit qualifications for manufacturer and installer.

1.6 CLOSEOUT SUBMITTALS

- A. Section 01 70 00 Execution and Closeout Requirements: Requirements for submittals.
- B. Project Record Documents: Record actual locations of piping mains, valves, connections, thrust restraints, and invert elevations. All installed infrastructure shall be referenced to state plane coordinates. Record Documents shall be an As-built survey performed, signed and sealed by a Florida Licensed Surveyor. Record Documents shall be furnished in electronic GIS format with locations in Florida State Plane Coordinates, and elevations in NAVD 88.
- C. Identify and describe unexpected variations to subsoil conditions or discovery of uncharted utilities.

1.7 QUALITY ASSURANCE

- A. All pipe, valves, fire hydrants, and fittings shall be clearly marked with the name or trademark of the manufacturer, the batch number, the location of the plant, date of manufacture, strength designation and pressure rating.
- B. Materials in Contact with Potable Water:
 - 1. Certified according to NSF 61 and NSF 372.
 - 2. Certified lead free in accordance with the Safe Drinking Water Act.
- C. All materials shall be free from defects, impairing strength, and durability, and be of the best commercial quality for the purpose specified. Materials shall be new, less than one year old from manufacture date. It shall have structural properties sufficient to safely sustain or withstand strains and stress to which it is normally subjected and be true to detail.
- D. Manufacturer shall supply a certificate of application that PVC pressure pipe meets all requirements of AWWA C-900/C-905.
- E. Flow Meters:

- 1. A copy of the affidavit of compliance from the manufacturer shall be submitted and shall certify that flow meters will be furnished in full compliance with the requirements of this specification and those of applicable AWWA standards.
- 2. Contractor shall submit actual test results for each water meter by serial number and certify the accuracy of the meter.

1.8 QUALIFICATIONS

- A. Manufacturer: Company specializing in manufacturing products specified in this Section with a minimum five (5) years of documented experience.
- B. Installer: Company specializing in performing Work of this Section with a minimum five
 (5) years of documented experience in installation of liner materials.

1.9 DELIVERY, STORAGE, AND HANDLING

- A. Section 01 60 00 Product Requirements: Requirements for transporting, handling, storing, and protecting products.
- B. The date stamped on any pipe shall be within one (1) year of delivery to the Site.
- C. Inspection: Accept materials on Site in manufacturer's original packaging and inspect for damage.
- D. Storage:
 - 1. Store materials according to manufacturer instructions.
 - 2. Block individual and stockpiled pipe lengths to prevent moving.
 - 3. Do not place pipe or pipe materials on private property or in areas obstructing pedestrian or vehicle traffic.
 - 4. Store PE and PVC materials out of sunlight.
- E. Protection:
 - 1. Protect materials from moisture and dust by storing in clean, dry location remote from construction operations areas.
 - 2. Provide additional protection according to manufacturer instructions.

1.10 EXISTING CONDITIONS

- A. Field Measurements:
 - 1. Verify field measurements prior to fabrication.
 - 2. Indicate field measurements on Shop Drawings.

1.11 WARRANTY

A. Section 01 70 00 - Execution and Closeout Requirements: Requirements for warranties.

PART 2 - PRODUCTS

2.1 WATER PIPING

- A. Ductile Iron Pipe:
 - 1. Flanged ductile iron pipe shall comply with AWWA C115.
 - 2. Bell and spigot ductile iron pipe shall comply with ANSI/AWWA C150/A21.50 AND ANSI/AWWA C151/A21.51,
 - 3. Pipe shall be rated for a minimum working pressure of 200 psi working pressure or project requirements, whichever is greater plus a 100 psi minimum surge allowance and 2 to 1 factor of safety, using a Type II laying condition and a minimum depth of cover of four (4) feet.
 - 4. The class or nominal thickness, net weight without lining, and casting period shall be clearly marked on each length of pipe.
 - 5. Manufacturer's mark, country where cast, year in which the pipe was produced, and the letters "DI or "Ductile" shall be cast or stamped on each length of pipe.
 - 6. Pipe and fittings shall be NSF approved for potable water use and bear the NSF logo.
 - 7. Ductile iron pipe shall be manufactured in the United States of America.
 - 8. Each pipe shall be subjected to a hydrostatic pressure test of at least 500 psi at the point of manufacture.
 - 9. Pipes with cracked or chipped linings or defective pipes will be rejected.
 - 10. Bituminous Outside Coating:
 - a. Comply with AWWA C151
 - b. Apply by airless spray method
 - 11. Pipe Cement Mortar Lining:
 - a. Comply with ANSI/AWWA C104/A21.4.
 - 12. PE Encasement: Comply with AWWA C105.
 - 13. Pipe Class:
 - a. Comply with AWWA C151.
 - b. Pipe Diameters 4-inch through 12-inch: Class 350 (minimum).
 - c. Pipe Diameters 14-inch through 20-inch: Class 250(minimum).
 - d. Pipe Diameters 24-inch and larger: Class 200 (minimum).
 - 14. Fittings:
 - a. Material: Ductile iron; comply with AWWAC110.
 - b. Compact Fittings: Comply with AWWA C153.
 - c. Coating and Lining:
 - 1) Bituminous Coating: Comply with AWWA C110.
 - 2) Cement-Mortar Lining: Comply with AWWA C104; double thickness.
 - 15. Joints:
 - a. Joints shall be in accordance with ANSI/AWWA C111/A21.11, of latest revision, and be furnished complete with all necessary accessories.
 - b. Flanged Joints: Comply with AWWA C115.

d.

- c. Push-On Restrained Joints: Shall be restrained using grip gaskets or lock- rings.
 - 1) Manufacturers:
 - a) American: Fast-Grip Gaskets,
 - b) McWane: Sure Stop Restrained Gaskets,
 - c) Griffin: Talon Restrained Gaskets,
 - d) U.S. Pipe: Field Lok Restrained Gaskets.
 - Locking Ring Restrained Joints:
 - 1) Manufacturers:
 - a) American: Lok-Ring,
 - b) McWane: Super-Lock,
 - c) Griffin: Snap-Lok
 - d) U.S. Pipe: TR Flex Gripper
 - e) EBAA Iron Works: Mega-Lug Restraint Harness Series 1700,
 - f) Sigma: PVP-Lok Restraint
 - g) Tyler Union: Tuff Grip MJ Fitting Restraint
- e. Restrained Fitting, Mega-Lug, DIP:
 - 1) Restrained Fittings shall be ductile iron conforming to ANSI/AWWA C151/A21.51 specifications.
 - 2) All restrained mega-lugs shall be furnished with accessories and have a minimum pressure resistance of 200 psi.
 - 3) Manufacturers:
 - a) EBAA Iron Works, Series 1100,
 - b) Sigma, One Lok Series SLD,
 - c) Tyler Union Tuflock,
 - d) or approved equal.
- f. Flanged Joints:
 - 1) Comply with AWWA/ANSI115/A21.51.
 - 2) Pipe shall be furnished complete with all accessories.
 - 3) Gaskets: Unless otherwise shown or specified, gaskets shall be minimum 1/8-inch thick, full-face type. Gaskets shall be suitable for the service conditions specified, specifically designed for use with ductile iron pipe and fittings.
- B. Polyethylene Pipe:
 - 1. Pipe shall conform to AWWA C901 and ASTM D-2737, PE 3408, copper tube outside diameter.
 - 2. Pipe shall have a pressure rating of not less than 200 psi.
 - 3. Pipe shall be NSF approved for potable water use.
 - 4. Pipe Color: Blue.
 - 5. Pipe Diameters: 3/4" to 2".
- C. Copper Pipe:
 - 1. Pipe shall be seamless and comply with ASTM B88, hard temper and applicable AWWA specifications.
 - 2. Pipe shall have a pressure rating of not less than 200 psi.
 - 3. Pipe shall be NSF approved for potable water use.

- D. High Density Polyethylene Pipe (HDPE):
 - 1. Comply with AWWA C901 and C906, PE 3408.
 - 2. HDPE pipe shall DR-9 or DR-11.
 - 3. HDPE pipe shall have a pressure rating of not less than 160 psi.
 - 4. Pipe Outside Diameter: Iron Pipe Sizes (IPS).
 - 5. Fittings:
 - a. Comply with AWWA C901 and C906.
 - b. Type: Molded or fabricated.
 - 6. Joints: Butt fusion.
 - 7. HDPE pipe shall be NSF approved for potable water use and bear the NSF logo.
- E. PVC Pipe (Push on Joint, 4" and Larger):
 - 1. Comply with AWWA C900 and C905.
 - 2. PVC pipe shall be DR-14 or DR-18 and have a pressure rating of no less than 200 psi.
 - 3. PVC shall be NSF 61 approved and bear the NSF logo.
 - 4. Fittings: Mechanical joint ductile iron, complying with AWWA C111.
 - a. Restraint system shall be non-penetrating type specifically designed for PVC pipe.
 - 5. Push-On Joints:
 - a. Comply with ASTM D3139 and ASTM F477.
 - b. Seals: PVC flexible elastomeric.
 - c. Solvent-cement couplings are not permitted.
 - 6. Restrained Joints:
 - a. Where required, joints shall be restrained using restrained joint PVC piping system or bell restraint harnesses complying with all applicable AWWA specifications.
 - b. Manufacturers:
 - 1) Certain Teed: Certa-Lok C900/RJ Restrained Joint, Mechanical Gland Adapters for DR 14 and DR 18 pipe;
 - 2) EBAA Iron Works: Bell Restraint Harness for C900 PVC Pipe, Series 1600 for DR 14 and DR 18 pipe;
 - 3) Sigma: PVP-LOK Restraint;
 - 4) S&B Technical Products: Bull Dog Joint Restraints;
 - 5) Tyler Union: Tuff Grip MJ Fitting Restraint.
 - 7. Restrained Fitting, Mega-Lug, PVC:
 - a. Restraint Fittings shall be ductile iron conforming to ANSI/AWWA C111/A21.11 specifications.
 - b. All restrained mega-lugs shall be furnished with accessories and have a minimum pressure resistance of 200 psi.
 - c. Manufacturers:
 - 1) EBAA Iron Works, Series 2000,
 - 2) Tyler Union, Tuflock,
 - 3) Sigma One-Lok, Series SLG,
 - 4) or approved equal.

- F. PVC Pipe (Solvent Weld):
 - 1. Solvent Weld PVC Pipe shall conform to ASTM D1785, Schedule 80.
 - 2. Pipe shall be grey in color and marked for use.
 - 3. Pipe shall have a pressure rating of no less than 200 psi.
 - 4. PVC shall be NSF 61 approved and bear the NSF logo.
 - 5. Solvent Weld PVC Fittings shall conform to ASTM D2467.
 - 6. Pipe Diameters: 3/4" to 2".
 - 7. Fittings:
 - a. Solvent Weld PVC Fittings shall conform to ASTM D2466, ASTM D2467, and applicable AWWA standards.
 - b. Fittings shall have a pressure rating of no less than 200 psi.
 - c. All fittings shall be NSF approved for potable water use.
- G. PVC Pipe (Push on Joint, 2" Water Main):
 - 1. Push on joint PVC pipe for 2" diameter water mains shall conform to ASTM D2672, SDR 21 and applicable AWWA standards.
 - 2. Pipe shall have a pressure rating of no less than 200 psi.
 - 3. Pipe shall be blue in color.
 - 4. PVC shall be NSF 61 approved and bear the NSF logo.
 - 5. Joints: Gasketed Bell Joint.
 - 6. Fittings: Schedule 80 PVC conforming to ASTM D2467.
- H. PVC Pipe (Thermal Butt-Fusion Joint):
 - 1. Thermal Butt-Fusion Joint PVC Pipe shall be utilized for horizontal directional drills 4" diameter or larger and shall conform to AWWA C900 and C905 standards.
 - 2. PVC pipe shall be DR-18 and have a pressure rating of no less than 200 psi.
 - 3. PVC pipe shall be blue in color.
 - 4. PVC shall be NSF 61 approved and bear the NSF logo.
- I. Brass Fittings:
 - 1. Brass Bushing:
 - a. Brass bushings shall have hex head and shall be threaded.
 - b. Bushings shall conform to applicable AWWA standards.
 - c. Bushings shall be brass, NSF approved for potable water use, and shall have a minimum pressure rating of 200 psi.
 - 2. Coupling, Brass:
 - a. Brass couplings shall be a compression connection for copper tube size polyethylene tubing to male iron pipe threads.
 - b. Couplings shall conform to applicable AWWA standards.
 - c. Couplings shall be brass, NSF approved for potable water use, and shall have a minimum pressure rating of 200 psi.
 - d. Manufacturers:
 - 1) Mueller, H-15428,
 - 2) Ford, C84-33 (3/4"), C84-44 (1"), C84-77 (2"),
 - 3) A. Y. McDonald, 4578-22,

- 4) or approved equal.
- 3. Elbow, Regular 90-degree, Brass:
 - a. Brass elbow shall be NPT threaded.
 - b. Brass elbows shall conform to applicable AWWA standards.
 - c. Brass elbows to be brass, NSF approved for potable water use, and shall have a minimum pressure rating of 200 psi.
- 4. Plug, Brass:
 - a. Brass plug shall be threaded.
 - b. Plugs shall conform to applicable AWWA standards.
 - c. Plugs shall be brass, NSF approved for potable water use, and shall have a minimum pressure rating of 200 psi.
- 5. Nipple, Brass:
 - a. Brass nipple shall have threaded ends.
 - b. All brass nipples shall conform to applicable AWWA standards.
 - c. Nipples shall be brass, NSF approved for potable water use, and shall have a minimum pressure rating of 200 psi.
- 6. Tee, Brass Compression Packjoint:
 - a. Brass Compression Tee shall for connecting polyethylene pipes shall conform to AWWA C800 and ASTM B-62.
 - b. Packjoint nut shall have a split clamp with stainless steel screw and grooves inside of clamp for additional gripping action.
 - c. Tee shall be brass, NSF approved for potable water use, and shall have a minimum pressure rating of 200 psi.
 - d. Manufacturers:
 - 1) Ford, T444,
 - 2) Mueller, H15381,
 - 3) A.Y. McDonald, 4760-22,
 - 4) or approved equal.
- 7. Fire Department Connection, Brass:
 - a. Brass Fire Department Connection shall be used for auxiliary connection by a fire department to boost water system pressure in sprinkler system mains.
 - b. This connection shall be UL listed and FM approved in accordance with NFPA and consist of a brass straight or 90° Angular body, have two (2) 2-1/2" female NST inlets with clapper and pin lug swivels, and (1) female NPT outlet.
 - c. Furnish with standard NST plugs and chains.
 - d. Fitting shall be stamped with wording indicating "Auto Sprinkler".
 - e. Brass Fire Department Connection shall conform to applicable AWWA standards.
 - 8. Coupling, Pack Joint:
 - a. Pack Joint Couplings shall be for connection of copper tube size polyethylene tubing to male iron pipe threads.
 - b. Coupling shall conform to applicable AWWA standards.
 - c. Pack Joint Couplings shall be NSF approved for potable water use and shall have a minimum pressure rating of 200 psi.
 - d. Manufacturers:

- 1) Mueller, H15428,
- 2) Ford, C84,
- 3) or approved equal.

2.2 ADAPTOR COUPLINGS

- A. Coupling, Brass Adaptor Elbow:
 - 1. Brass Adaptor Elbow Coupling for connecting polyethylene pipe shall conform to AWWA C800 and ASTM B-62.
 - 2. Pack joint nut shall have a split clamp with stainless steel screw and grooves inside of clamp for additional gripping action.
 - 3. All couplings shall be brass, NSF approved for potable water use, and shall have a minimum pressure rating of 200 psi.
 - 4. Manufacturers:
 - a. Ford, L44-33, L-44-44, L-44-77,
 - b. Mueller, H-15526N,
 - c. A. Y. McDonald, 4761-22,
 - d. or approved equal.
- B. Coupling, Brass Adaptor Reducing:
 - 1. Reducing Brass Coupling Adaptor shall be for connection of 1" polyethylene pipe to 3/4" polyethylene pipe and shall conform to AWWA C800 and ASTM B-62.
 - 2. All couplings shall be brass, NSF approved for potable water use and shall have a minimum pressure rating of 200 psi.
 - 3. Manufacturers:
 - a. Ford, L-44-34,
 - b. A.Y. McDonald, 4761-22,
 - c. Mueller, H15526N,
 - d. or approved equal.
- C. Coupling, Ductile Iron Pipe:
 - 1. Ductile Iron Pipe Couplings shall conform to applicable AWWA standards.
 - 2. Ductile Iron Pipe Couplings shall be ductile iron, NSF approved for potable water use, and shall have a minimum pressure rating of 200 psi.
- D. Coupling, Ductile Iron Pipe, Restrained
 - 1. Restrained Ductile Iron Pipe Couplings shall conform to applicable AWWA standards.
 - 2. Restrained Ductile Iron Pipe Couplings shall be ductile iron, NSF approved for potable water use, and shall have a minimum pressure rating of 200 psi.
 - 3. Manufacturers:
 - a. EBAA Iron Works, Mega Coupling Series 3800 Restrained Coupling,
 - b. or approved equal.
- E. Coupling, Brass Adaptor Corporation Elbow:

- 1. Brass Adaptor Corporation Elbows shall conform to AWWA C800 and ASTM B- 62.
- 2. Brass Adaptor Corporation Elbows shall be brass, NSF approved for potable water use and shall have a minimum pressure rating of 200 psi.
- 3. Inlet: Mueller thread (swivel nut).
- 4. Outlet: CTS packjoint.
- F. Repair Coupling, Stainless Steel
 - 1. Stainless Steel Repair Couplings for pipe repair shall conform to applicable AWWA standards.
 - 2. Repair couplings shall be stainless steel, NSF approved for potable water use, and shall have a minimum pressure rating of 200 psi.

2.3 VALVES

- A. Resilient Seat Gate Valves:
 - 1. Resilient Seat Gate Valves shall conform to AWWA C509 or C515 and shall be provided for 2-inch diameter through 10-inch diameter water mains.
 - 2. Valve shall be pressure rated for 175 psi.
 - 3. Valve Body: Cast Iron or Ductile Iron.
 - 4. Valve Wedge: Cast Iron or Ductile Iron and completely encapsulated in EPDM.
 - 5. Valve stems shall be O-ring sealed and non-rising stem design.
 - 6. Valve Stems shall be Type 304 or 431 stainless steel.
 - 7. Gate valves shall be NSF 61 approved and bear the NSF logo.
 - 8. Operating nut shall be 2" square and turn counter clockwise to open the valve.
 - 9. Joints:
 - a. Mechanical Joint end connections shall fully conform with ANSI/AWWA C111/A21.11 for 4" diameter and larger.
 - b. Flanged end connections shall fully conform with ANSI B16.1 for 4" diameter and larger.
 - c. Threaded Joint: 2" diameter only.
 - 10. Manufacturers:
 - a. American Flow Control, Series 2500 (2" diameter and larger),
 - b. Mueller, A2360-20-F (4" diameter and larger), A2360-8-F (2" diameter),
 - c. Clow, F6100 (4" diameter and larger), F6103 (2" diameter),
 - d. or approved equal.
- B. Butterfly Valves:
 - 1. Butterfly Valves shall conform to AWWA C504 and shall be provided for water mains 12-inch diameter and larger.
 - 2. Working Pressure: 175 psi.
 - 3. Valve Body: Cast Iron
 - 4. Valve Seat: Neoprene.
 - 5. Disc: Ductile Iron, ASTM A-536.
 - 6. Valve Stem: Type 304 or 431 Stainless Steel.
 - 7. Butterfly valves shall be NSF 61 approved and bear the NSF logo.

- 8. Operating nut shall be 2" square and shall turn counter clockwise to open.
- 9. Valve interior and exterior shall be epoxy coated in accordance with AWWA C550. 10. Joints:
- - a. Flanged end connections shall fully conform with ANSIB16.1.
 - Mechanical Joint end connections shall fully conform with ANSI/AWWA b. C111/A21.11.
- 11. Manufacturers:
 - Mueller, B3211-20, a.
 - DeZurik, Class 200 MJ, b.
 - Pratt, Ground Hog, c.
 - M&H / Clow, Style 4500, d.
 - e. GA Industries, Series 800,
 - Valmatic, VM-2104, f.
 - or approved equal. g.
- C. **Insertion Valves:**
 - Insertion valves shall meet or exceed the testing requirements of AWWA C509 1. or C515.
 - Valve body may be cast iron, ductile iron, or Type 304 stainless steel. 2.
 - Valve shall be pressure rated for 175 psi. 3.
 - Valve Stem: Type 304 or 431 Stainless Steel. 4.
 - Insertion valves shall be NSF 61 approved and bear the NSF logo. 5.
 - Operating nut shall be 2" square and turn counter clockwise to open the valve 6. with an operating rate of three (3) turns per inch of nominal pipe size.
 - Interior Lining: Epoxy. 7.
 - Exterior Coating: Tar. 8.
 - Manufacturers: 9.
 - Advanced Valve Technologies, EZ Valve, a.
 - b. Hydra-Stop, Insta-Valve Plus,
 - Team Industrial Services, Insert Valve, c.
 - d. or approved equal.
- D. Check Valves (Threaded Swing-Flex Type):
 - Threaded swing-flex type check valves shall be used in conjunction with fire 1. department connections and shall be suitable for vertical or horizontal installation.
 - 2. The valve shall be UL listed and certified by FM Approval in accordance with the NFPA.
 - Valve shall be pressure rated for 175 psi and shall conform to all applicable 3. AWWA standards.
 - Threaded swing-flex type check valves shall be NSF 61 approved and bear the 4. NSF logo.
 - Materials: 5.
 - Valve Body: Cast Brass. a.
 - Clapper: Bronze. b.
 - Seat Ring: Bronze. c.

- d. Stainless steel spring and hinge pin.
- 6. Joints: NPT inlet and outlet.
- E. Check Valves (Flanged Swing-Flex Type)
 - 1. Flanged swing-flex type check valves shall conform to AWWA C508.
 - 2. Flanges shall conform to ANSI B16.1.
 - 3. Materials:
 - a. The flexible disc shall be one piece and precision molded with alloy steel and Nylon reinforcement and an integral O-ring style seat for drop tight seating at low pressure.
 - b. Valve Body: Ductile Iron.
 - 4. Valve shall be pressure rated for 175 psi.
 - 5. Check valves shall be NSF 61 approved and bear the NSF logo.
 - 6. Manufacturers:
 - a. Val-Matic, 500A Swing-Flex,
 - b. Clow, Ken-Flex,
 - c. Pratt, Flex Check,
 - d. Mueller, Flex Check,
 - e. GA Industries, Ludlow Check,
 - f. or approved equal.
- F. Air Release Valves (Stainless Steel):
 - 1. Stainless Steel Air Release Valves shall be of the type designed for use in water distribution systems to exhaust entrapped air from water mains and shall conform to all applicable AWWA standards.
 - 2. Valve shall be simple lever type and be constructed and tested to 175 psi working pressure.
 - 3. Air release valves shall be NSF 61 approved and bear the NSF logo.
 - 4. Materials:
 - a. Body and Cover: Stainless Steel
 - b. Interior Working Parts: Stainless Steel
 - 5. Air release valve inlets and outlets shall be threaded to NPT standards.
 - 6. Manufacturers:
 - a. H-TEC Model 986
 - b. Vent-O-Mat Model RGXII
 - c. or approved equal.
- G. Air Release Valves (Stainless Steel Body):
 - 1. Stainless Steel Body Air Release Valves shall be of the type designed for use in water distribution systems to exhaust entrapped air from water mains and shall conform to all applicable AWWA standards.
 - 2. Valve shall be simple lever type and be constructed and tested to 175 psi working pressure.
 - 3. Air release valves shall be NSF 61 approved and bear the NSF logo.

