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**IFB NO. Y18-723-TA**

**ISSUED: December 7, 2017**

**INVITATION FOR BIDS**

**FOR**

**PRESIDENTS DRIVE (PS 3177 TO SAND LAKE ROAD) WASTEWATER SYSTEM  
IMPROVEMENTS**

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**PART H  
TECHNICAL SPECIFICATIONS**

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**PART H  
VOLUME II**



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TECHNICAL SPECIFICATIONS**

**ORANGE COUNTY**

**PRESIDENTS DRIVE (PS 3177 TO SAND LAKE ROAD)  
WASTEWATER SYSTEM IMPROVEMENTS PROJECT**

**CPH Project No. O28519  
OCU Project No. 65786**

**November 2017**

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**SECTION 01001**  
**GENERAL WORK REQUIREMENTS**

**PART 1 - GENERAL**

1.01 NOTICES

- A. All notices or other papers required to be delivered by the Contractor to the County shall be delivered to the office of the Engineering Division, Orange County Utilities Department, 9150 Curry Ford Road, Orlando, FL 32825.

1.02 WORK TO BE DONE

- A. The Contractor shall furnish all labor, materials, equipment, tools, services, and incidentals to complete all work required by these specifications and as shown on the Drawings, at a rate of progress which will ensure completion of the Work within the Contract Time stipulated.
- B. The Contractor shall perform the Work complete, in place, and ready for continuous service, and shall include repairs, testing, permits, clean up, replacements, and restoration required as a result of damages caused during this construction.
- C. The Contractor shall comply with all City, County, State, Federal, and other codes, which are applicable to the proposed Work.
- D. All newly constructed Work shall be carefully protected from injury in any way. No wheeling, walking, or placing of heavy loads on it shall be allowed and all portions damaged shall be reconstructed by the Contractor at his own expense.
- E. Scope of Work: See Section 01010 "Summary of Work" and the Bid Schedule for details.

1.03 DRAWINGS AND PROJECT MANUAL

- A. The Work shall be performed in accordance with the Drawings and Specifications prepared by the County/Professional. All work and materials shall conform to the Orange County Utilities Standards and Construction Specifications Manual, latest edition or as indicated in these Specifications or Drawings.
- B. The Contractor shall verify all dimensions, quantities and details shown on the Drawings, Supplementary Drawings, Schedules, Specifications or other data received from the County/Professional, and shall notify same, in writing, of all errors, omissions, conflicts and discrepancies found therein. Failure to discover or correct errors, conflicts or discrepancies shall not relieve the Contractor of full responsibility for unsatisfactory Work, faulty construction or improper operation resulting there from, nor from rectifying such conditions at his own expense.



- C. All schedules are given for the convenience of the County and the Contractor and are not guaranteed to be complete. The Contractor shall assume all responsibility for the making of estimates of the size, kind, and quantity of materials and equipment included in the Work to be done under this Contract.
- D. Intent:
  - 1. All Work called for in the Specifications applicable to this Contract, but not shown on the Drawings in their present form, or vice versa, shall be of like effect as if shown or mentioned in both. Work not specified either in the Drawings or in the Specifications, but involved in carrying out their intent or in the complete and proper execution of the Work, is required and shall be performed by the Contractor as though it were specifically delineated or described.
  - 2. Items of material, equipment, machinery, and the like may be specified on the Drawings and not in the Specifications. Such items shall be provided by the Contractor in accordance with the specification on the Drawings.
  - 3. The apparent silence of the Specifications as to any detail, or the apparent omission from them of a detailed description concerning any Work to be done and materials to be furnished, shall be regarded as meaning that only the best general practice is to prevail and that only material and workmanship of the best quality is to be used, and interpretation of these Specifications shall be made upon that basis.
- E. Refer to the Contract for the order of precedence of items and documents.