- 4. Materials:
 - a. Body and Cover: PVC
 - b. Interior Working Parts: PVC
- 5. Air release valve inlets and outlets shall be threaded to NPT standards.
- 6. Manufacturers:
 - a. A.R.I. Flow Control Accessories, Ltd., D-040,
 - b. or approved equal.
- H. Corporation Stops:
 - 1. Corporation stop shall meet AWWA C800 and ASTM B62.
 - 2. Inlet shall be threaded per AWWA IP standard with outlet copper tube size pack joint.
 - 3. Pack joint nut to have a split clamp with stainless steel screw and grooves inside of clamp for additional gripping action.
 - 4. Corporation stop shall be NSF approved for potable water use and shall have a pressure rating of 200 psi.
 - 5. Manufacturers:
 - a. Ford, F-1100,
 - b. Mueller, H15028,
 - c. A. Y. McDonald, 74704-22,
 - d. or approved equal.
- I. Corporation Stops (Polyethylene):
 - 1. Corporation stop shall meet AWWA C800 and ASTM B62.
 - 2. Inlet shall be threaded per AWWA IP standard with outlet copper tube size pack joint for polyethylene.
 - 3. Pack joint nut to have a split clamp with stainless steel screw and grooves inside of clamp for additional gripping action.
 - 4. Corporation stop shall be NSF approved for potable water use and shall have a pressure rating of 200 psi.
 - 5. Manufacturers:
 - a. Ford, F-1000,
 - b. Mueller, H15008,
 - c. A. Y. McDonald, 74701-22,
 - d. or approved equal.
- J. Curb Ball Valves:
 - 1. Curb Ball Valve shall conform to AWWA C800 and ASTM B62.
 - 2. Inlet and outlet shall be female iron pipe thread with tee head lock wing.
 - 3. Valve shall be NSF approved for potable water use and be pressure rated for 175 psi.
 - 4. Manufacturers:
 - a. Ford, B 41,
 - b. A. Y. McDonald, 6101W,
 - c. Mueller, B20200,
 - d. or approved equal.

- K. Hose Bibbs:
 - 1. Hose Bibbs shall be brass with iron pipe thread up stream and hose thread downstream.
 - 2. Valve operator shall turn counter-clockwise to open.
 - 3. Hose bibb shall be NSF approved for potable water use and conform to all applicable AWWA standards.
 - 4. Hose bibb shall have a pressure rating of 200 psi.
 - 5. Manufacturers:
 - a. Conbraco, No. 35-202-10,
 - b. Red-White Valve Co., RW 5313,
 - c. or approved equal.
- L. Pressure Reducing Valve (PRV)
 - 1. Pressure Reducing Valve shall meet AWWA C530 and NSF/ANSI 61
 - 2. Pressure Reducing Valve shall be check valve with isolation valve, full port globe body, and ANSI Class 150 flanges.
 - 3. Pilot with isolation valves, inlet and outlet pressure gauges (liquid filled), and "wye" type strainer. Pilot Spring Range to be 15-150 PSI.
 - 4. Materials:
 - a. Main Valve Body and Bonnet: Ductile Iron and epoxy coated
 - b. Disc Guide, Seat, Stem, and Spring: Stainless Steel
 - c. Disc: Rubber
 - d. Diaphragm: Nylon
 - e. Pilot: Copper Tubing and Brass Fittings
 - 5. Manufacturers:
 - a. Zurn/Wilkins, ZW209,
 - b. or approved equal.

2.4 TAPPING SLEEVES AND VALVES

- A. Tapping Saddles:
 - 1. Tapping Saddles for water main tapping shall be suitable for tapping cast iron, ductile iron, and PVC pipe.
 - 2. Saddles shall be approved for potable water use, shall have a pressure rating of 200 psi, and shall be certified to ANSI/NSF61 specifications.
 - 3. Tapping Saddles shall have Stainless Steel Stems.
 - 4. Description:
 - a. Material:
 - 1) Body: Ductile Iron.
 - 2) Bolts: Hot Dip Galvanized.
 - b. Type: Dual compression.
 - c. Outlet Flange Dimensions and Drilling: Comply with ASME B16.1, Class 125, and MSS SP-60.
 - 5. Manufacturers:
 - a. Mueller, H-615,
 - b. or approved equal.

- B. Sleeve, Tapping, Steel:
 - 1. Body: Carbon Steel
 - 2. Flanges: AWWA C207 Class D, ANSI 150 lb. drilling.
 - 3. Steel Tapping Sleeve shall have test plug with ³/₄" NPT and recessed cavity for mating tapping valves.
 - 4. Gasket: Grade 60 gasket compounded for use with water, oil, salt solutions, mild acids, bases, and natural gas.
 - 5. Bolts, washers, and nuts: 18-8 stainless steel type 304.
 - 6. Finish: Fusion bonded epoxy coated to an average of 12 mil thickness inside and out, per AWWA C213.
 - 7. Sleeves shall be NSF approved for potable water and shall have a minimum pressure rating of 200 psi.
 - 8. Manufacturers:
 - a. Smith-Blair, 622,
 - b. Dresser, 610,
 - c. JCM, 412,
 - d. Romac, FTS420SSFE,
 - e. or approved equal.
- C. Sleeve, Tapping, Stainless Steel:
 - 1. Body: 18-8 stainless steel
 - 2. Lugs: 18-8 stainless steel
 - 3. Bolts, washers, and nuts: NC rolled thread, 18-8 stainless steel
 - 4. Gasket: Virgin SBR compounded for water service, full wrap around design.
 - 5. Flange: 18-8 stainless steel with 3/4" NPT test plug.
 - 6. All sleeves shall conform to applicable AWWA standards.
 - 7. All sleeves to be NSF approved for potable water and shall have a minimum pressure rating of 200 psi.
 - 8. Manufacturers:
 - a. Romac, Style SST,
 - b. Ford, Fast,
 - c. JCM, 432,
 - d. Dresser, 630,
 - e. Mueller, H304SS,
 - f. or approved equal.
- D. Tapping Valves:
 - 1. Tapping Valves shall be resilient seat gate valves that conform to AWWA C509 or C515.
 - 2. Valve shall be pressure rated for 175 psi.
 - 3. Valve Body: Cast Iron or Ductile Iron.
 - 4. Valve Wedge: Cast Iron or Ductile Iron and completely encapsulated in EPDM.
 - 5. Valve Stems shall be O-ring sealed and non-rising stem design.
 - 6. Valve Stems shall be Type 304 or 431 stainless steel.
 - 7. Gate valves shall be NSF 61 approved and bear the NSF logo.

- 8. Operating nut shall be 2" square and turn counter clockwise to open the valve.
- 9. Joints:
 - a. Tapping Valves shall be flanged joint by mechanical joint.
 - b. Mechanical Joint end connections shall fully conform with ANSI/AWWA C111/A21.11 for 4" diameter and larger.
 - c. Flanged end connections shall fully conform with ANSI B16.1 for 4" diameter and larger.
 - d. Threaded Joint: 2" diameter only.
- 10. Manufacturers:
 - a. American Flow Control, Series 2500,
 - b. Mueller, T2360-16-F,
 - c. Clow, F6114,
 - d. or approved equal.

2.5 FLOW METERS

- A. Electromagnetic Meters:
 - 1. Electromagnetic Meters shall have a Stainless Steel or Brass body containing not less than 75% copper.
 - 2. Positive Displacement Flow Meters shall be rated for 200 psi working pressure.
 - 3. Size, model, and direction of flow shall be marked permanently on outer case of all meters. The name of the manufacturer shall be marked permanently on the lid of the register box. The serial number of the meter shall be imprinted on the lid and on meter main case.
 - 4. Register:
 - a. The register shall be permanently hermetically sealed.
 - b. No fogging, large numerals, tempered glass or plastic lens.
 - c. Unit of Measure: Cubic foot.
 - d. Straight and AMI reading, and low flow indicator.
 - e. The register shall connect to a Cellular Endpoint. AMI transmitter via factory potted NICOR Connector as part of the register. The AMI transmitter shall be capable of communicating to Badger's Beacon AMA Cellular Metering System.
 - 5. Connection: Flanged and/or screwed ends as designated
 - a. Flanged connections shall include companion flanges, gaskets, bolts, and nuts.
 - 6. Manufacturers:
 - a. Badger,
 - b. or approved equal.
- B. Electromagnetic Flow Meter for Fire Service:
 - 1. Electromagnetic Flow Meters for Fire Service shall meet or exceed requirements of AWWA C703 standards and shall be NSF approved for potable water use.
 - 2. Materials:
 - a. Body: Stainless Steel.

- b. Electrodes: Type 316 Stainless Steel.
- c. Display Housing: Aluminum Alloy with glass display window.
- Electromagnetic Flow Meters shall be rated for 200 psi working pressure.
- 4. Connection: Flanged.
 - a. Flanged connections shall include companion flanges, gaskets, bolts, and nuts.
- 5. Electronic Display:

3.

- a. Electronic display shall be included with Electromagnetic Flow Meter.
- b. Display shall include three (3) outputs for pulses and alarm and shall display usage and total.
- c. Electronic display shall be mounted in a secure location.
- 6. Manufacturers:
 - a. Badger,
 - b. or approved equal.
- C. Electromagnetic Flow Meters:
 - 1. Electromagnetic Flow Meters shall meet or exceed requirements of AWWA C751 standards and shall be NSF approved for potable water use.
 - 2. Materials:
 - a. Body: Bronze, Cast Iron, or Stainless Steel.
 - b. Liner: Fusion-bonded epoxy coated.
 - c. Electrodes: Type 316 Stainless Steel.
 - d. Display Housing: Aluminum Alloy with glass display window.
 - 3. Electromagnetic Flow Meters shall be rated for 200 psi working pressure.
 - 4. Connection: Flanged.
 - a. Flanged connections shall include companion flanges, gaskets, bolts, and nuts.
 - 5. Register:
 - a. The register shall be permanently hermetically sealed.
 - b. No fogging, large numerals, tempered glass lens.
 - c. Unit of Measure: Cubic foot.
 - d. Magnetic drive, low torque registration.
 - e. Straight and AMI reading, and low flow indicator.
 - f. The register shall connect to a Cellular Endpoint. AMI transmitter via factory potted NICOR Connector as part of the register. The AMI transmitter shall be capable of communicating to Badger's Beacon AMA Cellular Metering System.
 - 6. Manufacturers:
 - a. ABB, Aquamaster,
 - b. AMCO, Q4000 Mag Meter,
 - c. McCrometer, Ultra Mag,
 - d. Badger,
 - e. or approved equal.
 - D. Remote Readers:
 - 1. Remote Readers shall conform to all applicable AWWA specifications.

- 2. Electronic LCD time counter, battery operated, to be mounted in a NEMA four(4) fiberglass enclosure.
- 3. Manufacturers:
 - a. Hersey, Model REC-1,
 - b. or approved equal.

2.6 FIRE ASSEMBLIES

- A. Fire Hydrants:
 - 1. Fire hydrant assemblies shall conform to AWWA C-502.
 - 2. Fire hydrant shall contain two (2) 2 ¹/₂" hoses and one (1) 4 ¹/₂" steamer connection with National standard fire hose coupling screw threads, 5 ¹/₄" valve opening, and 6" diameter mechanical joint inlet.
 - 3. Operating nut shall be $1\frac{1}{2}$ " pentagon and open counterclockwise.
 - 4. Stem shall be stainless steel.
 - 5. Fire hydrants shall be factory painted Red (Epoxy Primer, Polyurethane Finish Coat, Safety Red, CC13, ANSIZ53.1-1971).
 - 6. Inside of hydrant shoe shall be epoxy coated.
 - 7. Bonnet shall be bolted to upper barrel with bonnet bolt and nut.
 - 8. Hydrants shall have drain holes and be complete with all accessories.
 - 9. Fire hydrant assemblies shall be NSF approved for potable water use and shall have a minimum pressure rating of 200 psi.
 - 10. Manufacturers:
 - a. Mueller, Centurion 250,
 - b. American Flow Control, B-84-B
 - c. M & H, Style 129,
 - d. Clow, Medallion F2545,
 - e. or approved equal.
- B. Detector Check Assemblies, Single:
 - 1. Single Detector Check Assemblies shall conform to applicable AWWA standards and consist of one (1) internally spring loaded "Y" figure check valve with cast iron body, bronze replaceable seat ring with stainless steel stem and spring.
 - 2. All internal cast iron parts shall be epoxy coated.
 - 3. The bypass assembly shall consist of an internally spring-loaded double check valve in series with a water meter which shall read in cubic feet and a shutoff gate valve.
 - 4. Single detector check assemblies shall have a minimum pressure rating of 200 psi, meet USC approval, and NSF approval for potable water.
 - 5. Manufacturers:
 - a. Hersey, EDC II,
 - b. Ames, 1000 DCV,
 - c. or approved equal.
- C. Detector Check Assemblies, Double:

- 1. Double Detector Check Assemblies shall conform to applicable AWW standards and consist of two (2) internally spring loaded "Y" figure check valves having cast iron bodies, bronze replaceable seat rings and stainless-steel stems and springs.
- 2. All internal cast iron parts shall be epoxy coated.
- 3. The bypass assembly shall consist of a bronze body internally spring-loaded double check valve in series with a bronze water meter which shall read in cubic feet and two (2) gate valves.
- 4. Double detector check assemblies shall have a minimum pressure rating of 200 psi, meet USC approval, and NSF approval for potable water.
- 5. Manufacturers:
 - a. Febco, 806YD,
 - b. Hersey, DDC II,
 - c. Ames, 3000-DCDA,
 - d. Wilkins, 350-DA,
 - e. or approved equal.
- D. Check Assemblies, Double:
 - 1. Double check valve assemblies shall conform to applicable AWWA standards and consist of two (2) internally spring loaded "Y" figure check valves having cast iron bodies, bronze replaceable seat rings and stainless-steel stems and springs.
 - 2. All internal cast iron parts shall be epoxy coated.
 - 3. Double check valve assemblies shall have a minimum pressure rating of 200 psi and meet USC approval and NSF approval for potable water.
 - 4. Manufacturers:
 - a. Febco, 805YD,
 - b. Hersey, No. 2,
 - c. Watts, 709RW,
 - d. Ames, 2000-SS,
 - e. or approved equal.
 - E. Fire Flow Assembly:
 - 1. Fire flow assembly shall consist of an internal spring loaded "Lever" check valve, magnetic drive, mainline proportional meter, bypass turbine meter, bypass check valve and shutoff valve.
 - 2. Valve shall meet UL and FM approvals.
 - 3. Meters shall read in cubic feet.
 - 4. Assembly shall be cast iron and conform to all applicable AWWA standards.
 - 5. Fire flow assemblies shall meet NSF approval for potable water use and shall have a minimum pressure rating of 200 psi.
 - 6. Manufacturers:
 - a. Hersey, MFM-MHR
 - b. Neptune, Protectus III,
 - c. Sensus, Fireline,
 - d. or approved equal.

- F. Hydrant Out of Service Markers:
 - 1. Fire Hydrant Out of Service Markers shall be heavy duty plastic markers installed on the steamer nozzle and stenciled with "OUT OF SERVICE" on one side in bold black paint.
 - 2. Markers shall fit 4" and $4\frac{1}{2}$ " steamer nozzle.
 - 3. Color to be high visibility orange.
 - 4. Out of Service Markers shall be installed on all new hydrants until flow tested and placed into service.

2.7 REPAIR SLEEVES

- A. General: Couplings shall be furnished with the pipe stop removed. Couplings shall be provided with plain, Grade 27, rubber gaskets and with black, steel, track-head bolts with nuts.
- B. Sleeve, Compression, Galvanized Steel:
 - 1. Galvanized Steel Compression Sleeve shall be hot dip galvanized and shall have a protected gasket.
 - 2. Sleeves shall conform to applicable AWWA standards.
 - 3. Sleeves shall be NSF approved for potable water and shall have a minimum pressure rating of 200 psi.
 - 4. Manufacturers:
 - a. Smith-Blair, 522,
 - b. Telsco Industries, 700 Series,
 - c. or approved equal.
- C. Sleeve, Compression, Brass:
 - 1. Brass Compression Sleeves for joining 2" HDPE to 2" PVC Piping shall be brass and shall have a protected gasket.
 - 2. Sleeves shall conform to applicable AWWA standards.
 - 3. Sleeves shall be NSF approved for potable water and shall have a minimum pressure rating of 200 psi.
- D. Sleeve, Ductile Iron, Mechanical Joint:
 - 1. Ductile Iron Mechanical Joint Sleeves shall conform to ANSI/AWWA C153 for compact fittings, three (3") inch through 36" diameter.
 - 2. Sleeves shall be ductile iron long pattern with mechanical joint ends and shall be cement mortar lined and bituminous sealed.
 - 3. Sleeves shall be furnished with accessories.
 - 4. Ductile Iron Mechanical Joint Sleeves shall be NSF approved for potable water use and shall have a minimum pressure rating of 200 psi.

2.8 SERVICE TAPPING SADDLES

A. Service Tapping Saddle for Cast Iron, Ductile Iron, and PVC Water Mains:

- 1. Tapping saddles for cast iron, ductile iron, and PVC water mains shall conform to applicable AWWA standards.
- 2. Outlet shall be for connection to PVC or polyethylene pipe.
- 3. Tapping saddles shall be nylon coated or painted ductile iron with double stainless-steel strap and neoprene gasket.
- 4. Tapping saddles shall have a pressure rating of 200 psi and shall be NSF approved for potable water use.
- 5. Manufacturers:
 - a. Ford, F202,
 - b. Baker, 181,
 - c. Mueller, DR-25 Series,
 - d. Romac Industries, 202-N or S Series,
 - e. Smith-Blair, 313 Series,
 - f. or approved equal.
- B. Service Tapping Saddle for HDPE Water Mains:
 - 1. Tapping saddles for HDPE water mains shall conform to applicable AWWA standards.
 - 2. Outlet shall be for connection to PVC or polyethylene pipe.
 - 3. Tapping saddles shall be nylon coated or painted ductile iron with double stainless-steel strap and neoprene gasket.
 - 4. Tapping saddles shall have a pressure rating of 200 psi and shall be NSF approved for potable water use.
 - 5. Manufacturers:
 - a. Mueller, DR-2S Series,
 - b. Romac Industries, 202-N or S Series,
 - c. Smith-Blair, 313 Series,
 - d. or approved equal.

2.9 VALVE BOXES AND LIDS

- A. Valve Box:
 - 1. Valve boxes shall not be deeper than five (5) feet without Owner approval.
 - 2. Bottom Section:
 - a. Cast iron, ASTM A48, heavy duty screw type.
 - b. Cast iron screw valve box will be only type allowed in asphalt pavement.
 - c. Cast iron screw or sliding type valve box may be used in right of way as specified per project.
 - 3. Valve Box Extension:
 - a. Cast iron, ASTM A48, heavy duty screw type extension.
 - b. For deep valves use six (6) inch ductile or cast-iron pipe cut to proper length so only one valve box extension is used.
 - 4. Valve Box Tops shall be cast iron, screw type, and conform to ASTM A48.
 - Valve Box Tops shall be rated for H-20 traffic in conformance with AASHTO M- 306.
 - 6. Manufacturers:

- a. Tyler, #6850-5625-24B (Bottom), #6050-5625-585C (Extension), #6850- 5625-16T (Top),
- b. Opelika Foundry, #4908-5562-S-625 (Bottom), #4906X-64E (Extension), #4905-5562-S-55S (Top),
- c. Sigma, VB 2622 (Bottom), VB302-18 (Extension), VB2621X (Top),
- d. Star Pipe Products, VBB24SHD (Bottom), VBEX14S (Extension), VBT16SHD (Top),
- e. or approved equal.
- B. Valve Box Lid:
 - 1. Provide cast iron, ASTM A48, heavy duty, screw type, valve box, 5 ¹/₄" shaft for non-pavement installations.
 - Valve Box Lid shall be rated for H-20 traffic in conformance with AASHTO M- 306.
 - 3. Cover shall be marked "WATER".
 - 4. Manufacturers:
 - a. Sigma, VB2600X,
 - b. Tyler, 5 1/4" Drop Lid,
 - c. Opelika Foundry, #4908-562 Lid,
 - d. Star Pipe Products, VBLIOHD,
 - e. or approved equal.
- C. Non-Pop Valve Box Lid:
 - 1. Provide high tech molded polymer lid, ASTM A48, heavy duty, screw type, valve box, 5 ¹/₄" shaft cast iron valve box top.
 - 2. Non-Pop Valve Box Lids shall be installed in heavy traffic pavement areas.
 - Valve Box Lids shall be rated for H-20 traffic in conformance with AASHTO M- 306.
 - 4. All boxes shall conform to applicable AWWA standards.
 - 5. Cover shall be marked "WATER".
 - 6. Manufacturers:
 - a. SW Services, 5 1/4" Non-Pop Lid,
 - b. or approved equal.

2.10 METER BOXES AND LIDS

- A. Lid, Gulf Meter Box:
 - 1. Gulf Meter Box Lids shall be locking type, plastic material, heavy duty, and with legend "WATER METER" on lid.
 - 2. Meter Box Lids shall conform to applicable AWWA standards.
- B. Box, Gulf Meter:
 - 1. Meter box shall be furnished with locking lid.
 - 2. Lid shall be plastic material, heavy duty, and with the legend "WATER METER".
 - 3. Box shall conform to applicable AWWA standards.
 - 4. Manufacturer:

- a. Ford, G148-233,
- b. Mueller, H-1453-3
- c. or approved equal.
- C. Box, Polymer Meter:
 - 1. Meter box shall be constructed of polymer concrete and reinforced by a heavy weave fiberglass type service box.
 - 2. Logo on cover shall read "WATER METER".
 - 3. Covers shall be non-locking and have hinged reader lid.
 - 4. Color shall be blue.
 - 5. Box and cover shall have H-10 load rating unless specified otherwise
 - 6. Box shall include mouse holes on both ends and have stacking capability.
 - 7. Polymer Meter Boxes shall conform to applicable AWWA standards.
 - 8. Manufacturers:
 - a. DFW Plastics, DFWB40WBC-14-1T 63D (24" x 36"),
 - b. DFW Plastics, DFW37F-12-1 (body) w/DFW37C-1 (lid) (Residential)
 - c. or approved equal.
- D. Box, Utility, Precast Concrete Vault:
 - 1. Precast Concrete Utility Box shall meet the requirements of ASTM C478, with the exclusion of Section 10 (a), except as modified herein.
 - 2. Cement shall meet the requirements of ASTM C150, Specification for Portland Cement, Type I/II.
 - 3. Concrete for utility boxes shall be 4,000 PSI and meet the minimum requirements for Class III.
 - 4. Minimum wall thickness shall be six inches.
 - 5. The required minimum strength of concrete and conformance to the design parameters shall be confirmed by testing in accordance with Section 345 of the Florida Department of Transportation Standard Specifications for Road and Bridge Construction (latest edition) except that the CONTRACTOR shall be responsible for all testing.
 - 6. Reinforcing steel shall be #4 GR60 rebar 12" O.C. both ways.
 - 7. Utility box shall be constructed with open bottom.
 - 8. Where a top slab is required, it shall be six inches (6") thick, 4,000 PSI concrete with #4 GR60 rebar 12" O.C. both ways.
 - 9. Where details call for aluminum hatch to be cast with the utility box, the hatch shall be as specified in Section 33 32 1 Field-Erected Wastewater Pumping Stations.

2.11 PIPE SUPPORTS AND ANCHORING

- A. Metal for Pipe Support Brackets:
 - 1. Material: Structural steel.
 - 2. Finish: Galvanized.
 - 3. Coating: Bituminous paint.
- B. Metal Tie Rods and Clamps or Lugs:

- 1. Material: Galvanized steel.
- 2. Size: Comply with NFPA 24.
- 3. Coating: Bituminous paint.

2.12 CONCRETE ENCASEMENT AND CRADLES

- A. Concrete:
 - 1. As specified in the Florida Department of Transportation Standard Specifications for Road and Bridge Construction (latest edition.)
 - 2. Type: Reinforced, air entrained.
 - 3. Compressive Strength: 4,000 psi at 28 days.
 - 4. Finish: Rough troweled.
- 2.13 MATERIALS
 - A. Backfill:
 - 1. Bedding, cover, and soil backfill materials shall be in accordance with Section125 of the Florida Department of Transportation Standard Specifications for Road and Bridge Construction (latest edition.)
- 2.14 FINISHES
 - A. Steel: Hot-dip galvanized after fabrication, according to ASTM A123/A123M.
 - B. Protective Coating: Coal-tar epoxy for below grade piping and epoxy paint for exposed piping.
- 2.15 ACCESSORIES
 - A. Pipe Markers: As specified in Section 33 05 97 Identification and Signage for Utilities.
 - B. Vaults: As specified in Section 33 05 63 Concrete Vaults and Chambers.
 - C. Steel Rods, Bolt, Lugs, and Brackets:
 - 1. Comply with ASTM A36/A36M or A307, Grade A carbon steel unless otherwise shown or specified.

PART 3 - EXECUTION

- 3.1 EXAMINATION
 - A. Section 01 70 00 Execution and Closeout Requirements: Requirements for installation examination.
 - B. Contractor shall contact Sunshine 811 for location of existing utilities at 811 or 1-800- 432-4770 a minimum of 48 hours prior beginning Work.

- C. The Contractor shall field verify vertical and horizontal locations of all underground facilities in advance of construction to verify that no conflicts exist with the proposed pipe alignment and depth.
 - 1. Should a conflict be discovered, the Contractor shall contact the Engineer immediately and provide all pertinent information for preparation of a remedial design.
- D. Verify that existing utility water main size, location, and invert are as indicated on Drawings.
- 3.2 PREPARATION
 - A. Section 01 70 00 Execution and Closeout Requirements: Requirements for installation preparation.
 - B. Preconstruction Site Photos:
 - 1. As specified in Section 01 70 00 Execution and Closeout Requirements.
 - 2. Take photographs along centerline of proposed pipe trench; minimum one photograph for each 50 feet of pipe trench.
 - 3. Show mailboxes, curbing, lawns, driveways, signs, culverts, and other existing Site features.
 - 4. Include Project description, date taken, and sequential number on back of each photograph.
 - C. Pipe Cutting and Lining Repair:
 - 1. Cut pipe ends square, ream pipe and tube ends to full pipe diameter, and remove burrs.
 - 2. Use only equipment specifically designed for pipe cutting; use of chisels or hand saws is not permitted.
 - 3. Grind edges smooth with beveled end for push-on connections.
 - 4. Remove all traces of oil, grease, asphalt, dust, dirt, etc.
 - 5. Remove damaged lining and clean any exposed metal by sanding or scraping. Sandblasting and power tool cleaning is also acceptable.
 - a. Remove any loose lining by chiseling, cutting, or scraping to well adhered lined area before patching.
 - b. Lining patch shall overlap remaining lining at least one (1)inch.
 - 6 With the area to be sealed or repaired absolutely cleaned and thoroughly roughened, apply a coat of repair compound specified in the applicator's "Certificate of Application" as furnished and approved with the pipe submittal. The Contractor shall apply the repair compound in strict accordance with the manufacturer's written instructions.
 - 7. The Contractor shall repair damaged coating and lining immediately, using the repair compound recommended by the manufacturer.
 - 8 The cost of repair to cut pipe ends or damaged linings shall be incidental to construction and the Contractor shall absorb the cost thereof in the unit price specified for related items.

- D. Remove scale and dirt on inside and outside before assembly.
- E. Prepare pipe connections to equipment with flanges or unions.
- 3.3 INSTALLATION
 - A. Bedding and installation shall be Class B as shown on the Drawings unless otherwise specified or directed by the Engineer.
 - B. Horizontal Directional Drill and Jack and Bore Installations shall be in accordance with Specification Section 33 05 07.00 – Boring and Jacking and Section 33 05 07.13 – Utility Directional Drilling.
- C. Handling and Cutting Pipe:
 - 1. The Contractor shall exercise extreme care in handling and laying pipe and fittings to avoid damaging, scratching, or marring machined surfaces, and abrasion of the pipe or fitting coating.
 - 2 Any fitting showing a crack and any fitting or pipe that has received a severe blow that may have resulted in an incipient fracture, even though no such fracture can be seen, shall be marked as rejected and immediately removed from the Work.
 - 3. Any pipe showing a distinct crack and in which it is believed there is no incipient fracture beyond the limits of the visible crack, the cracked portion, if so approved by the Engineer, may be cut off by and at the expense of the Contractor before the pipe is laid so that the pipe used may be perfectly sound. The cut shall be made in the sound barrel at a point at least twelve (12) inches from the visible limits of the crack.
 - 4. Except as otherwise approved, all cuttings shall be done with a machine having rolling wheel cutters, or pipe saw adapted for that purpose. All cut ends shall be examined for possible cracks caused by cutting.
- D. Abandoning Water Mains:
 - 1. Water Mains Abandoned in Place: The Contractor shall cut the water main as required to make connections or install plugs. That portion of the pipe to be abandoned and left in place shall be plugged at locations where the pipe was cut or punctured. Plugging shall be accomplished by grouting the end or punctured area to the satisfaction of the Engineer.
 - 2 Water Mains Abandoned in Place with Grout Fill: The Contractor shall cut the water main as required, install plugs, and fill the pipe with grout as shown on the Drawings.
 - 3. Water mains to be abandoned and removed shall be cut or disconnected as required.
- E. Pipe Installation:
 - 1. Comply with AWWA C600 and C605 as applicable.
 - 2 Handle and assemble pipe according to pipe and gasket manufacturer instructions and as indicated on Drawings.
 - 3. Steel Rods, Bolts, Lugs, and Brackets: Coat buried steel before backfilling.

- 4. No water main shall be installed within six (6) feet of a sanitary sewer line, unless the bottom of the water main is at least six (6) inches higher than the crown of the sanitary sewer, or unless special permission is obtained from the Engineer or FDEP. In no case shall a water main be placed in the same trench with a sanitary sewer.
- 5. Water Main Location:
 - a. Water mains shall be constructed eight (8) feet off the north or east right of way lines unless otherwise shown on the plans.
 - b. Water lines to be constructed in easements shall be centered within the boundaries of the easement.
 - c. If trees or other structures should interfere with the alignment of the water main, the water main shall be adjusted towards the right of way line.
 - d. Minimum depth of installation shall be three (3) feet, measured from the top of the pipe to the finished grade or centerline of roadway directly above the pipe.
 - e. Minimum horizontal clearance between parallel water mains and sanitary sewer gravity mains shall be six (6) feet, ten (10) feet preferred.
 - f. Minimum horizontal clearance between parallel water mains and sanitary sewer force mains shall be six (6) feet, ten (10) feet preferred.
 - g. Minimum horizontal clearance between parallel water mains and storm sewer mains shall be three (3) feet.
 - h. Minimum horizontal clearance between parallel water mains and reuse force mains shall be three (3) feet.
 - i. Minimum vertical clearance between water mains and gravity sanitary sewer mains crossing each other shall be six (6) inches, twelve (12) feet preferred.
 - j. Minimum vertical clearance between water mains and storm sewer mains crossing each other shall be six (6) inches, twelve (12) inches preferred.
 - k. Minimum vertical clearance between water mains and sanitary sewer force mains crossing each other shall be twelve (12) inches.
 - 1. Minimum vertical clearance between water mains and reuse force mains crossing each other shall be twelve (12) inches.
- 6 Route pipe in straight line and re-lay pipe that is out of alignment or grade.
- 7. Ductile-Iron Piping and Fittings: Comply with AWWA C600.
- 8 PVC Pipe Piping and Fittings: Comply with AWWAC605.
- 9. Field Welding Materials: Comply with AWWA C206.
- 10. Flanged Joints: Do not use in underground installations except within structures.
- 11. To ensure correct fitting of pipe and couplings, all sleeve-type couplings and accessories shall be furnished by the supplier of the pipe.
- 12. High Points:
 - a. Install pipe with no high points other than shown on the Drawings.
 - b. If approved by the Engineer, minor changes in alignment may be permitted to avoid underground facilities.
 - c. If unforeseen field conditions arise that necessitate high points, install airrelease valves as specified or as directed by the Engineer.
- 13. Bearing:

- a. The pipe shall be laid on an unyielding foundation with uniform bearing under the full length of the barrel of the pipe.
- b. Excavate bell holes to permit proper joint installation.
- c. The spigot end of the pipe shall abut the base of the socket of the adjacent pipe in such a manner that there will be no gaps along the perimeter of the mating halves.
- 14. Do not lay pipe in wet or frozen trench.
- 15. The Contractor shall take all necessary precautions to prevent flotation of the pipe from flooding of the trench.
- 16 The pipe shall not be driven down to grade by striking it with a shovel handle, timber, rammer, or other unyielding object.
- 17. Immediately before joining the pipe, the mating ends shall be thoroughly cleaned of all dirt, debris, and foreign material.
- 18. Prevent mud, sand, or other foreign material from entering pipe during placement.
- 19. At all times when pipe laying is not actually in progress, the open ends of the pipe shall be closed by temporary watertight plugs or by other approved means. If water is in the trench when work is resumed, the plug shall not be removed until all danger of water entering the pipe has passed.
- 20. Allow for expansion and contraction without stressing pipe or joints.
- 21. Close pipe openings with watertight plugs during Work stoppages.
- 22. Install access fittings to permit disinfection of water system performed under Section 33 01 10 Disinfection of Water Utility Piping Systems.
- 23. Cover:
 - a. Establish elevations of buried piping with not less than four (4) feet of cover.
 - b. Measure depth of cover from final surface grade to top of pipe barrel.
- 24. Pipe Markers: As specified in Section 33 05 97 Identification and Signage for Utilities.
- 25. Any defective pipe that may have been installed shall be removed and replaced with sound pipe at no additional cost to the Owner.
- F. Pipe Joint Assembly:
 - 1. Assemble all joints in accordance with recommendations of the manufacturer.
 - 2 If a lubricant is required to facilitate assembly, it shall have no detrimental effect on the gasket or on the pipe when subjected to prolonged exposure.
 - 3. Proper jointing may be verified by rotation of the spigot by hand or with a strap wrench.
 - 4. If unusual jointing resistance is encountered or if the insertion mark does not reach the flush position, disassemble the joint, inspect for damage, re-clean the joint components, and repeat the assembly steps.
 - 5. Note that fitting bells may permit less insertion depth than pipe bells.
 - 6 When mechanical equipment is used to assemble joints, care should be taken to prevent over-insertion.
- G. Valves
 - 1. Valves shall be installed as indicated on Drawings and according to manufacturer instructions.

- 2 Valves shall be set vertically so that stems form a vertical line. Care shall be taken to keep out dirt and sand, and no valve shall be operated until it has been cleaned of sand, grit, or other foreign material.
- 3. No valve operating nut shall be deeper than five (5) feet without Owner approval.
- 4. Valve Boxes:
 - a. All valves shall be fitted with heavy duty traffic rated valve box and cover as specified herein.
 - b. Valve boxes shall be long enough to reach from the valve to finished ground level and shall be installed as recommended by the manufacturer.
 - c. Valve boxes shall have suitable barrel and shaft extension sections to cover and protect the valve bonnet section.
 - d. Extension sections fabricated by one piece of ductile iron are allowed. No more than one (1) shaft extension shall be used in any one (1) valve installation.
 - e. Valve box extensions shall be by same manufacturer as valve box or ductile iron pipe.
 - f. Valve boxes shall be installed in vertical alignment and positioned to facilitate the operation of the valve with a standard valve wrench. The box shall be installed as shown on the drawings and shall be set on firmly packed soil or bricks to prevent settlement and to prevent bearing on the valve or the main at any point.
 - g. Adjustment of valve boxes shall be subject to the approval of the Engineer. The Contractor shall maintain vertical alignment and position to permit operation of the valve with a standard valve wrench.
 - h. All valve boxes located in heavy traffic pavement areas shall include non-pop covers as specified.
 - i. Terminate locating wire for all sizes of PVC and HDPE water mains in the valve boxes in accordance with the Drawings.
 - j. Valve Box Adjustment:
 - 1) All valve boxes within the area of finished construction shall be adjusted to finish grade as shown and specified.
 - 2) Valve boxes damaged during construction shall be replaced by the Contractor at no additional cost to the Owner. Removal and replacement of valve boxes during construction may be authorized, provided the Contractor ensures that sufficient valve ties are available and on site in order to quickly locate the valve.
 - 3) Adjustment of valve boxes shall be subject to approval of the Engineer.
- H. Hydrants:
 - 1. As indicated on Drawings and according to manufacturer instructions.
 - 2 The Contractor shall be responsible for hydrant adjustment to grade and all extensions, fittings, pipe, or appurtenances required to achieve the required adjustments.

- 3. Hydrants shall be set so that a minimum of seven (7) feet of clearance on each side and seven (7) feet of clearance on front and back is provided between the hydrant operating nut and any obstacles that may hinder opening and closing of the hydrant.
- 4. Fire hydrants shall be blocked by concrete or mega-lug restraints on the back side of the hydrant to prevent movement due to water pressure thrust.
- 5. Only one (1) extension shall be allowed to adjust the hydrant to final grade. Hydrant extension shall be by the same manufacturer as the hydrant. Maximum length of extension is two (2) feet.
- 6 Gravel shall be placed around the base of the hydrant to ensure complete drainage of the hydrant when closed.
- 7. The Contractor shall place a hydrant status sign on the steamer connection of each fire hydrant until hydrants have been accepted by the Engineer and are ready for use.
- I. Double continuous tracing wires shall be installed on all non-metallic pipes per Specification Section 33 05 97 Identification and Signage for Utilities.
- J. Early warning tape, as specified in Section 33 05 97 Identification and Signage for Utilities, shall be installed 12-inches to 18-inches above all sanitary sewer forcemains.
- K. Tapping Sleeves and Valves: As indicated on Drawings and according to manufacturer instructions.
- L. Water Service Connections:
 - 1. Water services shall be installed at property corners and may be either single or double type services.
 - 2 Water meters shall be located at the right-of-way line.
 - 3. All water services shall be installed with a locating wire in accordance with Section 33 05 97 Identification and Signage for Utilities and the Drawings.
 - a. Locating wires shall be installed to a three o'clock, nine o'clock position, or directly under the service pipe.
 - b. Locating wire shall not be installed directly over the main. Plastic tie straps shall be used to secure the wire.
 - 4. Water services under roads shall be installed in a casing.
 - a. For one (1) inch diameter service piping, install in two (2) inch diameter PVC, HDPE, or steel casing.
 - b. For two (2) inch diameter service piping, install in four (4) inch PVC, HDPE, or steel casing.
 - 5. Existing water services that are to be relocated to new water mains shall be relocated as indicated on the plans. The Contractor shall install all new service pipe and fittings, including the back side of the meter box.
 - 6 Where new water services are to replace existing water services, the entire existing water service shall be removed to the main except for the valve or corporation stop controlling the service. This shall include the pipe and gooseneck assembly.

- M. PE Encasement:
 - 1. Encase ductile iron piping in PE to prevent contact with surrounding backfill material when pipe is installed in corrosive soils as shown on the Drawings.
 - 2 Comply with AWWA C105.
 - 3. Terminate encasement 3 to 6 inches above ground where pipe is exposed.
 - N. Bedding and Backfilling:
 - 1. Excavation, trenching, and backfilling shall be in accordance with Section 125 of the Florida Department of Transportation Standard Specifications for Road and Bridge Construction (latest edition.)
 - Backfill around sides and to top of pipe with cover fill in minimum lifts of six
 (6) inches and compact to the requirements specified in Section 31 23 23.00 Fill.
 - 3. Immediately after the pipe has been jointed and inspected, sufficient backfill shall be performed to protect the pipe adequately from injury and movement.
 - 4. Maintain optimum moisture content of bedding material to attain required compaction density.
 - 5. Where so indicated on the drawings or where directed by the Engineer, the pipe shall be supported by compacted granular fill or concrete cradle or encasement according to the applicable detail shown on the Drawings.
 - a. Pipe bedded in compacted granular backfill shall not be supported on blocking, wedges, bricks, or anything except the bedding material.
 - b. Where concrete cradle or encasement is required, the pipe shall be supported on solid concrete blocks or pre-cast concrete saddles which shall become part of the completed cradle or encasement.
 - c. Where no other bedding is indicated, pipe shall be placed on a shaped bed of undisturbed material.
 - O. Cleaning and Flushing:
 - 1. As the Work progresses, the interior of the water piping shall be cleaned of all dirt, jointing material, and superfluous materials of every description.
 - 2. Prior to the pressure and leakage tests, all piping shall be thoroughly cleaned of all dirt, dust, oil, grease, and other foreign matter. This work shall be done with care to avoid damage to any inside coating.
 - 3. All lines shall be thoroughly flushed with clean water to clear the lines of all foreign matter.
 - P. Disinfection of Potable Water Piping Systems: As specified in Section 33 01 10 - Disinfection of Water Utility Piping Systems.

3.4 PIPE SUPPORT AND THRUST RESTRAINT

A. The Contractor shall furnish and install all supports necessary to hold the piping and appurtenances in a firm, substantial manner at the lines and grades indicated on the Drawings or specified.

- B. Where buried piping contains fittings, which raise or lower the centerline of the pipe, suitable socket clamps, tie rods, or other approved restraining devices shall be used to prevent movement of the fittings. The restraining devices shall be coated thoroughly and heavily with an approved bituminous paint.
- C. All bends, tees, and other fittings in pipelines, and sleeve-coupled pipelines buried in the ground shall be backed with Class 1 concrete placed against undisturbed earth where firm support can be obtained or by the use of restrained joints. If the soil does not provide firm support, then suitable clamps, and accessories or restrained joints shall be provided to brace the fitting properly. Such items shall be coated thoroughly and heavily with an approved bituminous paint after assembly or, if necessary, before assembly.
- D. Thrust blocks and joint restraints shall be provided as shown.

3.5 MAINTENANCE OF SERVICE

- A. Maintenance of service is of the utmost importance and no service shall be discontinued without the consent of the Engineer for each interruption of said service.
- B. In no case will any service be discontinued without at least 48-hour notice given to the Engineer by the Contractor.
- C. Contractor shall be responsible for 48-hour notification (residential) and 2-week notification (commercial) to those affected by the shutdown, including door hanger/notice distribution.
- D. To achieve minimum inconvenience to the public and users of the water system, portions of the Work may have to be performed outside of normal working hours at no additional cost to the Owner.

3.6 CONNECTION TO EXISTING WATER LINES

- A. Connections to existing water lines shall be as shown on the Drawings or as directed by the Engineer. Connection shall not occur until approval has been obtained from the Florida Department of Environmental Protection.
- B. Connection of new to existing mains shall be performed in the normal accepted method for connecting mains and shall be done without unduly disrupting service. All connections are subject to the approval of the Engineer as to method, time, and location.
- C. Construct locate wire(s) point of connection on ferrous pipe at non-ferrous pipe joints.
- D. To ensure adequate backflow prevention and accountability of water use, the Contractor shall install a temporary jumper connection as shown on the Drawings.

- E. Where new lines are connected to existing lines, the Contractor shall take appropriate action to prevent existing lines from interfering with the disinfection or pressure testing portions of the Work. Failure to do so will not relieve the Contractor of the responsibility of properly disinfecting and pressure-testing the entire system installed. The Contractor shall bear full responsibility for his action or inaction in this matter and shall not claim damages, injuries or additional compensation for his action or inaction.
- F. At least 48 hours prior to beginning the actual connection operation, the Contractor shall excavate and expose the main to be tapped at the proposed location and shall so advise the Engineer to allow for inspection of the exposed facilities.
- G. Water from existing lines cut either by accident or during connection to proposed lines shall not be disposed of in a manner that would be injurious to residents, property, or structures.
- H. Existing water mains or services reduced to 20 psi, or lower, shall be bacteriologically tested by Contractor to ensure no contamination. Boil water notices or advisories shall be issued to affected customers whether by accident or planned.
- 3.7 TOLERANCES
 - A. Section 01 40 00 Quality Requirements: Requirements for tolerances.
 - B. Install pipe to indicated elevation within tolerance of 5/8 inch.
- 3.8 PAVEMENT CROSSINGS
 - A. Bases, Sidewalk, Curb, and Driveway Repairs The Contractor shall replace any and all bases, sidewalks, curbs and gutter, and driveways with materials and workmanship sufficient to give an equal and similar surface to the disturbed areas as existed before construction.
 - B. Pavement removal and replacement shall be in accordance with Florida Department of Transportation Standard Specifications for Road and Bridge Construction (latest edition) and as shown on the Drawings.
 - C. Temporary Asphalt Millings will be acceptable with a maximum of 7 calendar days before final asphalt pavement. If more than 7 calendar days before final asphalt pavement is needed, a cold patch asphalt mix must be used.
- 3.9 FIELD QUALITY CONTROL
 - A. Section 01 70 00 Execution and Closeout Requirements: Requirements for testing, adjusting, and balancing.
 - B. Testing:

- 1. All parts of the Work including, but not being limited to, pipe, fittings, joints, valves, hydrants, and any other appurtenances shall be subjected to testing as described herein. To achieve this, all methods of testing shall be approved by the Engineer and FDEP
- 2. Except as otherwise directed, all pipelines shall be tested. Pipelines installed in excavation or bedded in concrete shall be tested prior to the backfilling of the excavation or placing of the concrete and exposed piping shall be tested prior to field painting.
- 3. All piping to operate under liquid pressure shall be tested in sections of approved length. The section of pipe being tested shall be limited to a maximum length of 2000 feet. For these tests the Contractor shall furnish clean water, suitable temporary testing plugs or caps, and other necessary equipment and all labor required, without additional compensation. The Contractor shall furnish suitable pressure gauges, pumps, and measuring tank.
- 4. The Contractor shall be responsible for the cost of all water used for testing and flushing. The Contractor shall make suitable arrangements with the Owner for the monitoring of water consumption and locations to which water may be made available. Water charges shall be in accordance with City of Ocala Ordinance Section 70- 413.
- 5. Pressure test piping system as specified in Section 33 05 05.31 Hydrostatic Testing.
- 6 Disinfection and bacteriological testing shall be performed as specified in Section 33 01 10 Disinfection of Water Utility Piping Systems.
- 7. Compaction Testing:
 - a. See Section 31 23 23.00 Fill for requirements for compaction testing.
 - b. If tests indicate Work does not meet specified requirements, remove Work, replace, and retest.

END OF SECTION 33 14 13

SECTION 33 31 11

PUBLIC SANITARY SEWERAGE GRAVITY PIPING

PART 1 - GENERAL

1.1 SUMMARY

- A. General: This section includes the minimum requirements for installing sanitary sewer gravity systems, which includes the furnishing, installing, laying, jointing, and testing of all sewer lines, manholes, fittings, and appurtenances, including necessary service connections required for a complete system to connect to City sewer and as shown on the Drawings and specified herein. The Work shall also include such connections, reconnections, relocations, temporary services, abandonments, and all other provisions in regard to existing sewer operations and modifications as required.
- B. Section Includes:
 - 1. Sanitary sewerage piping.
 - 2. Connection to existing manholes.
 - 3. Wye branches and tees.
 - 4. Sanitary laterals.
 - 5. Bedding and cover materials.
- C. Related Requirements:
 - 1. Section 31 05 13 Soils for Earthwork.
 - 2. Section 31 05 16 Aggregates for Earthwork.
 - 3. Section 31 23 16 Excavation.
 - 4. Section 31 23 23 Fill.
 - 5. Section 33 05 05.33 Infiltration and Exfiltration Testing.
 - 6. Section 33 05 05.43 Mandrel Testing.
 - 7. Section 33 05 61 Concrete Manholes.
 - 8. Section 33 05 97 Identification and Signage for Utilities.

1.2 DEFINITIONS

- A. ABS: Acrylonitrile butadiene styrene.
- B. Bedding: Fill placed under, beside, and directly over pipe, prior to subsequent backfill operations.
- C. EPDM: Ethylene-propylene-diene monomer.

1.3 REFERENCE STANDARDS

- A. American Association of State Highway and Transportation Officials:
 - 1. AASHTO T 180 Standard Method of Test for Moisture-Density Relations of Soils Using a 4.54-kg (10-lb) Rammer and a 457-mm (18-in.)Drop.