#### 1.04 PROTECTION AND RESTORATION

- A. The Contractor shall be responsible for the preservation of all public and private property, and shall use every means of protection necessary to prevent damage thereto. If any direct or indirect damage is done to public or private property by or on account of any act, omission, neglect, or misconduct in the execution of the Work on the part of the Contractor, such property shall be restored by the Contractor, at his expense, to a condition similar or equal to that existing before the damage was done, or the Contractor shall make good the damage in other manner acceptable to the County/Professional.
- B. Protection of Trees and Shrubs
  - 1. Protect with boxes or other barricades.
  - 2. Do not place excavated material so as to injure trees or shrubs.
  - 3. Install pipelines in short tunnels between and under root systems.
  - 4. Support trees to prevent root disturbance during nearby excavation.
- C. Tree and Limb Removal
  - 1. Tree limbs, which interfere with equipment operation and are approved for pruning, shall be neatly trimmed and the tree cut coated with tree paint.
  - 2. The County may order the Contractor, for the convenience of the County, to remove trees along the line or trench excavation. The Contractor shall obtain any permits required for removal of trees. Ordered tree removal shall be paid for under the appropriate Contract Items.

- D. Trees or shrubs destroyed by negligence of the Contractor or his employees shall be replaced by the Contractor with new stock of similar size and age, at the proper season and at the sole expense of the Contractor.
- E. Lawn Areas: All lawn areas disturbed by construction shall be replaced with like kind to a condition similar or equal to that existing before construction. Where sod is to be removed, it shall be carefully removed, and the same re-sodded, or the area where sod has been removed shall be restored with new sod in the manner described in the applicable section.
- F. Where fencing, walls, shrubbery, grass strips or area must be removed or damaged incident to the construction operation, the Contractor shall, after completion of the work, replace or restore to the original condition.
- G. The cost of all labor, materials, equipment, and work for restoration shall be deemed included in the appropriate Contract Item or items, or if no specific item is provided therefore, as part of the overhead cost of the Work, and no additional payment will be made therefore.

#### 1.05 PUBLIC NUISANCE

- A. The Contractor shall not create a public nuisance including, but not limited to, encroachment on adjacent lands, flooding of adjacent lands, or excessive noise.
- B. Sound levels measured by the County/Professional shall not exceed 45 dBA from 8 p.m. to 8 a.m. or 55 dBA 8 a.m. to 8 p.m. This sound level shall be measured at the exterior of the nearest exterior wall of the nearest residence. Levels at the equipment shall not exceed 85 dBA at any time. Sound levels in excess of these values are sufficient cause to have the Work halted until equipment can be quieted to these levels. Work stoppage by the County/Professional for excessive noise shall not relieve the Contractor of the other portions of this specification including, but not limited to, completion dates and bid amounts.
- C. No extra charge may be made for time lost due to work stoppage resulting from the creation of a public nuisance.

#### 1.06 CONTRACTOR'S PAYMENTS TO COUNTY FOR OVERTIME WORK

- A. **County Inspector Work Hours: Normal work hours for the County's inspector(s) are defined as any 8-hour period between the hours of 7:00 a.m. and 7:00 p.m. on the weekdays of Monday through Friday. Any County Inspector(s) work beyond the aforementioned normal work hours shall be requested in writing 48-hours in advance. All overtime, any County holidays or weekend work compensation for the County's Inspector(s) to work beyond the normal working hours are considered overtime compensation and shall be paid for by the Contractor. The overtime pay rate will be \$51.00 per hour or the most current rate as listed in the County Fee Directory prepared by the Office of Management and Budget, in section "Orange County Utilities Engineering & Construction", under the heading of "Inspection Fee**

**other than Normal Working Hours". The Contractor agrees that the County shall deduct charges for work outside normal work hours and for overtime pay from payments due the Contractor.**

#### 1.07 MAINTENANCE OF SERVICE

- A. Unless noted otherwise on the plans, the operation of the existing water, reclaimed water or wastewater facility on each of the respective locations shall remain in service until the transfer of service has been completed. The Contractor shall, prior to interrupting any utility service (water, sewer, etc.) for the purpose of making cut-ins to the existing lines or for any other purposes, contact the County and make arrangements for the interruption which will be satisfactory to the County.
- B. Utility lines that are damaged during construction shall be repaired by the Contractor and service restored within 4-hours of the breakage. The County retains the option of repairing any damage to utility pipes in order to expedite service to the customers. The Contractor will remain responsible for all costs associated with the repair.