- B. American Water Works Association:
 - 1. AWWA C105 Polyethylene Encasement for Ductile-Iron Pipe Systems.
 - 2. AWWA C110 Ductile-Iron and Gray-Iron Fittings.
 - 3. AWWA C111 Rubber-Gasket Joints for Ductile-Iron Pressure Pipe and Fittings.
 - 4. AWWA C150 Thickness Design of Ductile-Iron Pipe.
 - 5. AWWA C151 Ductile-Iron Pipe, Centrifugally Cast.
 - 6. AWWA C153 Ductile-Iron Compact Fittings.
- C. ASTM International:
 - 1. ASTM A74 Standard Specification for Cast Iron Soil Pipe and Fittings.
 - 2. ASTM A123/.
 - 3. ASTM C14 Standard Specification for Nonreinforced Concrete Sewer, Storm Drain, and Culvert Pipe.
 - 4. ASTM C14M Standard Specification for Nonreinforced Concrete Sewer, Storm Drain, and Culvert Pipe (Metric).
 - 5. ASTM C443 Standard Specification for Joints for Concrete Pipe and Manholes, Using Rubber Gaskets.
 - 6. ASTM C443M Standard Specification for Joints for Concrete Pipe and Manholes, Using Rubber Gaskets (Metric).
 - 7. ASTM C923 Standard Specification for Resilient Connectors Between Reinforced Concrete Manhole Structures, Pipes, and Laterals.
 - 8. ASTM C923M Standard Specification for Resilient Connectors Between Reinforced Concrete Manhole Structures, Pipes, and Laterals (Metric).
 - 9. ASTM D698 Standard Test Method for Laboratory Compaction Characteristics of Soil Using Standard Effort (12,400 ft-lb./ft3 (600 kN-m/m3).
 - 10. ASTM D1557 Standard Test Methods for Laboratory Compaction Characteristics of Soil Using Modified Effort (56,000 ft-lb./ft3 (2,700 kN-m/m3).
 - 11. ASTM D1785 Standard Specification for Poly(Vinyl Chloride) (PVC) Plastic Pipe, Schedules 40, 80, and 120.
 - 12. ASTM D2321 Standard Practice for Underground Installation of Thermoplastic Pipe for Sewers and Other Gravity-Flow Applications.
 - 13. ASTM D2729 Standard Specification for Poly(Vinyl Chloride) (PVC) Sewer Pipe and Fittings.
 - 14. ASTM D2855 Standard Practice for Making Solvent-Cemented Joints with Poly(Vinyl Chloride) (PVC) Pipe and Fittings.
 - 15. ASTM D3034 Standard Specification for Type PSM Poly(Vinyl Chloride) (PVC) Sewer Pipe and Fittings.
 - 16. ASTM D6938 Standard Test Method for In-Place Density and Water Content of Soil and Soil-Aggregate by Nuclear Methods (Shallow Depth).
 - 17. ASTM F477 Standard Specification for Elastomeric Seals (Gaskets) for Joining Plastic Pipe.

1.4 COORDINATION

A. Section 01 30 00 - Administrative Requirements: Requirements for coordination.
- B. Coordinate Work of this Section with the Owner and all authorities having jurisdiction.
- C. Contractor shall contact Sunshine 811 for location of existing utilities at 811 or 1-800-432-4770 a minimum of 48 hours prior beginning work.

1.5 SUBMITTALS

- A. Section 01 33 00 Submittal Procedures: Requirements for submittals.
- B. Product Data: Submit manufacturer catalog cuts and other information indicating proposed materials, accessories, details, and construction information.
- C. Permits: Submit three (3) copies of all permits required for completion of the Work shown and specified.
- D. Manufacturer's Certificate: Certify that products meet or exceed specified requirements.
- E. Test and Evaluation Reports: Submit reports indicating field tests made and results obtained.
- F. The pipe or fitting manufacturer shall supply a "Certificate of Application" that the lining applicator has met the specified requirements.
- G. Manufacturer Instructions:
 - 1. Indicate special procedures required to install specified products.
 - 2. Submit detailed description of procedures for connecting new sewer to existing sewer line and directional drilling installation.
- H. Source Quality-Control Submittals: Indicate results of factory tests and inspections.
- I. Field Quality-Control Submittals: Indicate results of Contractor-furnished tests and inspections.
- J. Qualifications Statement:
 - 1. Submit qualifications for manufacturer(s) and installer(s).

1.6 CLOSEOUT SUBMITTALS

- A. Section 01 70 00 Execution and Closeout Requirements: Requirements for submittals.
- B. Project Record Documents: Record invert elevations and actual locations of pipe runs, connections, manholes, cleanouts, existing utilities adjacent to new utilities, and all other pertinent features associated with the Work. Record Documents shall be an As-built survey performed, signed and sealed by a Florida Licensed Surveyor. Record Documents shall be furnished in electronic GIS format with locations in Florida State Plane Coordinates, and elevations in NAVD 88.
- C. Identify and describe unexpected variations to subsoil conditions or discovery of uncharted utilities.

1.7 QUALITY ASSURANCE

- A. Perform Work according to applicable Federal, State, and Local standards.
- 1.8 QUALIFICATIONS
 - A. Manufacturer: Company specializing in manufacturing products specified in this Section with minimum five (5) years of documented experience.
 - B. Installer: Company specializing in performing Work of this Section with minimum five (5) years of documented experience.

1.9 DELIVERY, STORAGE, AND HANDLING

- A. Section 01 60 00 Product Requirements: Requirements for transporting, handling, storing, and protecting products.
- B. Inspection: Accept materials on Site in manufacturer's original packaging and inspect for damage.
 - 1. Pipe with cracked or chipped linings or defects in the pipe will be rejected.

C. Storage:

- 1. Store materials according to manufacturer instructions.
- 2. Store valves in shipping containers with labeling in place.

D. Protection:

- 1. Protect materials from moisture and dust by storing in clean, dry location remote from construction operations areas.
- 2. Block individual and stockpiled pipe lengths to prevent moving.
- 3. Provide additional protection according to manufacturer instructions.

1.10 EXISTING CONDITIONS

- A. Field Measurements:
 - 1. Verify field measurements prior to fabrication.
 - 2. Indicate field measurements on Shop Drawings.

PART 2 - PRODUCTS

2.1 SANITARY SEWERAGE PIPING

- A. Polyvinyl Chloride (PVC) Pipe:
 - 1. Gravity sewer PVC pipe shall conform to ASTM 3034, SDR-26.
 - 2. Color: Green.
 - 3. Pipe manufacturer shall supply a Certificate of Application that the pipe has met requirements of ASTM 3034, SDR-26.

- 4. PVC fittings shall conform to ASTM 1336, SDR-26.
 - a. Fittings shall be gasketed bell joint type and green in color.
- B. Ductile Iron Pipe:
 - 1. Comply with AWWA C150 and AWWA C151.
 - 2. Pipe shall be rated for a minimum working pressure of 200 psi plus a 100psi minimum surge allowance, and a two to one (2:1) factor of safety, using a Type II laying condition and a depth of cover of 4 feet.
 - a. Pipe diameters 4-inch through 12-inch shall be Class 350, minimum.
 - b. Pipe diameters 14-inch through 20-inch shall be Class 250, minimum.
 - c. Pipe diameters 24-inches and larger shall be Class 200, minimum.
 - 3. End Connections: Bell and spigot.
 - 4. Ductile iron pipe shall be manufactured in the U.S.A. and each piece shall be subjected to a hydrostatic pressure test of at least 500 psi at the point of manufacture.
 - 5. The class or nominal thickness, new weight without lining, and casting period shall be clearly marked on each length of pipe. Additionally, the manufacturer's mark, country where cast, year in which the pipe was produced, and the letters "DI" or "Ductile" shall be cast or stamped on each length of pipe.
 - 6. Pipe shall have an exterior bituminous coating applied by airless spray method.
 - 7. Pipe shall have an interior Amine Cured Epoxy Lining.
 - 8. PE Encasement: Comply with AWWA C105 for installation of PE Encasement when pipe is installed in corrosive soils.
 - 9. Fittings:
 - a. Material: Ductile iron with a pressure rating that meets but does not exceed the specified pressure rating of connected pipe.
 - b. Comply with AWWA C153 or AWWA C110.
 - c. Lining: Factory applied amine cured epoxy.
 - d. Coating: Exterior of fittings shall be epoxy coated as specified in Section 09 90 00 Painting and Coating.
 - 10. Joints:
 - a. Push-On Joints:
 - 1) Comply with AWWA/ANSIC111/A21.11.
 - 2) Furnish complete with all accessories required.
 - b. Restrained Joint:
 - 1) Restrained joints shall be restrained using grip gaskets of locking rings.
 - 2) All restraints shall comply with applicable AWWA standards.
 - 3) Manufacturers:
 - a) American, Fast-Grip Restrained Gaskets, Lok-Ring Restrained Rings,
 - b) McWane, Sure Stop Restrained Gaskets, Super Lok Restrained Rings,
 - c) Griffin, Talon Restrained Gaskets, Snap-Lok Restrained Rings,
 - d) U.S. Pipe, Field-Lok Restrained Gaskets, TR Flex Gripper Restrained Rings,
 - e) EBAA Iron, Mega-Lug Restraint Harness, Series 1700,

- f) Sigma, Bell Joint Restraint Series PVP (16-inch and smaller), Series SLDH (18-inch and larger),
- g) Tyler Union, Tuff Grip MJ Fitting Restraints,
- h) or approved equal.

C. Cleanouts:

- 1. Cleanout assembly shall include a PVC wye, PVC threaded/slip adaptor, threaded cleanout plug, and pipe required for connection from wye to plug,
- 2. All cleanout materials shall conform to ASTM F1336, SDR-26.

2.2 MANHOLES

A. As specified in Section 33 05 61 - Concrete Manholes.

2.3 FLEXIBLE COUPLINGS

- A. Flexible Couplings for connection of Clay Pipe to Ductile Iron Pipe:
 - 1. Couplings shall be constructed of heavy-duty rubber and conform to applicable AWWA standards.
 - 2. Manufacturers:
 - a. Fernco, 1003,
 - b. Indiana Seal, 103,
 - c. Dallas Specialty, DS 03,
 - d. or approved equal.
- B. Flexible Couplings for connection of Clay Pipe to PVC Pipe:
 - 1. Couplings shall be constructed of heavy-duty rubber and conform to applicable AWWA standards.
 - 2. Manufacturers:
 - a. Fernco, 1002,
 - b. Indiana Seal, 102,
 - c. Dallas Specialty, DS 02,
 - d. or approved equal.

2.4 FLEXIBLE PIPE BOOTS FOR MANHOLE PIPE ENTRANCES

- A. Description:
 - 1. Material: Heavy duty rubber.
 - 2. Comply with ASTM C923.
 - 3. Attachment: Series-300 stainless-steel clamp and hardware.

2.5 MATERIALS

- A. Bedding and Cover:
 - 1. Excavation, trenching, and backfilling shall be in accordance with Section 125 of the Florida Department of Transportation Standard Specifications for Road and Bridge Construction (latest edition.)

- 2. Backfill shall be compacted in accordance with Section 31 23 23.00 Fill.
- 3. Immediately after the pipe has been jointed and inspected, sufficient backfill shall be performed to protect the pipe adequately from injury and movement.
- 4. Maintain optimum moisture content of bedding material to attain required compaction density.
- 5. Where so indicated on the drawings or where directed by the Engineer, the pipe shall be supported by compacted granular fill or concrete cradle or encasement according to the applicable detail shown on the Drawings.
 - a. Pipe bedded in compacted granular backfill shall not be supported on blocking, wedges, bricks, or anything except the bedding material.
 - b. Where concrete cradle or encasement is required, the pipe shall be supported on solid concrete blocks or pre-cast concrete saddles which shall become part of the completed cradle or encasement.
 - c. Where no other bedding is indicated, pipe shall be placed on a shaped bed of undisturbed material

2.6 MIXES

- A. Grout: Grout shall be Embeco 167 or approved equal.
- B. Mortar: Mortar shall be Embeco 381 or approved equal.

2.7 FINISHES

- A. Galvanizing:
 - 1. Hot-dip galvanize after fabrication.
 - 2. Comply with ASTM A123/A123M.
- 2.8 ACCESSORIES
- A. Pipe Markers: As specified in Section 33 05 97 Identification and Signage for Utilities.
 2.9 SOURCE QUALITY CONTROL
 - A. Section 01 40 00 Quality Requirements: Requirements for testing, inspection, and analysis.
 - B. Provide shop inspection and testing of pipe.
 - C. Owner Inspection:
 - 1. Make completed pipe sections available for inspection at manufacturer's factory prior to packaging for shipment.
 - 2. Notify Owner at least seven days before inspection is allowed.
 - D. Owner Witnessing:
 - 1. Allow witnessing of factory inspections and tests at manufacturer's test facility.
 - 2. Notify Owner at least seven days before inspections and tests are scheduled.
 - E. Certificate of Compliance:

- 1. If manufacturer is approved by authorities having jurisdiction, submit certificate of compliance indicating Work performed at manufacturer's facility conforms to Contract Documents.
- 2. Specified shop tests are not required for Work performed by approved manufacturer.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Section 01 70 00 Execution and Closeout Requirements: Requirements for installation examination.
- B. Verify that trench cut, or excavation base is ready to receive Work of this Section.
- C. Verify that excavations, dimensions, and elevations are as indicated on Drawings or as directed by the Engineer.

3.2 PREPARATION

- A. Section 01 70 00 Execution and Closeout Requirements: Requirements for installation preparation.
- B. Correct over-excavation with coarse aggregate.
- C. Remove large stones or other hard materials that could damage pipe or impede consistent backfilling or compaction.
- D. Protect and support existing sewer lines, utilities, and appurtenances.

E. Utilities:

- 1. Maintain profiles of utilities.
- 2. Coordinate with existing utilities to eliminate interference.
- 3. Notify Engineer if crossing conflicts occur.

3.3 INSTALLATION

- A. Bedding and Backfill:
 - 1. Excavation, trenching, and backfilling shall be in accordance with Section 125 of the Florida Department of Transportation Standard Specifications for Road and Bridge Construction (latest edition.)
 - 2. Backfill around sides and to top of pipe with cover fill in minimum lifts of six (6) inches and compact to the requirements specified in Section 31 23 23.00 Fill.
 - 3. Immediately after the pipe has been jointed and inspected, sufficient backfill shall be performed to protect the pipe adequately from injury and movement.
 - 4. Maintain optimum moisture content of bedding material to attain required compaction density.

- 5. Where so indicated on the drawings or where directed by the Engineer, the pipe shall be supported by compacted granular fill or concrete cradle or encasement according to the applicable detail shown on the Drawings.
 - a. Pipe bedded in compacted granular backfill shall not be supported on blocking, wedges, bricks, or anything except the bedding material.
 - b. Where concrete cradle or encasement is required, the pipe shall be supported on solid concrete blocks or pre-cast concrete saddles which shall become part of the completed cradle or encasement.
 - c. Where no other bedding is indicated, pipe shall be placed on a shaped bed of undisturbed material.
- B. Piping:
 - 1. Install pipe, fittings, and accessories according to ASTM D2321, and seal joints watertight.
 - 2. Lay pipe to slope gradients as indicated on Drawings.
 - 3. Begin at downstream end of system and progress upstream.
 - 4. Bedding: As indicated on Drawings.
 - 5. Lay bell-and-spigot pipe with bells upstream.
 - 6. PE Pipe Encasement: Comply with AWWA C105, Method A.
 - 7. Backfill and compact as specified in Section 31 23 23.00 Fill.
 - 8. Do not displace or damage pipe when compacting.
 - 9. Connect pipe to existing facilities as shown on the Drawings.
 - 10. Pipe Markers: As specified in Section 33 05 97 Identification and Signage for Utilities.
- C. Manholes: As specified in Section 33 05 61 Concrete Manholes.
- D. Connections to Existing Manholes:
 - 1. Drilling:
 - a. Core drill existing manhole to clean opening.
 - b. Use of pneumatic hammers, chipping guns, and sledgehammers are not permitted.
 - 2. Install watertight neoprene gasket and seal with non-shrink concrete grout.
 - 3. Encasement:
 - a. Concrete encase new sewer pipe as shown on the Drawings.
 - b. Use epoxy binder between new and existing concrete.
 - 4. Prevent construction debris from entering existing sewer line when making connection.
- E. Wye Branches and Tees:
 - 1. Concurrent with pipe-laying operations, install wye branches and pipe tees at locations indicated on Drawings.
 - 2. Use standard fittings of same material and joint type as sewer main.
 - 3. Maintain minimum 5-foot separation distance between wye connection and manhole.
 - 4. Use saddle wye or tee with stainless-steel clamps for taps into existing piping.
 - 5. Mount saddles with solvent cement or gasket and secure with metal bands.

- 6. Lay out holes with template and cut holes with mechanical cutter.
- F. Bypassing Sewage:
 - 1. The Contractor, when required, shall provide for the flow of sewage around a section or sections of pipe as required to complete the Work.
 - 2. The bypass shall be made by plugging the line at an existing upstream manhole and pumping the flow into a downstream manhole or adjacent system. The pump and bypass lines shall be of adequate capacity and size to handle the flow.
 - 3. The Contractor shall submit a detailed bypass plan to the Engineer prior to performing any bypassing activities.
- G. Sanitary Laterals:
 - 1. Construct laterals from wye branch to terminal point at right-of-way.
 - 2. Where depth of main pipeline warrants, construct riser-type laterals from wye branch.
 - 3. Minimum Depth of Cover over Piping: 4 feet.
 - 4. Minimum Separation Distance between Laterals: 5 feet.
 - 5. Install watertight plug, braced to withstand pipeline test pressure thrust, at termination of lateral.
 - 6. Install temporary marker stake as shown on the Drawings.
- H. Backfilling:
 - 1. Excavation, trenching, and backfilling shall be in accordance with Section 125 of the Florida Department of Transportation Standard Specifications for Road and Bridge Construction (latest edition.)
 - 2. Backfill around sides and to top of pipe with cover fill in minimum lifts of six (6) inches and compact to the requirements specified in Section 31 23 23.00 Fill.
 - 3. Place and compact material immediately adjacent to pipes to avoid damage to pipe and prevent pipe misalignment.
 - 4. Maintain optimum moisture content of bedding material as required to attain specified compaction density.

3.4 TOLERANCES

- A. Section 01 40 00 Quality Requirements: Requirements for tolerances.
- B. Maximum Variation from Indicated Slope: 1/8 inch in 10 feet.

3.5 FIELD QUALITY CONTROL

- A. Section 01 70 00 Execution and Closeout Requirements: Requirements for testing, adjusting, and balancing.
- B. Request inspection by Engineer prior to and immediately after placing bedding.
- C. Testing:

- 1. If tests indicate that Work does not meet specified requirements, remove Work, replace, and retest.
- 2. Pipe Testing:
 - a. Pressure Testing: As specified in Section 33 05 05.41 Air Testing.
 - b. Infiltration and Exfiltration Testing: As specified in Section 33 05 05.33 -Infiltration and Exfiltration Testing.
 - c. Deflection Testing: As specified in Section 33 05 05.43 Mandrel Testing.
- 3. Compaction testing shall comply with Florida Department of Transportation Standard Specifications for Road and Bridge Construction (latest edition.)
- 3.6 PROTECTION
 - A. Section 01 70 00 Execution and Closeout Requirements: Requirements for protecting finished Work.
 - B. Protect pipe and aggregate cover from damage or displacement until backfilling operation is in progress.
 - C. Cap open ends of piping during periods of Work stoppage.

END OF SECTION 33 31 11

SECTION 33 31 23

SANITARY SEWERAGE FORCE MAIN PIPING

PART 1 - GENERAL

1.1 SUMMARY

- A. General: This section includes the minimum requirements for installing sanitary sewer force mains, which includes the furnishing, installing, laying, jointing, and testing of all force mains, fittings, air release valves, plug valves, and appurtenances required for a complete system as shown on the Drawings and specified herein. The Work shall also include such connections, reconnections, relocations, temporary force mains, temporary pumping, abandonments, and all other provisions in regard to existing force main operations and modifications required to perform the Work.
- B. Section Includes:
 - 1. Force mains.
 - 2. Valves.
 - 3. Valve Boxes and Lids.
 - 4. Couplings and Adaptors.
 - 5. Tapping Saddles.
 - 6. Bedding and cover materials.
 - 7. Accessories.
- C. Related Requirements:
 - 1. Section 33 05 05.31 Hydrostatic Testing.
 - 2. Section 33 05 61 Concrete Manholes
 - 3. Section 33 05 97 Identification and Signage for Utilities.

1.2 REFERENCE STANDARDS

- A. American Association of State Highway and Transportation Officials:
 - 1. AASHTO T 180 Standard Method of Test for Moisture-Density Relations of Soils Using a 4.54-kg (10-lb) Rammer and a 457-mm (18-in.) Drop.
- B. American Water Works Association:
 - 1. AWWA C110 Ductile-Iron and Gray-Iron Fittings.
 - 2. AWWA C111 Rubber-Gasket Joints for Ductile-Iron Pressure Pipe and Fittings.
 - 3. AWWA C151 Ductile-Iron Pipe, Centrifugally Cast.
 - 4. AWWA C900 Polyvinyl Chloride (PVC) Pressure Pipe and Fabricated Fittings, 4 In. Through 12 In., for Water Transmission and Distribution.
 - 5. AWWA C905 Polyvinyl Chloride (PVC) Pressure Pipe and Fabricated Fittings, 14 In. Through 48 In., for Water Transmission and Distribution.

C. ASTM International:

- 1. ASTM D698 Standard Test Methods for Laboratory Compaction Characteristics of Soil Using Standard Effort (12,400 ft-lb./ft3 (600 kN-m/m3).
- 2. ASTM F 714-05 Standard Specification for Polyethylene (PE) Pipe (SDR-PR) Based on Outside Diameter.
- 3. ASTM D1557 Standard Test Methods for Laboratory Compaction Characteristics of Soil Using Modified Effort (56,000 ft-lb./ft3 (2,700 kN-m/m3).
- 4. ASTM D1785 Standard Specification for Poly(Vinyl Chloride) (PVC) Plastic Pipe, Schedules 40, 80, and 120.
- 5. ASTM D2241 Standard Specification for Poly(Vinyl Chloride) (PVC) Pressure-Rated Pipe (SDR Series).
- 6. ASTM D2466 Standard Specification for Poly(Vinyl Chloride) (PVC) Plastic Pipe Fittings, Schedule 40.
- 7. ASTM D2467 Standard Specification for Poly(Vinyl Chloride) (PVC) Plastic Pipe Fittings, Schedule 80.
- 8. ASTM D6938 Standard Test Method for In-Place Density and Water Content of Soil and Soil-Aggregate by Nuclear Methods (Shallow Depth).

1.3 COORDINATION

- A. Section 01 30 00 Administrative Requirements: Requirements for coordination.
- B. Coordinate Work of this Section with connection to existing sanitary sewer system.

1.4 SUBMITTALS

- A. Section 01 33 00 Submittal Procedures: Requirements for submittals.
- B. Product Data: Submit manufacturer information indicating pipe material used, pipe accessories, valves, and restrained joint details and materials.
- C. Shop Drawings:
 - 1. Indicate piping piece numbers and locations.
 - 2. Indicate restrained joint locations.
- D. The Contractor shall submit certificates of inspection in triplicate from the manufacturer that the pipe, valves, and fittings to be supplied have been inspected at the plant and meet the requirements of the Contract Documents. These certificates shall be submitted prior to beginning Work.
- E. Manufacturer Instructions: Submit special procedures required to install specified products.
- F. Field Quality-Control Submittals: Indicate results of Contractor-furnished tests and inspections.
- G. Qualifications Statement:
 1. Submit qualifications for manufacturer, installer, and licensed professional.

1.5 CLOSEOUT SUBMITTALS

- A. Section 01 70 00 Execution and Closeout Requirements: Requirements for submittals.
- B. Project Record Documents: Record invert elevations and actual locations of pipe runs and connections. Record Documents shall be an As-built survey performed, signed and sealed by a Florida Licensed Surveyor. Record Documents shall be furnished in electronic GIS format with locations in Florida State Plane Coordinates, and elevations in NAVD 88.
- C. Identify and describe unexpected variations to subsoil conditions or discovery of uncharted utilities.
- 1.6 QUALITY ASSURANCE
 - A. Perform Work according to Florida Department of Environmental Protection and Florida Department of Transportation standards.
- 1.7 QUALIFICATIONS
 - A. Manufacturer: Company specializing in manufacturing products specified in this Section with minimum five (5) years of documented experience.
 - B. Installer: Company specializing in performing Work of this Section with minimum five (5) years of documented experience.
 - C. Licensed Professional: Professional engineer, if required, experienced in design of specified Work and licensed in State of Florida.

1.8 DELIVERY, STORAGE, AND HANDLING

- A. Section 01 60 00 Product Requirements: Requirements for transporting, handling, storing, and protecting products.
- B. Inspection: Accept materials on Site in manufacturer's original packaging and inspect for damage.
- C. Storage:
 - 1. Store materials according to manufacturer instructions.
 - 2. Do not place materials on private property without written permission of property owner.
 - 3. Do not stack pipe higher than recommended by pipe manufacturer.
- D. Protection:
 - 1. Protect materials from moisture and dust by storing in clean, dry location remote from construction operations areas.
 - 2. Store gaskets for mechanical and push-on joints in cool and dry location, out of direct sunlight, and not in contact with petroleum products.

ROAD DESIGN

3. Provide additional protection according to manufacturer instructions.

1.9 EXISTING CONDITIONS

- A. Field Measurements:
 - 1. Verify field measurements prior to fabrication.
 - 2. Indicate field measurements on Shop Drawings.

PART 2 - PRODUCTS

2.1 FORCE MAIN

A. Ductile Iron Pipe:

- 1. Flanged ductile iron pipe shall comply with AWWA C115.
- 2. Bell and spigot ductile iron pipe shall comply with AWWA C150 and AWWA C151.
- 3. Pipe shall be rated for a minimum working pressure of 200 psi or specified project requirements, whichever is greater, plus a two to one (2:1) factor of safety, using a Type II laying condition and a depth of cover of 4 feet.
 - a. Pipe diameters 4-inch through 12-inch shall be Class 350, minimum.
 - b. Pipe diameters 14-inch through 20-inch shall be Class 250, minimum.
 - c. Pipe diameters 24-inches and larger shall be Class 200, minimum.
- 4. End Connections: Bell and spigot.
- 5. Ductile iron pipe shall be manufactured in the U.S.A. and each piece shall be subjected to a hydrostatic pressure test of at least 500 psi at the point of manufacture.
- 6. The class or nominal thickness, new weight without lining, and casting period shall be clearly marked on each length of pipe. Additionally, the manufacturer's mark, country where cast, year in which the pipe was produced, and the letters "DI" or "Ductile" shall be cast or stamped on each length of pipe.
- 7. Pipe shall have an exterior bituminous coating applied by airless spray method.
- 8. Pipe shall have an interior Amine Cured Epoxy Lining.
- 9. PE Encasement: Comply with AWWA C105 for installation of PE Encasement when pipe is installed in corrosive soils.
- 10. Fittings:
 - a. Material: Ductile iron with a pressure rating that meets but does not exceed the specified pressure rating of connected pipe.
 - b. Comply with AWWA C153 or AWWA C110.
 - c. Lining: Factory applied amine cured epoxy.
 - d. Coating: Exterior of fittings shall be epoxy coated as specified in Section 09 90 00 Painting and Coating.
- 11. Joints:
 - a. Push-On Joints:
 - 1) Comply with AWWA/ANSIC111/A21.11.
 - 2) Furnish complete with all accessories required.
 - b. Restrained Joint:

- 1) Restrained joints shall be restrained using grip gaskets or locking rings.
- 2) All restraints shall comply with applicable AWWA standards.
- 3) Manufacturers:
 - a) American, Fast-Grip Restrained Gaskets, Lok-Ring Restrained Rings,
 - b) McWane, Sure Stop Restrained Gaskets, Super Lok Restrained Rings,
 - c) Griffin, Talon Restrained Gaskets, Snap-Lok Restrained Rings,
 - d) U.S. Pipe, Field-Lok Restrained Gaskets, TR Flex Gripper Restrained Rings,
 - e) EBAA Iron, Mega-Lug Restraint Harness, Series 1700,
 - f) Sigma, Bell Joint Restraint Series PVP (16-inch and smaller), Series SLDH (18-inch and larger),
 - g) Tyler Union, Tuff Grip MJ Fitting Restraints,
- h) or approved equal.
- c. Restrained Mechanical Joints:
 - 1) Restraint shall be ductile iron conforming to ANSI/AWWA C151/A21.51.
 - 2) All restrained mechanical joints shall be furnished with accessories and have a minimum pressure resistance of 200 psi.
 - 3) Manufacturers:
 - a) EBAA Iron Works, Megalug,
 - b) Tyler Union, Tuflock,
 - c) Sigma, SLD Series,
 - d) or approved equal.
- d. Flanged Joints:
 - 1) Comply with AWWA/ANSI115/A21.51.
 - 2) Pipe shall be furnished complete with all accessories.
 - 3) Gaskets: Unless otherwise shown or specified, gaskets shall be minimum 1/8-inch thick, full-face type. Gaskets shall be suitable for the service conditions specified, specifically designed for use with ductile iron pipe and fittings.
- B. PVC Pipe (Push on Joint, 4" and Larger):
 - 1. Comply with AWWA C900 and C905.
 - 2. PVC pipe shall be DR-18, minimum, and have a pressure rating of no less than 200 psi.
 - 3. PVC pipe shall be green in color.
 - Fittings: Mechanical joint ductile iron, complying with AWWA C111.
 - a. Restraint system shall be non-penetrating type specifically designed for PVC pipe.
 - 5. Push-On Joints:
 - a. Comply with ASTM D3139 and ASTM F477.
 - b. Seals: PVC flexible elastomeric.
 - c. Solvent-cement couplings are not permitted.
 - 6. Restrained Joints:

4.

- a. Where required, joints shall be restrained using restrained joint PVC piping system or bell restraint harnesses complying with all applicable AWWA specifications.
- b. Manufacturers:
 - 1) Certain Teed: Certa-Lok C900/RJ Restrained Joint, Mechanical Gland Adapters for DR 14 and DR 18 pipe.
 - 2) EBAA Iron Works: Bell Restraint Harness for C900 PVC Pipe, Series 1600 for DR 14, and DR 18 pipe.
 - 3) Sigma: PVP-LOK Restraint.
 - 4) S&B Technical Products: Bull Dog Joint Restraints.
 - 5) Tyler Union: Tuff Grip MJ Fitting Restraint.
- C. PVC Pipe (Thermal Butt-Fusion Joint):
 - 1. Thermal Butt-Fusion Joint PVC Pipe shall be utilized for horizontal directional drills 4" diameter and larger and shall conform to AWWA C900 and C905 standards.
 - 2. PVC pipe shall be DR-18 and have a pressure rating of no less than 200 psi.
 - 3. PVC pipe shall be green in color.
- D. PVC Pipe (Solvent Weld):
 - 1. Solvent Weld PVC Pipe shall conform to ASTM D1785, Schedule 80.
 - 2. Pipe shall be labeled in accordance with FDEP requirements.
 - 3. Pipe shall have a pressure rating of no less than 200 psi.
 - 4. Solvent Weld PVC Fittings shall conform to ASTM D2467.
 - 5. Fittings:
 - a. Solvent Weld PVC Fittings shall conform to ASTM D2466, ASTM D2467, and applicable AWWA standards.
 - b. Fittings shall have a pressure rating of no less than 200 psi.
- E. High Density Polyethylene Pipe (HDPE):
 - 1. Comply with AWWA C906, PE 3408.
 - 2. HDPE pipe shall DR-9 or DR-11.
 - 3. HDPE pipe shall have a pressure rating of not less than 160 psi.
 - 4. Pipe Outside Diameter: Iron Pipe Sizes (IPS).
 - 5. HDPE pipe shall include green striping.
 - 6. Fittings:
 - a. Comply with AWWA C901 and C906.
 - b. Type: Molded or fabricated.
 - 7. Joints: Butt fusion.
 - F. Mechanical Joint Restraints:
 - 1. Mechanical joint restraints shall include a restraining mechanism, which when activated, imparts multiple wedging action against the pipe, increasing its resistance as the pressure increases.
 - 2. Flexibility of the joint shall be maintained after burial.
 - 3. Glands shall be manufactured of ductile iron conforming to ASTM A 536-80.

- 4. Restraining devices shall be of ductile iron, heat treated to a minimum hardness of 370 BHN.
- 5. Dimensions of the gland shall be such that it can be used with the standardized mechanical joint bell and tee-headed bolts conforming to ANSI/AWWA A21.11 and ANSI/AWWA C153/A21.53.
- 6. Twist off nuts shall be used to insure proper actuating of the restraining devices.
- 7. The mechanical joint restraint device shall have a working pressure of at least 250 psi with a minimum safety factor of 2:1.
- 8. Manufacturers:
 - a. EBAA Iron Works, Megalug,
 - b. Sigma, SLD Series,
 - c. Tyler Union, Tuflock
 - d. or approved equal.

2.2 VALVES

- A. Eccentric Plug Valves:
 - 1. Resilient plug valve shall be permanently lubricated eccentric type with resilient faced plugs.
 - 2. The resilient plug shall be Buna- N or neoprene coated.
 - 3. Plug valves up to 12-inch diameter shall have a minimum pressure rating of 175 psi and plug valves 14-inch and larger shall have a minimum pressure rating of 150 psi.
 - 4. Plug valves shall conform to ANSI/AWWA C517 and be able to shut off flow from both directions.
 - 5. Plug valves shall have a port opening not be less than 81% on valves up to 24-inch diameter.
 - 6. Valve bodies shall be constructed of ASTM A-126 Class B semi-steel.
 - 7. Valve Stem: Type 304 or 431 Stainless Steel.
 - 8. All valves shall be equipped with two (2) inch square operating nut on all sizes through 24-inch diameter and shall be equipped with gear actuators.
 - 9. Eccentric plug valves shall be mechanical joint or flanged joint as shown on the Drawings.
 - 10. All bolts and nuts shall be stainless steel for non-buried service valves.
 - 11. Shall be epoxy coated inside and out.
 - 12. Manufacturers:
 - a. Clow, F-5413,
 - b. Val-Matic, Series 5000,
 - c. DeZurik, Series 100,
 - d. Pratt, Ballcentric,
 - e. Milliken Camcentric,
 - f. VSI Waterworks, Series PVII,
 - g. or approved equal.
- B. Insertion Valves:

- 1. Insertion valves shall meet or exceed the testing requirements of AWWA C509 or C515.
- 2. Valve body may be cast iron, ductile iron, or Type 304 stainless steel.
- 3. Valve shall be pressure rated for 175 psi.
- 4. Valve Stem: Type 304 or 431 Stainless Steel.
- 5. Operating nut shall be 2" square and turn counterclockwise to open the valve with an operating rate of three (3) turns per inch of nominal pipe size.
- 6. Interior Lining: Epoxy.
- 7. Exterior Coating: Tar.
- 8. Manufacturers:
 - a. Advanced Valve Technologies, EZ Valve,
 - b. Rangeline, Hydro Stop Valve,
 - c. Team Industrial Services, Insert Valve,
 - d. or approved equal.
- C. Air Release Valves (Stainless Steel Body):
 - 1. Stainless Steel Body Air Release Valves shall be of the type designed for use in sanitary sewage force mains to exhaust entrapped air and shall conform to all applicable AWWA standards.
 - 2. Valve shall be simple lever type and be constructed and tested to 175 psi working pressure.
 - 3. Air release valves shall be furnished with backwash accessories.
 - 4. Materials:
 - a. Body and Cover: Stainless Steel
 - b. Interior Working Parts: Stainless Steel
 - 5. Air release valve inlets and outlets shall be threaded to NPT standards.
 - 6. Manufacturers:
 - a. Val-Matic, Model 48ASV,
 - b. H-TEC, Model 986,
 - c. or approved equal.
- D. Air/Vacuum Valves (Stainless Steel Body):
 - 1. Stainless Steel Body Air/Vacuum Valves shall be of the type designed for use in sanitary sewage force mains to exhaust entrapped air while the pipe is being filled and allow air to reenter during draining to prevent vacuum conditions within the pipe.
 - 2. Valve shall be spherical float operated and shall close drop tight against replaceable rubber seat.
 - 3. Minimum working pressure: 175 psi.
 - 4. Air/vacuum valves shall be furnished with backwash accessories.
 - 5. Materials:
 - a. Body and Cover: Stainless Steel
 - b. Interior Working Parts: Stainless Steel
 - 6. Air/vacuum valve inlets and outlets shall be threaded to NPT standards.
 - 7. Manufacturers:
 - a. H-Tec Model 986
 - b. Vent-O-Mat Model PN16

- c. or approved equal.
- E. Combination Air Valves (Plastic Body):
 - 1. Plastic Body Combination Air Valves shall be of the type designed for use in sanitary sewage force mains to exhaust entrapped air while the pipe is being filled, allow air to reenter during draining to prevent vacuum conditions within the pipe, and release air from the system while operating under pressure.
 - 2. Valve shall be tested to 175 psi working pressure.
 - 3. Air release valves shall be furnished with required backwash accessories.
 - 4. Materials:
 - a. Body and Cover: PVC
 - b. Interior Working Parts: PVC and stainless steel.
 - 5. Air release valve inlets and outlets shall be threaded to NPT standards.
 - 6. Manufacturers:
 - a. A.R.I. Flow Control Accessories, Ltd., D-025-PN10,
 - b. or approved equal.
- F. Check Valves (Lever and Spring Type)
 - 1. Lever and spring type check valves shall conform to AWWA C508.
 - 2. Flanges shall conform to ANSI B16.1, Class 125.
 - 3. Materials:
 - a. Disc: Bronze.
 - b. Valve Body: Ductile iron, bronze mounted.
 - 4. Valve shall be pressure rated for 175 psi.
 - 5. Stuffing box shall be O-ring sealed.
 - 6. Lever and spring with adjustable tension shall be included to control opening and closing of the clapper.
 - a. Lever and spring shall be capable of being installed on either side of valve.
 - 7. Interior Lining: Factory applied amine cured epoxy.
 - 8. Exterior Coating: Exterior of fittings shall be epoxy coated as specified in Section 09 90 00 Painting and Coating.
 - 9. Manufacturers:
 - a. Clow, F-5382,
 - b. Mueller, A-2600-6-02,
 - c. M & H, Style 259-02,
 - d. AMI, Series 504,
 - e. or approved equal.
 - G. Check Valves (Flanged Swing-Flex Type)
 - 1. Flanged swing-flex type check valves shall conform to AWWA C508.
 - 2. Flanges shall conform to ANSI B16.1, Class 125.
 - 3. Materials:
 - a. The flexible disc shall be one piece and precision molded with alloy steel and Nylon reinforcement and an integral O-ring style seat for drop tight seating at low pressure.
 - b. Valve Body: Ductile iron, bronze mounted.

- 4. Valve shall be pressure rated for 175 psi and include a mechanical position indicator.
- 5. Interior Lining: Factory applied amine cured epoxy.
- 6. Exterior Coating: Exterior of fittings shall be epoxy coated as specified in Section 09 90 00 Painting and Coating.
- 7. Manufacturers:
 - a. Val-Matic, 500A Swing-Flex,
 - b. Clow, Ken-Flex,
 - c. Pratt, Flex Check,
 - d. Mueller, Flex Check,
 - e. VSI Waterworks, Series CVII,
 - f. or approved equal.

2.3 VALVE BOXES AND LIDS

- A. Valve Box:
 - 1. Valve boxes shall not deeper than five (5) feet without Owner approval.
 - 2. Bottom Section:
 - a. Cast iron, ASTM A48, heavy duty screw type.
 - b. Cast iron screw valve box will be only type allowed in asphalt pavement.
 - c. Cast iron screw or sliding type valve box may be used in right of way as specified per project.
 - 3. Valve Box Extension:
 - a. Cast iron, ASTM A48, heavy duty screw type extension.
 - b. For deep valves use six (6) inch ductile or cast-iron pipe cut to proper length so only one valve box extension is used.
 - 4. Valve Box Tops shall be cast iron, screw type, and conform to ASTM A48.
 - 5. Valve Box Tops shall be rated for H-20 traffic in conformance with AASHTO M-306.
 - 6. Manufacturers:
 - a. Tyler, #6850-5625-24B (Bottom), #6050-5625-585C (Extension), #6850-5625-16T (Top),
 - b. Opelika Foundry, #4908-5562-S-625 (Bottom), #4906X-64E (Extension), #4905-5562-S-55S (Top),
 - c. Sigma, VB 2622 (Bottom), VB302-18 (Extension), VB2621X (Top),
 - d. Star Pipe Products, VBB24SHD (Bottom), VBEX14S (Extension), VBT16SHD (Top),
 - e. or approved equal.
- B. Valve Box Lid:
 - 1. Provide cast iron, ASTM A48, heavy duty, screw type, valve box, 5 ¹/₄" shaft for non-pavement installations.
 - 2. Valve Box Lids shall be rated for H-20 traffic in conformance with AASHTO M-306.
 - 3. Cover shall be marked "SEWER".
 - 4. Manufacturers:

- a. Sigma, VB2600X,
- b. Tyler, 5 1/4" Drop Lid,
- c. Opelika Foundry, #4908-562 Lid,
- d. Star Pipe Products, VBLIOHD,
- e. or approved equal.
- C. Non-Pop Valve Box Lid:
 - 1. Provide high tech molded polymer lid, ASTM A48, heavy duty, screw type, valve box, 5 ¹/₄" shaft cast iron valve box top.
 - 2. Non-Pop Valve Box Lids shall be installed in heavy traffic pavement areas.
 - 3. Valve Box Lids shall be rated for H-20 traffic in conformance with AASHTO M-306.
 - 4. All boxes shall conform to applicable AWWA standards.
 - 5. Cover shall be marked "SEWER".
 - 6. Manufacturers:
 - a. SW Services, 5 1/4" Non-Pop Lid,
 - b. or approved equal.

2.4 COUPLINGS AND ADAPTORS

- A. Flange Adaptors:
 - 1. Flange adaptors shall be cast iron with iron pipe threads.
 - 2. Flange adaptors shall conform to applicable AWWA standards and shall receive the same interior and exterior coating as the pipe receiving the flange.
 - 3. Lining: Factory applied amine cured epoxy.
 - Coating: Exterior of fittings shall be epoxy coated as specified in Section 09 9000
 Painting and Coating.
- B. Sleeve-Type Couplings:
 - 1. Sleeve-type couplings shall be stainless steel couplings for plain-end cast iron and ductile iron pipe.
 - 2. The couplings shall be furnished with the pipe stop removed.
 - 3. Couplings shall be provided with plain, Grade 27, rubber gaskets and with stainless steel, track-head bolts with nuts.
 - 4. To ensure correct fitting of pipe and couplings, all sleeve-type couplings, and accessories shall be furnished by the supplier of the pipe.

2.5 TAPPING SADDLES

- A. Stainless Steel Tapping Saddles:
 - 1. Tapping saddle shall be all Type 304 stainless steel, per ASTM A-240.
 - 2. All welds and metal surfaces shall be chemically passivated to meet ASTM A-380.
 - 3. Saddles to be two-piece construction with two (2) inch outlet with IPS thread.
 - 4. Saddles to have double bolt and received bars. Bolts and nuts shall be 18-8 stainless steel.
 - 5. Saddle shall be rated for 150 psi.
 - 6. Manufacturers:

- a. Ford, FRS202,
- b. Cascade, CS22,
- c. or approved equal.

2.6 MATERIALS

- A. Bedding and Cover:
 - 1. Excavation, trenching, and backfilling shall be in accordance with Section 125 of the Florida Department of Transportation Standard Specifications for Road and Bridge Construction (latest edition.)
 - 2. Backfill around sides and to top of pipe with cover fill in minimum lifts of six (6) inches and compact to the requirements specified in Section 31 23 23.00 Fill.
 - 3. Immediately after the pipe has been jointed and inspected, sufficient backfill shall be performed to protect the pipe adequately from injury and movement.
 - 4. Maintain optimum moisture content of bedding material to attain required compaction density.
 - 5. Where so indicated on the drawings or where directed by the Engineer, the pipe shall be supported by compacted granular fill or concrete cradle or encasement according to the applicable detail shown on the Drawings.
 - a. Pipe bedded in compacted granular backfill shall not be supported on blocking, wedges, bricks, or anything except the bedding material.
 - b. Where concrete cradle or encasement is required, the pipe shall be supported on solid concrete blocks or pre-cast concrete saddles which shall become part of the completed cradle or encasement.
 - c. Where no other bedding is indicated, pipe shall be placed on a shaped bed of undisturbed material.

2.7 MIXES

A. Concrete: As specified in the Florida Department of Transportation Standard Specifications for Road and Bridge Construction (latest edition.)

2.8 ACCESSORIES

A. Pipe Markers: As specified in Section 33 05 97 - Identification and Signage for Utilities.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Section 01 70 00 Execution and Closeout Requirements: Requirements for installation examination.
- B. Contractor shall contact Sunshine 811 for location of existing utilities at 811 or 1-800-432-4770 a minimum of 48 hours prior beginning Work.

- C. The Contractor shall field verify vertical and horizontal locations of all underground facilities in advance of construction to verify that no conflicts exist with the proposed pipe alignment and depth.
 - 1. Should a conflict be discovered, the Contractor shall contact the Engineer immediately and provide all pertinent information for preparation of a remedial design.
- D. Verify that excavation base is ready to receive Work.
- E. Verify that excavations, dimensions, and elevations are as indicated on the Drawings.

3.2 PREPARATION

- A. Section 01 70 00 Execution and Closeout Requirements: Requirements for installation preparation.
- B. Preconstruction Site Photos:
 - 1. As specified in Section 01 70 00 Execution and Closeout Requirements.
 - 2. Take photographs along centerline of proposed pipe trench; minimum one photograph for each 50 feet of pipe trench.
 - 3. Show mailboxes, curbing, lawns, driveways, signs, culverts, and other existing Site features.
 - 4. Include Project description, date taken, and sequential number on back of each photograph.
- C. Pipe Cutting and Lining Repair:
 - 1. Cut pipe ends square, ream pipe and tube ends to full pipe diameter, and remove burrs.
 - 2. Use only equipment specifically designed for pipe cutting; use of chisels or hand saws is not permitted.
 - 3. Grind edges smooth with beveled end for push-on connections.
 - 4. Remove all traces of oil, grease, asphalt, dust, dirt, etc.
 - 5. Remove damaged lining and clean any exposed metal by sanding or scraping. Sandblasting and power tool cleaning is also acceptable.
 - a. Remove any loose lining by chiseling, cutting, or scraping to well adhered lined area before patching.
 - b. Lining patch shall overlap remaining lining at least one (1)inch.
 - 6 With the area to be sealed or repaired absolutely cleaned and thoroughly roughened, apply a coat of repair compound specified in the applicator's "Certificate of Application" as furnished and approved with the pipe submittal. The Contractor shall apply the repair compound in strict accordance with the manufacturer's written instructions.
 - 7. The Contractor shall repair damaged coating and lining immediately, using the repair compound recommended by the manufacturer.
 - 8 The cost of repair to cut pipe ends or damaged linings shall be incidental to construction and the Contractor shall absorb the cost thereof in the unit price specified for related items.

- D. Remove scale and dirt on inside and outside before assembly.
- E. Prepare pipe connections to equipment with flanges or unions.