#### 1.08 TRANSFER OF SERVICE

- A. When the County has accepted a proposed facility and placed it into operation, the transfer of service is complete. The Contractor may begin the work of removing the existing or temporary facilities.

#### 1.09 LABOR

- A. Supervision: The Contractor shall supervise and direct the Work efficiently and with his best skills and attention. The Contractor shall have a competent, English speaking superintendent or representative, who shall be on the site of the Project at all working hours, and who shall have full authority by the Contractor to direct the performance of the Work and make arrangements for all necessary materials, equipment, and labor without delay.
- B. Jurisdictional Disputes: It shall be the responsibility of the Contractor to pay all costs that may be required to perform any of the Work shown on the Drawings or specified herein to avoid any work stoppages due to jurisdictional disputes. The basis for subletting work in question, if any, shall conform to precedent agreements and decisions on record with the Building and Construction Trades Department, AFL-CIO, dated June, 1973, including any amendments thereto.
- C. Apprenticeship: The Contractor shall comply with all of the requirements of Section 446, Florida Statutes, for all contracts in excess of \$25,000 excluding roadway, highway or bridge contracts and the Contractor agrees to insert in any subcontract under this Contract the requirements of this Article.

## 1.10 MATERIALS AND EQUIPMENT

### A. MANUFACTURER

1. All transactions with the manufacturers or Subcontractors shall be through the Contractor, unless the Contractor and the County/Professional request that the manufacturer or Subcontractor communicate directly with the County/Professional. Any such transactions shall not in any way release the Contractor from his full responsibility under this Contract.
2. All workmanship and materials shall be of the highest quality. The equipment shall be the product of manufacturers who are experienced and skilled in the field with an established record of research and development. No equipment will be considered unless the manufacturer has designed and manufactured equipment of comparable type and size and have demonstrated sufficient experience in such design and manufacture.
3. No material shall be delivered to the Site without prior approval of the County/Professional.
4. All apparatus, mechanisms, equipment, machinery, and manufactured articles for incorporation into the Project shall be the new (most current production at time of bid) and unused standard products of recognized reputable manufacturers.
5. Manufactured and fabricated products:
  - a. Design, fabricate and assemble in accord with the best engineering and shop practices.
  - b. Manufacture like parts of duplicate units to standard sizes and gauges, to be interchangeable.
  - c. Any two or more pieces of material or equipment of the same kind, type or classification, and being used for identical types of service, shall be made by the same manufacturer.
  - d. Products shall be suitable for service conditions as specified and as stated by manufacturer.
  - e. Equipment capacities, sizes and dimensions shown or specified shall be adhered to unless variations are specifically approved in writing.
  - f. Do not use material or equipment for any purpose other than that for which it is designed or is specified.

## 1.11 MANUFACTURER'S SERVICE

- A. Where service by the manufacturer is specified to be furnished as part of the cost of the item of equipment, the Work shall be at the Contractor's expense.
- B. The services provided shall be by a qualified manufacturer's service representative to check and verify the completed installation, place the equipment in operation, and instruct the County's operators in the operation and maintenance procedures. Such services are to be for period of time and for the number of trips specified. A working day is defined as a normal 8-hour working day on the job and does not include travel time.
- C. The services shall further demonstrate to the County/Professional's complete satisfaction that the equipment will satisfactorily perform the functions for which it has been installed.