3.3 INSTALLATION

- A. Bedding and installation shall be Class B as shown on the Drawings unless otherwise specified or directed by the Engineer.
- B. Horizontal Directional Drill and Jack and Bore Installations shall be in accordance with Specification Section 33 05 07.00 Boring and Jacking and Section 33 05 07.13 Utility Directional Drilling.
- C. Handling and Cutting Pipe:
 - 1. The Contractor shall exercise extreme care in handling and laying pipe and fittings to avoid damaging, scratching, or marring machined surfaces, and abrasion of the pipe or fitting coating.
 - 2 Any fitting showing a crack and any fitting or pipe that has received a severe blow that may have resulted in an incipient fracture, even though no such fracture can be seen, shall be marked as rejected and immediately removed from the Work.
 - 3. Any pipe showing a distinct crack and in which it is believed there is no incipient fracture beyond the limits of the visible crack, the cracked portion, if so approved by the Engineer, may be cut off by and at the expense of the Contractor before the pipe is laid so that the pipe used may be perfectly sound. The cut shall be made in the sound barrel at a point at least twelve (12) inches from the visible limits of the crack.
 - 4. Except as otherwise approved, all cuttings shall be done with a machine having rolling wheel cutters, or pipe saw adapted for that purpose. All cut ends shall be examined for possible cracks caused by cutting.
- D. Abandoning Sewer Force Mains:
 - 1. Sewer Force Mains Abandoned in Place: The Contractor shall cut the sewer force main as required to make connections or install plugs. That portion of the pipe to be abandoned and left in place shall be plugged at locations where the pipe was cut or punctured. Plugging shall be accomplished by grouting the end or punctured area to the satisfaction of the Engineer.
 - 2 Sewer Force Mains Abandoned in Place with Grout Fill: The Contractor shall cut the sewer force main as required, install plugs, and fill the pipe with grout as shown on the Drawings.
 - 3. Sewer force mains to be abandoned and removed shall be cut or disconnected as required.
- E. Pipe Installation:
 - 1. Comply with AWWA C600 and C605 as applicable.
 - 2 Handle and assemble pipe according to pipe and gasket manufacturer instructions and as indicated on Drawings.
 - 3. Steel Rods, Bolts, Lugs, and Brackets: Coat buried steel before backfilling.

- 4. No sanitary sewer force main shall be installed within six (6) feet of a potable water line, unless the crown of the sewer main is at least six (6) inches lower than the bottom of the water line, or unless special permission is obtained from the Engineer and FDEP. In no case shall a sanitary sewer main be placed in the same trench with a water main.
- 5. Sanitary Sewer Force Main Location:
 - a. Sanitary sewer force mains shall be installed as shown on the Drawings.
 - b. Every effort shall be made to avoid creation of low or high points in the force main other than those shown on the Drawings.
 - c. Minimum depth of installation shall be three (3) feet, measured from the top of the pipe to the finished grade or centerline of roadway directly above the pipe.
 - d. Minimum depth of installation at air release valve locations shall be four (4) feet.
- 6 Route pipe in straight line and re-lay pipe that is out of alignment or grade.
- 7. Ductile-Iron Piping and Fittings: Comply with AWWAC600.
- 8 PVC Pipe Piping and Fittings: Comply with AWWAC605.
- 9. Field Welding Materials: Comply with AWWA C206.
- 10. Flanged Joints: Do not use in underground installations except within structures.
- 11. To ensure correct fitting of pipe and couplings, all sleeve-type couplings and accessories shall be furnished by the supplier of the pipe.
- 12. High Points:
 - a. Install pipe with no high points other than shown on the Drawings.
 - b. If approved by the Engineer, minor changes in alignment may be permitted to avoid underground facilities.
 - c. If unforeseen field conditions arise that necessitate high points, install airrelease valves as specified or as directed by the Engineer.
- 13. Bearing:
 - a. The pipe shall be laid on an unyielding foundation with uniform bearing under the full length of the barrel of the pipe.
 - b. Excavate bell holes to permit proper joint installation.
 - c. The spigot end of the pipe shall abut the base of the socket of the adjacent pipe in such a manner that there will be no gaps along the perimeter of the mating halves.
- 14. Do not lay pipe in wet or frozen trench.
- 15. The Contractor shall take all necessary precautions to prevent flotation of the pipe from flooding of the trench.
- 16. The pipe shall not be driven down to grade by striking it with a shovel handle, timber, rammer, or other unyielding object.
- 17. Immediately before jointing the pipe, the mating ends shall be thoroughly cleaned of all dirt, debris, and foreign material.
- 18. Prevent mud, sand, or other foreign material from entering pipe during placement.
- 19. At all times when pipe laying is not actually in progress, the open ends of the pipe shall be closed by temporary watertight plugs or by other approved means. If water is in the trench when work is resumed, the plug shall not be removed until all danger of water entering the pipe has passed.
- 20. Allow for expansion and contraction without stressing pipe or joints.

- ROAD DESIGN
 - 21. Close pipe openings with watertight plugs during Work stoppages.
 - 22. Cover:
 - a. Establish elevations of buried piping with not less than four (4) feet of cover.
 - b. Measure depth of cover from final surface grade to top of pipe barrel.
 - 23. Pipe Markers: As specified in Section 33 05 97 Identification and Signage for Utilities.
 - 24. Any defective pipe that may have been installed shall be removed and replaced with sound pipe at no additional cost to the Owner.
- F. Pipe Joint Assembly:
 - 1. Assemble all joints in accordance with recommendations of the manufacturer.
 - 2. If a lubricant is required to facilitate assembly, it shall have no detrimental effect on the gasket or on the pipe when subjected to prolonged exposure.
 - 3. Proper jointing may be verified by rotation of the spigot by hand or with a strap wrench.
 - 4. If unusual jointing resistance is encountered or if the insertion mark does not reach the flush position, disassemble the joint, inspect for damage, re-clean the joint components, and repeat the assembly steps.
 - 5. Note that fitting bells may permit less insertion depth than pipe bells.
 - 6 When mechanical equipment is used to assemble joints, care should be taken to prevent over-insertion.
- G. Valves
 - 1. Valves shall be installed as indicated on Drawings and according to manufacturer instructions.
 - 2 Valves shall be set vertically so that stems form a vertical line. Care shall be taken to keep out dirt and sand, and no valve shall be operated until it has been cleaned of sand, grit, or other foreign material.
 - 3. No valve operating nut shall be deeper than five (5) feet without Owner approval.
 - 4. Valve Boxes:
 - a. All valves shall be fitted with heavy duty traffic rated valve box and cover as specified herein.
 - b. Valve boxes shall be long enough to reach from the valve to finished ground level and shall be installed as recommended by the manufacturer.
 - c. Valve boxes shall have suitable barrel and shaft extension sections to cover and protect the valve bonnet section.
 - d. Extension sections fabricated by one piece of ductile iron are allowed. No more than one (1) shaft extension shall be used in any one (1) valve installation.
 - e. Valve box extensions shall be by same manufacturer as valve box or ductile iron pipe.
 - f. Valve boxes shall be installed in vertical alignment and positioned to facilitate the operation of the valve with a standard valve wrench. The box shall be installed as shown on the drawings and shall be set on firmly packed soil or bricks to prevent settlement and to prevent bearing on the valve or the main at any point.

- g. Adjustment of valve boxes shall be subject to the approval of the Engineer. The Contractor shall maintain vertical alignment and position to permit operation of the valve with a standard valve wrench.
- h. All valve boxes located in heavy traffic pavement areas shall include non-pop covers as specified.
- i. Terminate locating wire for all sizes of PVC and HDPE water mains in the valve boxes in accordance with the Drawings.
- j. Valve Box Adjustment:
 - 1) All valve boxes within the area of finished construction shall be adjusted to finish grade as shown and specified.
 - 2) Valve boxes damaged during construction shall be replaced by the Contractor at no additional cost to the Owner. Removal and replacement of valve boxes during construction may be authorized, provided the Contractor ensures that sufficient valve ties are available and on site in order to quickly locate the valve.
 - 3) Adjustment of valve boxes shall be subject to approval of the Engineer.
- H. Tapping Sleeves and Valves: As indicated on Drawings and according to manufacturer instructions.
- I. Double continuous tracing wires shall be installed on all non-metallic pipes per Specification Section 33 05 97 – Identification and Signage for Utilities.
- J. Early warning tape, as specified in Section 33 05 97 Identification and Signage for Utilities, shall be installed 12-inches to 18-inches above all sanitary sewer forcemains.
- K. PE Encasement:
 - 1. Encase ductile iron piping in PE to prevent contact with surrounding backfill material when pipe is installed in corrosive soils as shown on the Drawings.
 - 2 Comply with AWWA C105.
 - 3. Terminate encasement 3 to 6 inches above ground where pipe is exposed.
- L. Bedding and Backfilling:
 - 1. Excavation, trenching, and backfilling shall be in accordance with Section 125 of the Florida Department of Transportation Standard Specifications for Road and Bridge Construction (latest edition.)
 - 2 Backfill around sides and to top of pipe with cover fill in minimum lifts of six (6) inches and compact to the requirements specified in Section 31 23 23.00 Fill.
 - 3. Immediately after the pipe has been jointed and inspected, sufficient backfill shall be performed to protect the pipe adequately from injury and movement.
 - 4. Maintain optimum moisture content of bedding material to attain required compaction density.
 - 5. Where so indicated on the drawings or where directed by the Engineer, the pipe shall be supported by compacted granular fill or concrete cradle or encasement according to the applicable detail shown on the Drawings.
 - a. Pipe bedded in compacted granular backfill shall not be supported on blocking, wedges, bricks, or anything except the bedding material.

- b. Where concrete cradle or encasement is required, the pipe shall be supported on solid concrete blocks or pre-cast concrete saddles which shall become part of the completed cradle or encasement.
- c. Where no other bedding is indicated, pipe shall be placed on a shaped bed of undisturbed material.
- M. Cleaning and Flushing:
 - 1. As the Work progresses, the interior of the piping shall be cleaned of all dirt, jointing material, and superfluous materials of every description.
 - 2 Prior to the pressure and leakage tests, all piping shall be thoroughly cleaned of all dirt, dust, oil, grease, and other foreign matter. This work shall be done with care to avoid damage to any inside coating.
 - 3. All lines shall be thoroughly flushed with clean water to clear the lines of all foreign matter.

3.4 PIPE SUPPORT AND THRUST RESTRAINT

- A. The Contractor shall furnish and install all supports necessary to hold the piping and appurtenances in a firm, substantial manner at the lines and grades indicated on the Drawings or specified.
- B. Where buried piping contains fittings, which raise or lower the centerline of the pipe, suitable socket clamps, tie rods, or other approved restraining devices shall be used to prevent movement of the fittings. The restraining devices shall be coated thoroughly and heavily with an approved bituminous paint.
- C. All bends, tees, and other fittings in pipelines, and sleeve-coupled pipelines buried in the ground shall be backed with Class 1 concrete placed against undisturbed earth where firm support can be obtained or by the use of restrained joints. If the soil does not provide firm support, then suitable clamps, and accessories or restrained joints shall be provided to brace the fitting properly. Such items shall be coated thoroughly and heavily with an approved bituminous paint after assembly or, if necessary, before assembly.
- D. Thrust blocks and joint restraints shall be provided as shown on the Drawings.

3.5 CONNECTION TO EXISTING SANITARY SEWER FORCE MAINS

- A. Connections to existing force mains shall be performed as shown on the Drawings or as directed by the Engineer.
- B. Connection of new force mains to existing shall be performed in the normal accepted method for connecting mains and shall be done without unduly disrupting service. All connections are subject to the approval of the Engineer as to method, time, and location.

- C. Where existing lines are connected to proposed lines, the Contractor shall take appropriate action to ensure that the existing lines do not interfere with the pressure testing portions of the work. Failure to do so will not relieve the Contractor of the responsibility of properly pressure testing the entire system installed. The Contractor shall bear full responsibility for the action or inaction on this matter and shall not claim damages, injuries, or additional compensation for said action or inaction.
- D. At least 48 hours prior to excavating for the actual connection operation, the Contractor shall excavate and expose the main to be cut at the proposed location and shall advise the Engineer, so that the exposed area may be inspected by the Engineer to verify that no conditions are present that would hamper the connection operation.
- E. Damage caused by sewage from an accidentally cut force main or gravity sewer shall be mitigated by either pumping the sewage back into the gravity sewer system or cleaned by flushing with either fire hoses or tank trucks. Where practical, the affected area shall be treated with a disinfectant, such as Calcium Hypochlorite (HTH). Disinfectant shall be approved by the Engineer.
- F. The Contractor shall notify the City of Ocala Water Resources Department, Lift Station Division at least 48 hours prior to making connections to existing force mains.

3.6 CONNECTION TO SANITARY SEWER MANHOLES

- A. Where force mains are to be connected to manholes, the complete interior of the manhole shall be protected.
- B. The Contractor shall take upstream measurements necessary to properly install boots, grout pipe openings, and thoroughly clean the walls.
- C. Apply lining as shown and specified in accordance with Section 33 05 61 -Concrete Manholes. The application shall be installed in strict accordance with the manufacturer's written instructions.

3.7 PAVEMENT CROSSINGS

- A. Bases, Sidewalk, Curb, and Driveway Repairs The Contractor shall replace any and all bases, sidewalks, curbs and gutter, and driveways with materials and workmanship sufficient to give an equal and similar surface to the disturbed areas as existed before construction.
- B. Pavement removal and replacement shall be in accordance with Florida Department of Transportation Standard Specifications for Road and Bridge Construction (latest edition) and as shown on the Drawings.

Temporary Asphalt Millings will be acceptable with a maximum of 7 calendar days beforeC. final asphalt pavement. If more than 7 calendar days before final asphalt pavement is needed, a cold patch asphalt mix must be used.

3.8 TOLERANCES

A. Section 01 40 00 - Quality Requirements: Requirements for tolerances.

B. Install pipe to indicated elevation within tolerance of 5/8 inch.

3.9 FIELD QUALITY CONTROL

- A. Section 01 70 00 Execution and Closeout Requirements: Requirements for testing, adjusting, and balancing.
- B. Testing:
 - 1. All testing shall be performed in the presence of the Engineer or a designated representative thereof.
 - 2. All parts of the Work including, but not being limited to, pipe, fittings, joints, valves, and any other appurtenances shall be subjected to testing as described herein. To achieve this, all methods of testing shall be approved by the Engineer and FDEP.
 - 3. Except as otherwise directed, all pipelines shall be tested. Pipelines installed in excavation or bedded in concrete shall be tested prior to the backfilling of the excavation or placing of the concrete and exposed piping shall be tested prior to field painting.
 - 4. All piping to operate under liquid pressure shall be tested in sections of approved length. The section of pipe being tested shall be limited to a maximum length of 2000 feet. For these tests the Contractor shall furnish clean water, suitable temporary testing plugs or caps, and other necessary equipment and all labor required, without additional compensation. The Contractor shall furnish suitable pressure gauges, pumps, and measuring tank.
 - 5. The Contractor shall be responsible for the cost of all water used for testing and flushing. The Contractor shall make suitable arrangements with the Owner for the monitoring of water consumption and locations to which water may be made available. Water charges shall be in accordance with City of Ocala Ordinance Section 70- 413.
 - 6 Pressure test piping system as specified in Section 33 05 05.31 Hydrostatic Testing.
- C. Compaction Testing:
 - 1. See Section 31 23 23.00 Fill for compaction testing requirements.
 - 2. If tests indicate Work does not meet specified requirements, remove Work, replace, and retest.

3.10 **PROTECTION**

- A. Section 01 70 00 Execution and Closeout Requirements: Requirements for protecting finished Work.
- B. Protect pipe and aggregate cover from damage or displacement until backfilling operation is in progress.

END OF SECTION 33 31 23

SECTION 33 32 11

FIELD-ERECTED WASTEWATER PUMPING STATIONS

PART 1 - GENERAL

1.1 SUMMARY

A. General:

- 1. This Section covers the minimum requirements for installing sanitary sewer lift stations, which includes the furnishing of all labor, materials, and equipment necessary for the construction of new lift stations and wet wells. Work shall include construction of new wet wells together with all work involved in the installation of new factory-built lift stations complete with concrete slab, service panels, electric service, electrical wiring, hose bibs, water services, pump tests, pipe connections, temporary pumping facilities, and other equipment, materials, incidentals, and appurtenances necessary to provide a complete functional lift station.
- 2 Where lift stations exist and are being replaced or modified as specified herein and, on the drawings, the Contractor shall take all measures required, including plugging, temporary pumping, installing temporary screens or basket strainers, or any other work necessary in order to maintain continuous service of the lift station until the modifications or replacement has been completed. The Contractor shall be responsible for any damage to the Owner, customers, or to the existing equipment resulting from the temporary measures specified above.
- B. Section Includes:
 - 1. Packaged public wastewater pumping station.
 - 2. Initial operation of packaged public wastewater pumping station.
- C. Related Requirements:
 - 1. Section 33 31 23 Sanitary Sewerage Force Main Piping

1.2 REFERENCE STANDARDS

- A. American Association of State Highway and Transportation Officials:
 1. AASHTO T 180 Standard Method of Test for Moisture-Density Relations of Soils Using a 4.54-kg (10-lb) Rammer and a 457-mm (18-in.) Drop.
- B. American Bearing Manufacturers Association:
 - 1. ABMA 9 Load Ratings and Fatigue Life for Ball Bearings.
- C. ASTM International:
 - 1. ASTM A36/.
 - 2. ASTM A48/.
 - 3. ASTM A126 Standard Specification for Gray Iron Castings for Valves, Flanges, and Pipe Fittings.

- 4. ASTM A153/.
- 5. ASTM A307 Standard Specification for Carbon Steel Bolts, Studs, and Threaded Rod 60 000 PSI Tensile Strength.
- 6. ASTM A709/.
- 7. ASTM C478 Standard Specification for Circular Precast Reinforced Concrete Manhole Sections.
- 8. ASTM C497 Standard Test Methods for Concrete Pipe, Manhole Sections, or Tile.
- 9. ASTM C890 Standard Practice for Minimum Structural Design Loading for Monolithic or Sectional Precast Concrete Water and Wastewater Structures.
- 10. ASTM C913 Standard Specification for Precast Concrete Water and Wastewater Structures.
- 11. ASTM D698 Standard Test Methods for Laboratory Compaction Characteristics of Soil Using Standard Effort (12,400 ft-lb./ft3 (600 kN-m/m3).
- 12 ASTM D1557 Standard Test Methods for Laboratory Compaction Characteristics of Soil Using Modified Effort (56,000 ft-lb./ft3 (2,700 kN-m/m3).
- 13. ASTM D1785 Standard Specification for Poly(Vinyl Chloride) (PVC) Plastic Pipe, Schedules 40, 80, and 120.
- 14. ASTM D2241 Standard Specification for Poly(Vinyl Chloride) (PVC) Pressure-Rated Pipe (SDR Series).
- 15. ASTM D2466 Standard Specification for Poly(Vinyl Chloride) (PVC) Plastic Pipe Fittings, Schedule 40.
- 16 ASTM D2467 Standard Specification for Poly(Vinyl Chloride) (PVC) Plastic Pipe Fittings, Schedule 80.
- 17. ASTM D6938 Standard Test Method for In-Place Density and Water Content of Soil and Soil-Aggregate by Nuclear Methods (Shallow Depth).
- D. National Electrical Manufacturers Association:
 - 1. NEMA 250 Enclosures for Electrical Equipment (1000 Volts Maximum).
- E. National Fire Protection Association:1. NFPA 70 National Electrical Code (NEC).
- F. UL, Inc.1. UL 83 Thermoplastic-Insulated Wires and Cables.

1.3 COORDINATION

- A. Section 01 30 00 Administrative Requirements: Requirements for coordination.
- B. Coordinate Work of this Section with connection to existing facilities.

1.4 PREINSTALLATION MEETINGS

- A. Section 01 30 00 Administrative Requirements: Requirements for preinstallation meeting.
- B. Convene minimum one week prior to commencing Work of this Section.

1.5 SUBMITTALS

- A. Section 01 33 00 Submittal Procedures: Requirements for submittals.
- B. Product Data:
 - 1. Manufacturer catalog data for wet well, cover, hinged door, slide rail assembly, discharge piping, valves, junction box, level controls, and control panel.
 - 2. Manufacturer pump information, performance curve, breakaway fittings data, and access frame data.
 - 3. Control panel data and panel wiring schematic.
- C. Shop Drawings:
 - 1. Show size, materials, and components of system.
 - 2. Indicate wet well size, inlet and discharge location, cover dimensions, vent location, lifting cable location, valve locations, pump locations, discharge piping location, junction box locations, guide rail assembly location, level control locations, and ballast support flange dimensions.
- D. Manufacturer's Certificate: Certify that products meet or exceed specified requirements.
- E. Delegated Design Submittals: Submit signed and sealed Shop Drawings with design calculations and assumptions.
- F. Test and Evaluation Reports: Submit written report showing that factory pump inspections and that tests have been successfully performed.
- G. Manufacturer Instructions: Submit detailed instructions on installation requirements, including storage and handling procedures.
- H. Source Quality-Control Submittals: Indicate results of factory tests and inspections.
- I. Field Quality-Control Submittals: Indicate results of Contractor-furnished tests and inspections.
- J. Manufacturer Reports:
 - 1. Submit report of each visit of manufacturer's representative to provide technical assistance during installation.
 - 2. The manufacturer shall provide a written report, through the Contractor, and endorsed in writing by the Contractor, certifying that the equipment has been properly installed, checked and is ready for placement into routine permanent service.
- K. Qualifications Statements:
 - 1. Submit qualifications for manufacturer, installer, and licensed professional.
 - 2 Submit manufacturer's approval of installer.

ROAD DESIGN

1.6 CLOSEOUT SUBMITTALS

- A. Section 01 70 00 Execution and Closeout Requirements: Requirements for submittals.
- B. Project Record Documents: Record actual locations of packaged pumping stations, including wet wells and control panel. Record Documents shall be an As-built survey performed, signed and sealed by a Florida Licensed Surveyor. Record Documents shall be furnished in electronic GIS format with locations in Florida State Plane Coordinates, and elevations in NAVD 88.

1.7 MAINTENANCE MATERIAL SUBMITTALS

- A. Section 01 70 00 Execution and Closeout Requirements: Requirements for maintenance materials.
- B. Provide the following spare parts for each pump:
 - 1. One (1) set of seals.
 - 2 One (1) set of gaskets and O-rings.
 - 3. One (1) impeller.
 - 4. One (1) set of wear rings.
- C. The Contractor shall provide one (1) set of any special tools required for maintenance of equipment specified herein.
- 1.8 QUALITY ASSURANCE
 - A. Perform Work according to Florida Department of Environmental Protection and Florida Department of Transportation standards.
 - B. In order to unify responsibility for proper operation and service of the pumping station, it is the intent of these Specifications that all system components shall be furnished by a single manufacturer for the pump station and for the control panel, or the same (unitary source) for both.
 - C. Nothing in the Contract Documents shall be interpreted as permission or direction to violate any governing code or ordinance. Electrical equipment, materials, and workmanship shall comply with the latest revisions of the following codes and standards:
 - 1. State and local codes and ordinances and inspecting authorities.
 - 2. The National Board of Fire Underwriters.
 - 3. National Fire Protection Associate (NFPA)
 - 4. Underwriters Laboratories, Inc. (UL)
 - 5. National Electrical Manufacturers Association (NEMA)
 - 6. American National Standards Institute, Inc. (ANSI)
 - 7. Insulated Power Cable Engineers Association (IPCEA)
 - 8. State of Florida Department of Industrial Safety (OSHA)

1.9 QUALIFICATIONS

- A. Manufacturer: Company specializing in manufacturing products specified in this Section with minimum five (5) years of documented experience.
- B. Installer: Company specializing in performing Work of this Section with minimum five (5) years of documented experience and shall be approved by manufacturer.
- C. Licensed Professional: Professional engineer experienced in design of specified Work and licensed in State of Florida.
- 1.10 DELIVERY, STORAGE, AND HANDLING
 - A. Section 01 60 00 Product Requirements: Requirements for transporting, handling, storing, and protecting products.
 - B. Inspection: Accept materials on Site in manufacturer's original packaging and inspect for damage.
 - C. Handling: Support wet well with nylon slings to structural lift points.
 - D. Store materials according to manufacturer instructions.
 - E. Protection:
 - 1. Protect materials from moisture and dust by storing in clean, dry location remote from construction operations areas.
 - 2. Provide temporary end caps and closures on piping and fittings and maintain in place until installation.
 - 3. Provide additional protection according to manufacturer instructions.

1.11 AMBIENT CONDITIONS

- A. Section 01 50 00 Temporary Facilities and Controls: Requirements for ambient condition control facilities for product storage and installation.
- B. Do not install wet well base or piping if bedding is wet or frozen.

1.12 EXISTING CONDITIONS

- A. Field Measurements:
 - 1. Verify field measurements prior to fabrication.
 - 2 Indicate field measurements on Shop Drawings.

1.13 WARRANTY

A. Section 01 70 00 - Execution and Closeout Requirements: Requirements for warranties.

- B. The manufacturer of the pump station equipment and components shall warrant it to be of quality construction, free from defects in material and workmanship. This warranty shall include specific details described below.
 - 1. The structure, equipment, apparatus, and parts furnished shall be warranted for a period of one (1) year, excepting only those items that are normally consumed in service such as light bulbs, oil, grease, etc.
 - 2 The Contractor shall be solely responsible for the warranty and all required corrective actions. The Owner may consider extending the warranty period, if possible.
- C. Components failing to perform as specified or as represented by the manufacturer or proven defective in service during the warranty period, shall be replaced, repaired, or satisfactorily modified by the Contractor at no cost to the Owner.
- D. The warranty shall become effective at the time of Substantial Completion.

PART 2 - PRODUCTS

2.1 SYSTEM DESCRIPTION

- A. Pumping Station:
 - 1. Configuration: As shown on the Drawings.
 - 2. Wet Well: Precast concrete or fiberglass as shown on the Drawings.
 - 3. Pump Type: Submersible, nonclog.
- B. System Power Characteristics:
 - 1. Electrical power to be furnished to the site will be 3-phase, 60Hz, 4-wire, 208/120, 240/120 volts, or 480/277 volts, determined by the power company, maintained within plus or minus ten percent (+10%).
 - 2. Control voltage shall not exceed 120 volts. If only single-phase power is available, provide variable frequency drives to convert to three-phase. Sized as required for this application.

2.2 PUMP PERFORMANCE AND DESIGN CRITERIA

- A. Pump Performance Requirements: The pumps furnished shall meet the "Initial Performance Requirements" set forth on the Drawings. The pump discharge bases and rail systems furnished shall be capable of supporting future pumps which will meet the "Future Performance Requirements" set forth on the Drawings.
- B. Submersible Pumps:
 - 1. Pumps shall be submersible sewage pumps, specifically designed for pumping raw, unscreened domestic sanitary sewage.
 - 2. Pump performance and design criteria shall be as shown on the Drawings.
 - 3. Materials:

- a. All parts of the pump casing and volute which are exposed to sewage shall be constructed of gray cast iron, ASTM A-48, Class 30, 35, or 40 with smooth surfaces devoid of blow holes or other irregularities.
- 4. All openings and internal passages shall be large enough to permit the passage of a sphere three (3) inches in diameter and any trash or stringy material which may pass through the average domestic wastewater collection system without clogging.
- 5. Pump impellers shall have a minimum throughlet size of three (3) inches. Data to show compliance with this requirement shall be included in the required submittals.
- 6. Discharge Connection Elbow: Permanently installed in chamber with discharge piping.
- 7. Connection: Automatic to discharge connection elbows when lowered into place, and easily removed for inspection or service.
- 8. All metal surfaces contacting the pumped liquid, other than stainless steel, shall be protected by a factory applied coating on the exterior of the pump which is suitable for the intended service.
- 9. Critical mating surfaces, where watertight sealing is required, shall be machined and fitted with Nitrile or Viton rubber O-rings.
- 10. Motor Cable Entry:
 - a. The cable entry seal design shall preclude specific torque requirements to insure a watertight and submersible seal.
 - b. The cable entry shall consist of a single cylindrical elastomer grommet or quick connect cable connectors, flanked by washers, all having a close tolerance fit against the cable outside diameter and the entry inside diameter and compressed by the body containing a strain relief function, separate from the function of sealing the cable.
 - c. The assembly shall provide ease of changing the cable when necessary, using the same entry seal.
- 11. Motor Cooling System:
 - a. Pump motors shall have cooling characteristics suitable to permit intermittent operation in a partially submerged condition, or continuous operation in a fully submerged condition.
 - b. For dry pit or variable speed applications, motors shall be capable of intermittent or continuous operation while unsubmerged.
 - c. The cooling system shall provide for continuous pump operation in liquid temperature of up to 104° F. Restrictions below this temperature are not acceptable.
- 12. Pump Mechanical Seals:
 - a. Each pump shall be provided with a tandem mechanical shaft seal system.
 - b. Seals shall operate in a lubricant reservoir that hydrodynamically lubricates the lapped seal faces at a constant rate.
 - c. The lower, primary seal unit, located between the pump and the lubricant chamber, shall contain one stationary and one positively driven rotating silicon-carbide ring.
 - d. The upper, secondary seal unit, located between the lubricant chamber and the motor housing, shall be silicon-carbide/carbon, carbon/ceramic, or tungsten/tungsten construction.
- e. The seals shall require neither maintenance nor adjustment nor depend on direction of rotation for sealing.
- f. The position of both mechanical seals shall depend on the shaft. Mounting of the lower mechanical seal on the impeller hub will not be acceptable.
- g. Each pump shall be provided with a lubricant chamber for the shaft sealing system. The lubricant chamber shall be designed to prevent overfilling and to provide lubricant expansion capacity.
- h. The drain and inspection plug, with positive anti-leak seal shall be easily accessible from the outside.
- i. The seal system shall not rely upon the pumped media for lubrication. Seal lubricant shall be FDA approved, non-toxic.
- 13. Pump Bearings:
 - a. The pump shaft shall rotate on two (2) bearings. Motor bearings shall be permanently grease lubricated.
 - b. Upper bearing shall be a single roller bearing.
 - c. Lower bearing shall be a two-row angular contact bearing to compensate for axial thrust and radial forces.
 - d. Minimum L10 bearing life shall be 50,000 hours at any point along the useable portion of the pump curve at maximum product speed.
- 14. Pump Shaft:
 - a. Pump and motor shaft shall be the same unit.
 - b. The pump shaft shall be an extension of the motor shaft. Couplings shall not be acceptable.
 - c. The pump shaft shall be manufactured from 300 series stainless steel.
- 15. Pump Impeller:
 - a. The impeller shall be capable of handling solids, fibrous materials, heavy sludge, and other matter typically found in wastewater.
 - b. The impeller shall be of gray cast iron, Class 35 or 40, dynamically balanced, vortex design or double shrouded non-clogging design, having a minimum throughlet size of 3 inches. Manufacturer's data to show compliance with this requirement shall be included in the required submittals.
 - 16. Pump Wear Rings:
 - a. The pump shall be provided with a means to maintain a tight clearance between the impeller and the volute in order to maintain pump efficiency. A replaceable wear ring system or an adjustable wear plate are acceptable.
 - 17. Manufacturers:
 - a. Sulzer
 - b. Grundfos
 - c. Flygt,
 - d. ShinMaywa (10 HP and Below)
 - e. or approved equal.
- C. Operation Sequences: Pump operational control sequences shall be as shown on the Drawings.
 - 1. Duplex Control Sequence:

- a. When wet well liquid level increases to LEAD PUMP START setting, LEAD PUMP START switch energizes lead pump.
- b. When wet well liquid level decreases to PUMP STOP setting, PUMP STOP switch de-energizes lead pump.
- c. When lead pump is de-energized, alternating relay indexes such that lag pump starts on next rise in wet well liquid level.
- d. If wet well liquid level continues to rise to LAG PUMP START setting, LAG PUMP START switch energizes lag pump.
- e. When wet well liquid level decreases to PUMP STOP setting, PUMP STOP switch de-energizes both pumps.
- f. If wet well liquid level continues to rise, HIGH LEVEL alarm switch energizes alarm signal when liquid level reaches HIGH-LEVEL setting.
- D. Sound, Vibration, and Thermal Control:
 - 1. Dampen or suppress noise.
 - 2. Absorb vibration.
 - 3. Accommodate thermal expansion and stresses.
 - 4. Adjust or correct for misalignment in piping systems.
- 2.3 WET WELL
 - A. Description:
 - 1. Submersible pump wet well system, including cover with vent and access hatch, rail assemblies, discharge pipe and fittings, plug valves, junction box, and level controls.
 - 2. Wet well shall meet the requirements of ASTM C478, with the exclusion of Section 10(a), except as modified herein.
 - 3. Inlet Size: As shown on the Drawings.
 - 4. Discharge Size: As shown on the Drawings.
- B. Precast Concrete Wet Wells:
 - 1. Cement shall meet the requirements of ASTM C150, Specification for Portland Cement, Type II.
 - 2. Concrete for wet well shall meet the minimum requirements for Class III.
 - 3. Minimum wall thickness shall be eight inches or 1/12 the inside diameter, whichever is greater.
 - 4. The required minimum strength of concrete and conformance to the design parameters shall be confirmed by testing in accordance with ASTM C14, Contractor shall be responsible for all testing.
 - 5. Wet well shall be fabricated only from eccentric tapered sections or eccentric flat top sections and standard cylinder units with the proper internal diameter.
 - 6. Use a minimum allowable steel hoop of No. 4 wire to be cast into each unit at adequate places as a precautionary measure for handling.
 - 7. Joints:

- a. Joint contact surfaces shall be formed exactly parallel with a two-degree (2°) slope and nominal 1/16" clearance with the tongue equipped with a proper recess for the installation of an O-ring rubber gasket.
- 8. Joint surfaces and holes provided for handling capabilities shall be sealed after installation by the Contractor.
- 9. Coatings:
 - a. Interior Lining: HDPE or polyurea as shown on the Drawings and specified in Section 33 05 61 Concrete Manholes.
 - b. Exterior Coating: Bituminous coating as specified in Section 09 90 00 Painting and Coating.
 - c. Coatings shall be applied at point of fabrication.
- 10. Manufacturers:
 - a. Del Zotto,
 - b. Taylor Precast,
 - c. or approved equal.
- C. Precast Polymer Concrete Wet Wells:
 - 1. Precast polymer concrete wet wells may be used for highly corrosive environments as shown on the Drawings.
 - 2. Precast polymer concrete wet wells shall be placed with a concrete slab for structural reinforcement and support.
 - 3. Precast polymer concrete wet wells shall come with polymer concrete lift station sections, monolithic base sections, and all related components.
 - 4. Provide riser sections joined with bell and spigot/ship-lap design seamed with butyl mastic and or rubber gaskets (ASTM C 990) so that on assembly, manhole base, riser, and top section make a continuous and uniform manhole structure. Joint sealing surfaces shall be free of dents, gouges and other surface irregularities that would affect joint integrity.
 - 5. Construct riser sections for polymer concrete lift stations from standard polymer concrete cylinder sections of the diameter indicated on drawings. Use various lengths of polymer concrete sections in combination to provide correct height with the fewest joints.
 - 6. All precast base sections to be cast monolithically. Polymer bench and channel are to be constructed with all polymer concrete material.
 - 7. The polymer concrete lift stations shall be installed via tremie method. Extended ballast slab requirements for buoyancy concerns can be addressed with cementitious concrete material.
 - 8. Design wall sections for depth and loading conditions with wall thickness as designed by polymer concrete manufacturer.
 - 9. Provide tops to support AASHTO HS-20 loading or loads as required and receiving non-vented, solid cast iron frame covers or hatches, as indicated on drawings.
 - 10. Provide resilient connectors conforming to requirements of ASTM C923. All connectors are to be watertight. Install approved resilient connectors at each pipe entering and exiting manholes in accordance with manufacturer's instructions.

- 11. Construct invert channels to provide smooth flow transition with minimal disruption of flow at pipe-manhole connections. Invert slope through manhole is as indicated on drawings.
- 12. Polymer Concrete Mix Design shall consist of thermosetting resin, sand, and aggregate. No Portland cement shall be allowed as part of the mix design matrix. All sand and aggregate shall be inert in an acidic environment.
- 13. Reinforcements:
 - a. Shall use acid resistant reinforcement (FRP Bar) in accordance with ACI 440.1R-06 as applicable for polymer concrete design.
- 14. Each polymer concrete component shall be free of all defects, including indentations, cracks, foreign inclusions, and resin starved areas that, due to their nature and degree or extent, detrimentally affect the strength and serviceability of the component part. Cosmetic defect shall not be cause for rejection. The nominal internal diameter of manhole components shall not vary more than 2%. Variations in height of two opposite sides of risers and cones shall not be more the 5/8 inch. The under run-in height of a riser or cone shall not be more than ¹/₄ in/ft of height with a maximum of ¹/₂ inch in any one section.
- 15. The pipe material shall be resistant to corrosion resulting from the presence of Hydrogen Sulfide and pH values between 2 and 13.
- 16. Wet well top shall be precast polymer concrete reinforced with a rectangular cutout to accommodate the hatch cover assembly. The top shall also include openings for pipe penetrations as shown on the Drawings. A neck shall be extended above the top to accommodate concrete slab installation.
- 17. Manufacturer shall certify that wet well has been properly installed to manufacturer's requirements.
- 18. Manufacturers:
 - a. Armorock,
 - b. or approved equal.
- D. HDPE Wet Wells:
 - 1. HDPE wet wells may be used for highly corrosive environments as shown on the Drawings.
 - 2. HDPE wet wells shall be placed with a concrete slab for structural reinforcement and support.
 - 3. HDPE wet well shall be manufactured from a high-density polyethylene material which meets or exceeds to minimum cell classification requirements for base materials as specified on ASTM F894 when classified in accordance with ASTM D3350.
 - 4. Polyethylene raw material shall contain a minimum of 2%, well dispersed finely divided carbon black for UV stabilization. Additives which can be conclusively proven not to be detrimental to the pipe may also be used provided the pipe produced meets or exceeds all of the requirements of this specification.
 - 5. The pipe shall contain no recycled compound except that generated on the manufacturers' own plant.
 - 6. The pipe manufacturers Quality System shall be certified as meeting the requirements of an ISO 9000:2008 (or later) Quality Management System, by a qualified independent body.

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- 7. The pipe material shall be resistant to corrosion resulting from the presence of Hydrogen Sulfide and pH values between 2 and 13.
- 8. Pipe shall be extrusion welded to polyethylene wet well by manual extrusion welding techniques on both the interior and exterior of the wet well.
- 9. The complete wet well shall have a minimum dynamic-load rating of 16,000 ft/lbs. when tested in accordance with ASTM D-3753-latest edition, section 8.
 - a. To establish this rating, the complete wet well shall not leak, crack, or suffer other damage load tested to 40,000 ft/lbs. and shall not deflect vertically downward more than 1/4" at the point of load application when loaded to 24,000 pounds.
- 10. Wet well top shall be HDPE reinforced with a rectangular cutout to accommodate the hatch cover assembly. The top shall also include openings for pipe penetrations as shown on the Drawings. A neck shall be extended above the top to accommodate concrete slab installation.
- 11. Bottom shall have a 1" thick polyethylene round plate bottom anchored to an HDPE encapsulated rebar reinforced concrete base with sufficient stiffening ribs.
 - a. The bottom shall have a minimum three inch (3") anti-floatation ring or collar.
 - b. Wet well bottom (hopper) shall be minimum 1" thickness.
- 12. All incoming and outgoing pipe connections shall be factory installed or installed per factory recommendations.
 - a. Installation of HDPE pipe must be performed by sanding, priming, and using reinforced band lay- up.
 - b. The HDPE shall be the same type and grade as used in the fabrication of the wet well. Boots shall be installed by the wet well manufacturer using FRP pipe stub-out for the boot sealing surface.
- 13. Manufacturer shall certify that wet well has been properly installed to manufacturer's requirements.
- 14. Manufacturers:
 - a. Uponor Infra LTD,
 - b. or approved equal.
- E. Access Hatches Non-Traffic Rated:
 - 1. Provide access hatches as shown on the Drawings.
 - 2. Access hatches shall be constructed of one-quarter inch (1/4"), minimum, Floor Diamond Plate Aluminum with one-quarter inch (1/4"), minimum, extruded aluminum angle frame with concrete anchors and integral neoprene gasket strip.
 - 3. Aluminum shall be mill finished with coal tar epoxy applied to surfaces to be in contact with concrete.
 - 4. Hinges, bolts, and fasteners shall be stainless steel.
 - 5. All stainless steel is to be 316 grade stainless steel.
 - 6. Minimum design loading: 300 lb/ft².
 - 7. Hatch shall include hold-open arm mechanism and cast aluminum drop handle and safety hasp.
 - 8. Fall Protection System:
 - a. Hatches shall include the manufacturer's standard safety grating.

- b. Minimum safety grating load rating: 300 lb/ft^2 .
- c. Safety grating material: FRP or aluminum.
- d. Provide hinges and lift-assist to allow grating sections to automatically lock in place in full-open 90-degree position.
- e. Provide hold-open arm and release assembly of aluminum or Type 316 stainless steel. Safety grating shall be colored OSHA "Safety Yellow" or "Safety Orange".
- 9. Single Door Access Hatch:
 - a. Manufacturers:
 - 1) U.S. Foundry, APS,
 - 2) Halliday, S1R,
 - 3) or approved equal.
- 10. Double Door Access Hatch:
 - a. Manufacturers:
 - 1) U.S. Foundry, APD,
 - 2) Halliday, S2R,
 - 3) or approved equal.
- F. Access Hatches Traffic Rated:
 - 1. Provide access hatches as shown on the Drawings.
 - 2. Access hatches shall be constructed of one-quarter inch (1/4"), minimum, Floor Diamond Plate Aluminum with one-quarter inch (1/4"), minimum, extruded aluminum angle frame with concrete anchors and integral neoprene gasket strip.
 - 3. Aluminum shall be mill finished with coal tar epoxy applied to surfaces to be in contact with concrete.
 - 4. Hinges, bolts, and fasteners shall be stainless steel.
 - 5. All stainless steel is to be 316 grade stainless steel.
 - 6. Minimum design loading: H-20 Load Rating.
 - 7. Hatch shall include hold-open arm mechanism and cast aluminum drop handle and safety hasp.
 - 8. Fall Protection System:
 - a. Hatches shall include the manufacturer's standard safety grating.
 - b. Minimum safety grating load rating: 300 lb/ft^2 .
 - c. Safety grating material: FRP or aluminum.
 - d. Provide hinges and lift-assist to allow grating sections to automatically lock in place in full-open 90-degree position.
 - e. Provide hold-open arm and release assembly of aluminum or Type 316 stainless steel. Safety grating shall be colored OSHA "Safety Yellow" or "Safety Orange".
 - 9. Single Door Access Hatch:
 - a. Manufacturers:
 - 1) U.S. Foundry, AHS,
 - 2) Halliday, H1R,
 - 3) or approved equal.
 - 10. Double Door Access Hatch:
 - a. Manufacturers:

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- 1) U.S. Foundry, AHD,
- 2) Halliday, H2R,
- 3) or approved equal.
- G. Wet Well Connectors:
 - 1. Furnish openings as indicated on Drawings.
 - 2. Pipes shall be connected to wet wells with heavy duty flexible rubber connector boots conforming to ASTM C923 with stainless steel bands and hardware.
 - 3. No adhesives or lubricants shall be employed in the installation of the connector into the wet well.
 - 4. The connector shall be installed in the wet well wall by use of an expanding mechanism in strict accordance with the manufacturer's recommendations.
- H. Rail System: Slide rail assembly consisting of Type 316 stainless-steel, upper, and lower rail brackets and pump guide brackets.
- I. Level Controls: As indicated on Drawings.

2.4 PIPING

- A. General:
 - 1. All suction and discharge piping including valves shall be capable of passing three inch (3") spherical solids. Flanged pipe shall be centrifugally cast ductile iron, complying with ANSI/AWWA A21.51/C 115 and Class 53 thickness. Flanges shall be cast iron Class 125 rated and complying with ANSIB16.1.
- B. Pump Suction Spool: Each pump shall be equipped with a one-piece, cast iron suction spool, flanged on each end. Each spool shall have one (1) 1 ¹/₄" NPT and ¹/₄" NPTtapped hole with pipe plugs for mounting of gauges or other instrumentation.
- C. Check valves shall be full flow swing check valves as specified in Section 33 31 23 Sanitary Sewerage Force Main Piping.
- D. Plug valves shall be as specified in Section 33 31 23 Sanitary Sewerage Force Main Piping.
- E. Air release valves shall be as specified in Section 31 31 23 Sanitary Sewerage Force Main Piping and as shown on the Drawings.
- F. Electromagnetic Flow Meters:
 - 1. Electromagnetic Flow Meters shall meet or exceed requirements of AWWA C751 standards and shall be NSF approved for potable water use.
 - 2. Materials:
 - a. Body: Bronze, Cast Iron, or Stainless Steel.
 - b. Liner: Fusion-bonded epoxy coated.
 - c. Electrodes: Type 316 Stainless Steel.
 - d. Display Housing: Aluminum Alloy with glass display window.
 - 3. Electromagnetic Flow Meters shall be rated for 200 psi working pressure.

- 4. Connection: Flanged.
 - a. Flanged connections shall include companion flanges, gaskets, bolts, and nuts.
- 5. Register:
 - a. The register shall be permanently hermetically sealed.
 - b. No fogging, large numerals, tempered glass lens.
 - c. Unit of Measure: Cubic foot.
 - d. Magnetic drive, low torque registration.
 - e. Straight and AMI reading, and low flow indicator.
 - f. The register shall connect to a Cellular Endpoint. AMI transmitter via factory potted NICOR Connector as part of the register. The AMI transmitter shall be capable of communicating to Badger's Beacon AMA Cellular Metering System.
- 6. Manufacturers:
 - a. Rosemount 8750W Magnetic Flowmeter (with converter)
 - b. or approved equal.
- G. Discharge Piping:
 - 1. Discharge piping shall be as shown on the Drawings and specified in 31 31 23 Sanitary Sewerage Force Main Piping.
 - 2. Discharge piping shall include a pressure gauge assembly as follows:
 - a. Connection to force main: 1 ¹/₄" NPT.
 - b. Valve: Ball Valve.
 - c. Pressure Gauge.
- H. The piping and exposed steel framework shall be cleaned with industrial grade chemical cleaner. The prime coat shall be a zinc base synthetic primer. The finish coat shall be an epoxy grade as specified in Section 09 90 00 Painting and Coating.

2.5 MAIN DISCONNECT SWITCH PANEL

- A. Main Disconnect Switch:
 - 1. A NEMA 12/3R 316 Stainless Steel main disconnect switch, breaker type, shall be provided, fused to meet requirements of the load.
 - 2. Size: Sized to handle full-service load, 100 amps minimum at 480 volts, 200 amps minimum at 240 volts..
- B. Surge Protector:
 - 1. A surge protector shall be provided to protect the secondary line voltage circuitry in the main panel.
 - 2. The protector shall be 3 phases, 4 wire installed on the outside of the main disconnect switch and connected to the load side terminals of the disconnect switch.
 - 3. Manufacturers:
 - a. Square D, Model SDSA3650,
 - b. or approved equal.