## 1.12 INSPECTION AND TESTING

### A. General

1. All materials and equipment furnished by the Contractor shall be subject to the inspection, review and acceptance of the County and meet the requirements as outlined in the Orange County Utilities Standards and Construction Specifications Manual. If in the testing of any material or equipment it is ascertained by the County/Professional that the material or equipment does not comply with the Contract, the Contractor shall be notified thereof, and the Contractor will be directed to refrain from delivering said material or equipment, or to remove it promptly from the Site or from the Work and not accepted by the County shall be replaced with acceptable material, without cost to the County.
2. Tests of electrical and mechanical equipment and appliances shall be conducted in accordance with recognized test codes of the ANSI, ASME, or the IEE, except as may otherwise be stated herein.
3. The Contractor shall give notice in writing to the County sufficiently in advance of his intention to commence the manufacture or preparation of materials especially manufactured or prepared for use in or as part of the permanent construction. Such notice shall contain a request for inspection, the date of commencement and the expected date of completion of the manufacture or preparation of materials. Upon receipt of such notice, the County shall arrange to have a representative present at such times during the manufacture as may be necessary to inspect the materials; or the County will notify the Contractor that the inspection will be made at a point other than the point of manufacture; or the County will notify the Contractor that inspection will be waived.
4. When inspection is waived or when the County/Professional so requires, the Contractor shall furnish to the County authoritative evidence in the form of Certificates of Manufacture that the materials to be used in the Work have been manufactured and tested in conformity with the Contract Documents. These certificates shall be notarized and shall include five (5) copies of the results of physical tests and chemical analysis, where necessary, that have been made directly on the product or on similar products of the manufacturer.
5. The Contractor must comply with these provisions before shipping any material. Such inspections by the County shall not release the Contractor from the responsibility for furnishing materials meeting the requirements of the Contract Documents.

### B. Cost

1. County shall employ and pay for the services of an independent testing laboratory to perform testing indicated on the Contract Documents, or at the County's discretion to ensure conformity with the Contract Documents.
2. The cost of field leakage and pressure tests and shop tests of materials and equipment specifically called for in the Contract Documents shall be borne by the Contractor. Such costs shall be deemed to be included in the Contract price.
3. The Contractor shall notify the County laboratory a minimum of 48-hours in advance of operations for scheduling of tests. When tests or inspections cannot be performed after such notice, the Contractor shall reimburse County for expenses incurred.

4. The Contractor shall pay for all work required to uncover, remove, replace, retest, etc., any work not tested due to the Contractor's failure to provide the 48-hours advance notice or due to failed tests. The Contractor shall also provide compensation for the County/Professional's personnel for required re-testing due to failed or rescheduled testing.

C. Shop Testing

1. Each piece of equipment for which pressure, duty, capacity, rating, efficiency, performance, function or special requirements are specified shall be tested in the shop of the manufacturer in a manner which shall conclusively prove that its characteristics comply fully with the requirements of the Contract Documents. No such equipment shall be shipped to the worksite until the County/Professional notifies the Contractor, in writing, that the results of such tests are acceptable.
2. The manufacturing company shall provide five (5) copies of the manufacturer's actual shop test data and interpreted results signed by a responsible official of the manufacturing company and notarized, showing conformity with the Contract Documents as a prerequisite for the acceptance of any equipment. The cost of shop tests (excluding cost of County's representative) and of furnishing manufacturer's preliminary and shop test data of operating equipment shall be borne by the Contractor and shall be included in the Contract price.

D. Field Testing:

1. The County shall employ and pay for services of an independent testing laboratory to perform testing specifically indicated in the Contract Documents. Employment of the laboratory shall in no way relieve Contractor's obligations to perform the Work of the Contract. The Contractor shall provide compensation for retesting of all failed tests.
2. The County may at any time during the progress of the Work, request additional testing beyond that which is specified in the Contract. This testing will be at the County's expense. Contractor shall:
  - a. Cooperate with laboratory personnel, provide access to the Project.
  - b. Secure and deliver to the laboratory adequate quantities of representative samples of materials proposed to be used and which require testing.
  - c. Provide to the laboratory the preliminary design mix proposed to be used for concrete, and other material mixes, which require control by the testing laboratory.

E. Demonstration Tests: Upon completion of the Work and prior to final payment, all equipment and piping installed under this Contract shall be subjected to acceptance or demonstration tests as specified or required to provide compliance with the Contract Documents. The Contractor shall furnish all labor, fuel, energy, water and all other equipment necessary for the demonstration tests at no additional cost to the County.

F. Final Inspection: Prior to preparation of the final payment application, a final inspection will be performed by the County to determine if the Work is properly and satisfactorily constructed in accordance with the requirements of the Contract Documents. See also Section 01700 "Project Closeout."