2.6 CONTROL PANEL

A. Description:

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- 1. Factory fabricated, self-contained.
- 2. Motor Control Panel: At remote location with short circuit and overload protection for pumps and alternator to alternate pump duty between pumps on successive cycles or switch operation of pumps on pump failure.
- 3. Furnish HIGH-LEVEL ALARM light and RUN light to warn of high-level condition or failure of pump.
- B. Enclosure:
 - 1. Panel Enclosure:
 - a. The electrical components and control equipment shall be mounted within NEMA 12/3R, dead front type control enclosures fabricated of 316 stainless steel.
 - b. Enclosure doors shall be gasketed with neoprene, hinged, and equipped with 3-point pad-lockable handle.
 - c. Control compartments shall incorporate removable back panels on which control components shall be mounted.
 - d. Back panel shall be secured to enclosures with collar studs.
 - e. Single door panels shall be mounted on aluminum posts, double door panels shall be free standing on concrete slab.
- C. Components:
 - 1. Motor Branch Components:
 - a. All motor branch components shall be of the highest industrial quality, securely fastened to removable sub-plate with stainless steel screws and lock washers.
 - b. Sub-plate shall be tapped to accept all mounting screws. Self-tapping screws shall not be used to mount any components.
 - 2. Circuit breaker and Operating Mechanism:
 - a. A properly sized heavy-duty air circuit breaker shall be furnished for each pump motor.
 - b. All circuit breakers shall be sealed by the manufacturer after calibration to prevent tampering.
 - c. Each breaker shall have auxiliary contacts that open when breaker is off or tripped.
 - 3. Motor Starters/Contactors:
 - a. An open frame, across the line, NEMA rated magnetic motor starter shall be furnished for each pump motor.
 - b. Soft Starters:
 - 1) Solid state soft start starters shall be installed on motors 1-20 hp @ 240 volts, or @ 480 volts.
 - 2) Manufacturers:
 - a) Stellar, SR series,

- b) or approved equal.
- c. Variable Frequency Drives:
 - Variable Frequency Drives shall be installed on motors 5 hp or greater @ 240 volts, or 480 volts that have excessive starts or are designed to pump 1000 GPM or more.
 - 2) Manufacturers:
 - a) Yaskawa,
 - b) or approved equal.
- 4. Manual Transfer Switch:
 - a. Provide manual transfer switch breaker to switch to generator power.
 - b. Provide Russell-Stol generator receptacle sized to main breaker so lift station can be operated by generator.
 - c. Provisions shall be made to prevent main and emergency breakers from being on at the same time.
- 5. Circuit Breakers:
 - a. Circuit breakers shall be properly sized breakers for outlets, lighting, control system, and other uses.
 - b. Breakers shall be mounted with cutouts through the dead front panel so that breaker faces will be flush with the dead front.
- 6. Phase Monitor:
 - a. A line voltage rate phase sequence and loss monitor shall be provided as shown on the Drawings.
 - b. The monitor will be pre-wired into the control circuitry to take the station out of service if a phase is reversed, lost, or drops below 83% of normal voltage.
 - c. The unit shall automatically restore the station to normal conditions when normal power is restored.
- 7. Warning Light and Horn:
 - a. The main panel shall be provided with a lexon shielded LED warning light that is red in color LED and weatherproof horn.
 - b. A silence switch shall be mounted on the dead front and below the horn.
- 8. Surge Protector:
 - a. Provide a surge protector as shown on the Drawings to prevent transient voltages from damaging control circuits and equipment.
- 9. GFI Receptacle:
 - a. A weatherproof duplex ground fault indicating utility receptacle providing 115 volts, 60Hz, single-phase current, shall be mounted on the front of the main panel.
 - b. Receptacle circuit shall be protected by a 20-ampere thermal-magnetic circuit breaker.
- 10. Control Circuitry: The control circuit shall be protected by a thermal-magnetic air circuit breaker, which shall be connected in such a manner as to allow control power to be disconnected from all control circuits.
- 11. Pump Run Indicators:
 - a. Control panel shall be provided with one (1) pilot light for each pump motor for run, stop, and fault.

- b. Light shall be wired in parallel with the related pump motor starter to indicate that the motor is or should be running, stopped, or in fault.
 - All indicators shall be of the LED type and have push to test function.
- 12. Pump Mode Selection:

C.

- a. Pump mode selector switches shall be connected to permit manual start and stop of each pump individually, and to select automatic operation of each pump under control of the level control system.
- b. Manual operation shall override all shutdown systems, but not the motor overload relays.
- c. Selector switches shall be 3-position, rotary-maintained type.
- d. Switch contacts shall be rated 15 amperes minimum at 120 volts non-inductive.
- 13. High Pump Temperature and Moisture Protection:
 - a. The control panel shall be equipped with circuitry to override the level control system and shut down the pump motor(s) when required to protect the pump from damage caused by excessive temperature or moisture.
 - b. A thermostat and moisture sensor shall be mounted on each pump to detect its temperature or moisture, and a signal relay shall be supplied.
 - c. If the pump temperature should rise to a level which could cause pump damage or moisture is detected, the signal relay shall drop out the motor starter. An indicator, visible on the front of the control panel, shall indicate that the pump motor has been stopped because of a high temperature or moisture condition.
 - d. The pump shall remain locked out until the pump has cooled or moisture removed, and the circuit has been manually reset. Automatic reset of such a circuit shall not be acceptable.
 - 14. Wiring:
 - a. The pump station as furnished by the manufacturer shall be completely wired except for the power feeder lines to the branch circuit breakers and final connections to remote alarm devices.
 - b. All wiring, workmanship, and schematic wiring diagrams shall be in compliance with applicable standards and specifications set forth by the National Electric Code (NEC) and UL 508c listed.
 - c. A laminated AS BUILT schematic shall be permanently attached to the inner side of the enclosure door.
 - 15. Wire Identification and Sizing: Control circuit wiring inside the panel, except for the internal wiring of individual components, shall be as per UL 508c listing.
 - 16. Pump Motor Connection Box:
 - a. A NEMA 12/3R Type 316 stainless 24"W x 18"H x 8"D steel enclosure with a hinged, bolt on cover capable of being padlocked, shall be provided, and mounted on the electrical equipment rack between the electrical meter and main disconnect.
 - b. An aluminum backplane shall also be provided as part of the enclosure, with suitable power and control distribution blocks and terminals mounted within to connect the pump motor to the control panel and controls.

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2.7 LEVEL CONTROL SYSTEM

- A. General: The level control system shall start and stop the pump motors in response to change in wet well level, as set forth herein.
- B. Level Control System:
 - 1. VEGAPULS Model C11 or C21 level measurement unit.
 - 2. Level control system will provide 4-20mA signal.
 - 3. Pump Level Controller: MPE SC2000-02 or approved equal.
- C. Sequence of Operation:
 - 1. The electronic controller shall continuously monitor the wet well level, permitting the operator to read wet well level at any time.
 - 2. Upon operator selection of automatic operation, the controller shall start the motor for one pump when the liquid level in the wet well rises to the "lead pump start level".
 - 3. When the liquid is lowered to the "lead pump stop level", the electronic controller shall stop this pump. These actions shall constitute one pumping cycle.
 - 4. Should the wet level continue to rise, the electronic controller shall start the second pump when the liquid level reaches the "lag pump start level" so that both pumps are operating. These levels shall be adjustable as described below.
- D. Independent Lag Pump: Circuit design in which application of power to the lag pump motor starter is contingent upon completion of the lead pump circuit shall not be acceptable.
- E. High Water Alarm with Alarm Silencer:
 - 1. In the event that the wet well liquid reaches a preset high-water alarm level, the high-water output relay shall energize a signal relay. The signal relay shall complete a 115- volt circuit for an external alarm device. A red LED indicator, visible from outside the control panel, and an audible signal, shall indicate that a high wet well level exists.
 - 2. The signal relay shall maintain the alarm signal until the wet level has been lowered and the circuit has been manually reset.
 - 3. An alarm silence switch and relay shall be provided to permit maintenance personnel to de-energize the external audible device while corrective actions are underway. After silencing the alarm device, manual reset of the signal relay shall provide automatic reset of the alarm silence relay. Located outside of panel on left side as well as on dead front.
- F. Automatic Pump Alternation:
 - 1. The level control system shall select first one pump, then the second pump, to run as lead pump for a pumping cycle.
 - 2. Alternation shall occur at the end of a pumping cycle.
- 2.8 SUPERVISORY CONTROL AND DATA ACQUISITION(SCADA)
 - A. Remote Terminal Unit (RTU) shall be an MPE SC2000-02 or approved equivalent.

- B. The remote terminal unit shall communicate with the central site via a two-way radio link.
- C. RTU Assembly:
 - 1. Control Box with Modules.
 - 2. Connecting Antenna Cable
 - 3. Antenna Tower
 - 4. Antenna Mast
 - 5. Antenna
 - 6. All hardware necessary for a complete and operational RTU.
- D. Bring all I/O from controller to terminal strip for future use.

2.9 MATERIALS

- A. Bedding and Backfill.
 - 1. Bedding, cover, and soil backfill materials shall be in accordance with the Florida Department of Transportation Standard Specifications for Road and Bridge Construction (latest edition.)
- B. Odor Control Systems.
 - 1. Odor control systems shall be in accordance with the Florida Department of Transportation Standard Specifications for Road and Bridge Construction (latest edition.)
- 2.10 ACCESSORIES
 - A. Pipe Penetration Sealant in Concrete Structures: Non-Shrink Grout.
 - B. All pipe supports, anchors, fasteners and accessories shall be Type 316 Stainless Steel.
 - C. Exterior Lighting: As indicated on Drawings.
 - D. Fencing and Security Gate: As indicated on Drawings.
 - E. Fresh Water Supply: As indicated on Drawings.
- 2.11 SOURCE QUALITY CONTROL
 - A. Provide shop inspection and testing of completed assembly.
 - B. Inspection:
 - 1. Verify that motor voltage and frequency are as shown on nameplate.
 - 2. Verify that motor and cable insulation test for moisture content or insulation defects comply with UL 83.
 - C. Testing:
 - 1. Submerged Pump Run: Test to determine that pump meets hydraulic performance requirements.

- 2. Document and certify testing results in written report.
- D. Owner Inspection:
 - 1. Make completed pump assembly available for inspection at manufacturer's factory prior to packaging for shipment.
 - 2. Notify Owner at least seven days before inspection is allowed.
- E. Certificate of Compliance:
 - 1. Submit certificate of compliance indicating Work performed at fabricator's facility conforms to Contract Documents.

PART 3 - EXECUTION

- 3.1 EXAMINATION
 - A. Section 01 70 00 Execution and Closeout Requirements: Requirements for installation examination.
 - B. Verify that inlet and discharge piping connections are size, location, and elevation as indicated on Drawings.

3.2 PREPARATION

- A. Section 01 70 00 Execution and Closeout Requirements: Requirements for installation preparation.
- B. Buried piping shall be installed in accordance with Section 33 31 23 Sanitary Sewerage Force Main Piping.
- C. Protect piping from entry of foreign materials and water by using temporary covers, completing sections of Work, and isolating parts of completed system.

3.3 WET WELL AND MANHOLE ABANDONMENT

- A. Existing wet wells and manholes that are no longer to be used in the sanitary sewer system shall be abandoned.
- B. The Contractor shall divert existing sewage flows as called for on the plans and as specified herein. Pipe openings shall be plugged in a manner satisfactory to the Engineer. Where manholes are to be abandoned, the rim and cover shall be removed, salvaged, and made available to Owner. Manhole and wet well tops shall be removed and disposed of by the Contractor as specified elsewhere in the specifications.
 - 1. Remove top sections to the elevations shown on the plans.
 - 2. Where no elevation is shown, the manhole or wet well top section shall be removed to the first joint or 24 inches below grade, whichever is greater.

- 3. Wet well and manhole foundations to remain in place shall be punctured with minimum 2-inch diameter holes at maximum 6-feet spacing on center to prevent hydraulic uplift.
- 4. The Contractor shall fill and compact the remaining bottom section with select backfill.

3.4 INSTALLATION

- A. Excavation:
 - 1. Excavation and backfill shall be performed as specified in Section 125 of the Florida Department of Transportation Standard Specifications for Road and Bridge Construction (latest edition) and in indicated locations and depths.
 - 2. Keep excavation free of water during the construction process.
 - 3. Build structures to the line and grade shown on the plans.
 - 4. For the wet well, the Contractor shall excavate one (1) foot deeper than the elevation of the bottom of the wet well base and replace the material with suitable bearing rocks or gravel approved by the Engineer.
 - 5. The bottom shall provide a smooth, firm and stable foundation for the structure.
 - 6. At least one (1) compaction density test shall be made on the prepared base for each manhole. It is expressly agreed and understood that the Owner reserves the right to perform additional compaction tests or to increase or decrease the frequency of compaction test.
 - 7. Compaction testing shall be in accordance with Section 31 23 23.00 Fill.
- B. Wet Well:
 - 1. Installation of wet wells shall comply with the manufacturer's recommendations.
 - 2. Install wet well at proper grade and to indicated alignment on Drawings.
 - 3. Wet well sections shall be set so the wet well will be vertical and with sections in true alignment.
 - 4. Joints between sections of precast concrete wet wells shall be jointed using Ram-Nek joint sealant or approved equal.
 - 5. Wet wells are considered confined spaces and the Contractor must follow the Owner requirements for confined space entry.
 - 6. All holes in sections used for handling and the annular space between the wall and entering pipe shall be thoroughly plugged and sealed in strict conformance with the manufacturer's recommendations so that there will be zero leakage through openings and around pipes.
 - 7. After all holes, joints, annular spaces or other exposed areas have been jointed as specified above, the areas shall be sealed in accordance with its manufacturers written instructions with liner material.
 - 8. Ballast wet well with aggregate, over ballast support flange and around entire wet well perimeter, to specific weight of not less than 63 lb. per cubic foot of wet well volume.
- C. Pumps:
 - 1. Install pumps, including fittings, brackets, and discharge piping to wet well rail assembly, lifting device, and discharge.

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- 2. Wire pump to junction box.
- D. Electrical:
 - 1. Furnish all equipment, transportation, tools and labor, unless otherwise specified, to install a complete electrical system with wire, conduit, service panel, emergency hookup, control panel, emergency horn and light, and all other items shown, specified, or that can be reasonably inferred from the drawings, including excavation, backfill, placing of conduit, pulling wires, and testing for a complete job ready to operate. If any items for a complete job are omitted or not shown, the Contractor shall furnish and install the same without cost to the Owner.
 - 2. Permits and Inspection The Contractor shall make application for electrical service in the name of the Owner with voltages as indicated on the drawings.
 - 3. Make equipment of the same type of catalogued product of the same manufacturer. Use weatherproof switches and receptacles with weatherproof covers for outdoor locations or locations subject to moisture intrusion.
 - 4. Install all equipment in accordance with approved applicable codes, shop drawings, manufacturer's instructions, and to operate as specified.
 - 5. Identification Engrave nameplates, white-on-black laminated plastic, and attach with mounting frames or drive screws. Provide nameplates for all lighting and power panel boards, distribution circuit breakers, receptacles (other than standard convenience), motor control centers, switchboards, disconnect switches, selector switches, push buttons, and other major pieces of electrical equipment.
 - a. Provide typewritten circuit directories for each panel board.
 - b. Identify conductor as to load served:
 - 1) Leave all branch circuits tagged in the panel boards, in all gutters, and in all junction boxes where unused circuits terminate for the purpose of identifying the various circuits.
 - 2) Tag feeders and mains in the switchboards.
 - 3) Place identification tags within three inches (3") of the terminal connections at each feeder circuit breaker. Tag with adhesive-type marker.
 - 6. Service Entrance All services shall be 208/120, 240/120 or 480/277 volt, three
 - (3) phase services. Provide a meter base, stainless steel disconnect, lightning arrestor, concrete pad for transformer and other materials required by the City of Ocala Electric Utility which will provide service to the lift station. If a step-up transformer is needed, provide stainless steel housing.
 - 7. Junction and Pull Boxes Provide NEMA 4X watertight stainless-steel enclosures for junction and pull boxes.
 - 8. Raceway:
 - a. Rigid Aluminum Conduit: Provide rigid aluminum conduit, including bushings, couplings, elbows, and nipples meeting requirements of ANSI C 80.1 and NEC.
 - b. PVC Schedule 40 Conduit: Provide rigid Schedule 40 PVC conduit for underground burial.

- c. Warning Tape: Provide heavy-gauge, yellow plastic tape for use in trenches containing buried conduit. Warning tape shall state "Warning, Buried Electrical."
- d. Raceway Schedule:
 - 1) Minimum Size: 3/4".
 - 2) Exterior Installation: Aluminum.
 - 3) Underground Installation: Schedule 40 PVC.
- 9. Conductors:
 - a. Identify power and control conductors at each termination and in all accessible locations such as handholes, panels, pull boxes, and terminal boxes.
 - b. For power conductors, provide all single conductors and individual conductors of multi- conductor power cables with integral insulation pigmentation of the designated colors, except conductors larger than No. 6 AWG may be provided with color coding by wrapping the conductor at each end with vinyl tape.

System	Conductor	Color
All	Equipment Grounding	Green
120/240 volts, 1-phase, 3-wire	Grounded Neutral	White
	One Hot Leg	Black
	Other Hot Leg	Red
208/120 volts, 3-phase, 4-wire	Grounded Neutral	White
	Phase A	Black
	Phase B	Red
	Phase C	Blue
240/120 volts, 3-phase, 4-wire	Grounded Neutral	White
	Phase A	Black
	Phase B	Orange
	Phase C	Blue
480/277 volts, 3-phase, 4-wire	Grounded Neutral	White/Black Tracer
	Phase A	Brown
	Phase B	Orange
	Phase C	Yellow
<u>Note:</u> Phase A, B, C, implies the direction of positive phase rotation. Phase rotation shall be counterclockwise beyond first point of entry.		

c. Conductors shall be color coded according to the following:

10. Utilize only conductors meeting applicable requirements of NEMA WC3, WC5, WC7, and ICEA S-19-81, S-61-402, and S-66-524.

- 11. Provide stranded copper conductors type THHN/THWN.
- 12. Grounding:

- a. Ground all exposed metallic parts of electrical equipment, raceway systems, and the neutral of all wiring systems in accordance with the NEC, state, local, and other applicable laws, and regulations.
- b. Provide copper-clad steel ground rods not less than 3/4" in diameter, ten feet (10') long, driven full length into earth, spaced at six feet (6') apart.
- c. Ground rod to ground shall be cad welded of mechanically clamped. Grounding conductor shall be continuous.
- d. Ground rod connections shall be accessible for inspection in an approved underground round box enclosure flush with finish grade.
- E. Supervisory Control and Data Acquisition (SCADA):
 - 1. All lift stations shall be installed with a SCADA system. System shall be installed by the Contractor with the lift station. Installation of the SCADA system shall be required for final acceptance of the lift station.
 - 2. SCADA systems shall be installed and operational before the lift station is online and functional. The Contractor shall perform a radio survey to determine height of the antenna required. Typical height will be a minimum of 20' with a 1-1/2" x 48" adjustable aluminum mast, which will be adjusted after survey is completed.
 - 3. Coordinate with the Engineer for the radio survey and the installation of the SCADA system.
 - F. Backfilling:
 - 1. Excavation and backfill shall be performed in accordance with the Florida Department of Transportation Standard Specifications for Road and Bridge Construction (latest edition) to the locations and depths shown.
 - 2. Excavate undesirable material to a minimum depth of 12-inches below the proposed grade and backfill as specified.
 - 3. Place gravel under manholes located in wet soil conditions.
 - 4. Provide clearance around sidewalls of manhole or structure for construction operations.
 - 5. If ground water is encountered, prevent accumulation of water in excavations, place manhole or structure in dry trench.
 - 6. Where possibility exists of watertight manhole or structure becoming buoyant in flooded excavation, anchor manhole or structure to avoid flotation as approved by Engineer.
 - 7. Backfill around sides and to top of pipe with cover fill in minimum lifts of six (6) inches and compact to the requirements specified in Section 31 23 23.00 Fill.

3.5 FIELD QUALITY CONTROL

- A. Section 01 70 00 Execution and Closeout Requirements: Requirements for testing, adjusting, and balancing.
- B. Preoperational Inspection:
 - 1. Check pump and motor alignment.
 - 2. Check for proper motor rotation.

- 3. Check pump and drive units for proper lubrication.
- C. Wet Well Testing:
 - 1. The wet well shall be watertight and free from infiltration.
 - 2. Wet wells shall be free of seepage and surface moisture.
 - 3. The Contractor shall perform the following leakage testing to demonstrate compliance with the Contract Documents:
 - a. Plug all wet well inlets and outlets with approved stoppers or plugs.
 - b. Fill the structure with water to an elevation one (1) foot below the top slab.
 - c. The water shall stand for thirty (30) minutes before the test measurements begin or until the water level stabilizes. If the water level does not stabilize within thirty (30) minutes, the structure shall be considered to have failed the test.
 - d. The maximum allowable drop in the water surface is 1/10 of one percent (1%) in 24 hours of testing.
 - e. The Contractor shall repair any leaks that may be observed, regardless of whether the leakage tests pass or fail.
- D. Electrical Testing:
 - 1. Test all wiring and connections as required by the City of Ocala representative and other authorities having jurisdiction. Correct all failures in a manner satisfactory to the City and Engineer representative.
 - 2. The Contractor shall pay all costs of testing, including costs of correcting failures, furnishing all necessary testing equipment and of replacing or repairing any damage to associated work or surrounding area resulting therefrom and correcting faulty installations.
 - 3. Test resistance to ground by use of a megaohm instrument with a maximum resistance to ground of five (5) ohms, and provide additional grounding as required.
 - 4. Accomplish the following tests for all wire and connections:
 - a. Continuity.
 - b. Proper grounding.
 - c. Short circuits in system.
 - d. Electrical motor controls.
 - e. Panels with main disconnected from the feeder.
 - f. Sub and branch feeder connections.
 - g. Proper rotation of all motors.
 - 5. Subject all electrical systems to complete operational tests in accordance with placing the station in operation.
- E. Startup and Performance Testing:
 - 1. Notify Engineer, seven (7) days prior to flow rate testing.
 - 2. Startup and Initial Testing: Coordinate and operate pumps in conjunction with other construction activities.
 - 3. Hydraulically test station to performance requirements by receiving, pumping, and discharging water to and from wet well.
 - a. Flow Rate and Total Dynamic Head at three (3) points on pump curve, including the specified design point.

- b. Rate of flow and head must be within ten percent (10%) and five percent (5%) above design curve, respectively, for acceptance.
- 4. Test pump motor amperage draw and voltage.
 - a. Motor amp readings at or above full load amps (FLA) and Mega-Ohms reading less than 1000 mega-ohms will not be accepted.
- 5. Confirm general sequencing of pump and float operations at wet well and control panel are according to performance requirements.
- 6. Document and certify startup results in startup report.
- F. Operational Testing:
 - 1. After the system is in full operation, a full operating test shall be performed in the presence of the Engineer and a qualified manufacturer's representative.
 - 2. The Contractor shall furnish all labor, materials, and equipment required for such test and shall correct any deficiencies noted by repairing or replacing the defective component, and re- testing as required until the equipment meets the requirements of the Contract Documents.
- G. Manufacturer Services:
 - 1. The pump station equipment manufacturer shall furnish services of a representative approved by the Engineer to aid and be present during installation, inspect the completed installation, operate the equipment, place the equipment in operation, instruct the Owner's operations personnel in the operation and maintenance of the units.
 - 2. Operation and maintenance training shall include operation, service, adjustments, and routine maintenance. Recommended spare parts lists and maintenance schedules shall be provided at the time of the training.
 - 3. The Contractor shall furnish manufacturer representative's written report to the Engineer after the lift station has been installed and satisfactory pump tests have been run and all necessary operational features of the lift station are in accordance with the Contract Documents. The report shall certify that equipment has been satisfactorily installed, operated, and test run and that Owner personnel have been instructed by the pump manufacturer's representative.
- H. Equipment Acceptance:
 - 1. Adjust, repair, modify, or replace system components failing to perform as specified and rerun tests.
 - 2. Make final adjustments to equipment under direction of manufacturer's representative.
 - 3. Document adjustments, repairs, and replacements in manufacturer's field services certification.
- I. Furnish installation certificate from equipment manufacturer's representative attesting that equipment has been properly installed and is ready for startup and testing.
- J. Document and certify startup and testing results in written report.
- K. Compaction Testing:

- 1. See Section 31 23 23.00 Fill for compaction testing requirements.
- 2. At least one compaction density test shall be performed on the prepared base. It is expressly agreed and understood that the Owner reserves the right to perform additional compaction tests on its own or to increase or decrease the frequency of compaction testing.
- 3. Compaction tests shall be in accordance with the specifications. Should the test fail, the Contractor shall be required to take the appropriate action to satisfy the compaction requirement and at no time shall the manhole base be set in place without an approved compaction test or until satisfactory test is acquired.
- 3.6 ADJUSTING
 - A. Section 01 70 00 Execution and Closeout Requirements: Requirements for starting and adjusting.
 - B. Adjust wet well, pump, and control panel systems such that station operates to performance requirements and according to Specifications.
- 3.7 DEMONSTRATION
 - A. Section 01 70 00 Execution and Closeout Requirements: Requirements for demonstration and training.
 - B. Demonstrate equipment startup, shutdown, routine maintenance, and emergency repair procedures to Owner's personnel.

END OF SECTION 33 32 11