- G. Inspection by existing utility owners: The Contractor shall pay for all inspections during the progress of the work required and provided by the owner of all existing public utilities paralleling or crossing the Work, as shown on the Drawings. All such inspection fees shall be deemed included in the appropriate Contract Item or items, or if no specific item is provided therefore, as part of the overhead cost of the Work, and no additional payment will be made therefore.
- H. Inspection by Other Agencies: The Florida Department of Transportation, the Florida Department of Environmental Protection, and other authorized governmental agencies shall have free access to the site for inspecting materials and work, and the Contractor shall afford them all necessary facilities and assistance for doing so. Any instructions to the Contractor resulting from these inspections shall be given through the County. These rights of inspections shall not be construed to create any contractual relationship between the Contractor and these agencies.

### 1.13 PROJECT SITE AND ACCESS

#### A. RIGHT-OF-WAY AND EASEMENTS

1. The use of public streets and alleys shall be such as to provide a minimum of inconvenience to the public and to other traffic. Any earth or other excavated material shall be removed by the Contractor and the streets cleaned to the satisfaction of the County.
2. The Contractor shall not enter or occupy private land outside of easements, except by written permission of the property owner.
3. At the time of the Pre-Construction meetings, the Contractor shall become fully acquainted with the status of all easements. Should easements not be acquired by the County in specific areas of the Work, the Contractor shall sequence and schedule his work therein so as not to interfere with the progress of work in other areas of the Project. Any rescheduling of work due to easement acquisitions shall be performed by the Contractor at no additional cost to the County. The County agrees that it will make every effort to acquire all remaining easements with all speed and diligence possible so as to allow the completion of the Work within the Contract time.

#### B. ACCESS

1. Neither the material excavated nor the materials or equipment used in the construction of the Work shall be so placed as to prevent free access to all fire hydrants, valves or manholes.
2. Access to businesses located adjacent to the project site must be maintained at all times. Contractor may prearrange the closing of business access with the business Owner. Such prearranged access closing shall not exceed two (2) hours. Property drainage and grading shall be restored and all construction debris removed within 48-hours of backfilling trench.
3. Contractor agrees that representatives of the County and any governmental agents will have access to the Work wherever it is in preparation or progress and that the Contractor shall provide facilities for such access and inspection.

## 1.14 UTILITIES

### A. UTILITY CONSTRUCTION

1. Public utility installations and structures shall be understood to include all poles, tracks, pipes, wires, conduits, house service connections, vaults, manholes and all other appurtenances and facilities pertaining thereto, whether owned or controlled by governmental bodies or privately owned by individuals, firms or corporations, used to serve the public with transportation, traffic control, gas, electricity, telephone, sewerage, drainage or water. Other public or private property, which may be affected by the Work, shall be deemed included hereunder.
2. All open excavations shall be adequately safeguarded by providing temporary barricades, caution signs, lights and other means. The Contractor shall, at his own expense, provide suitable and safe bridges and other crossings for accommodating travel by pedestrians and workmen. Bridges provided for access to private property during construction shall be removed when no longer required.
3. The length of open trench will be controlled by the particular surrounding conditions, but shall always be confined to the limits described by the County. If any excavation becomes a hazard, or if it excessively restricts traffic at any point, the County may require special construction procedures. As a minimum, the Contractor shall conform to the following restoration procedures:
  - a. Interim Restoration: All excavations shall be backfilled and compacted as specified by the end of each working day. For excavations within existing paved areas; limerock base or soil cement base (match existing) shall be spread and compacted to provide a relatively smooth surface free of loose aggregate material. At the end of each workweek, the S-I asphaltic surface course shall be completed and opened to traffic. Contractor shall coordinate his construction activity including density tests and inspections to allow sufficient time to achieve this requirement. All driveway cuts shall be backfilled, compacted, and limerock base spread and compacted immediately after installation. Contractor shall coordinate with the individual property owners prior to removing the driveway section. Any utility crossing an existing roadway, parking lot or other paved area shall be patched by the end of the working day.
  - b. All pipe and fittings shall be neatly stored in a location, which will cause the least disturbance to the public. All debris shall be removed and properly disposed of by the end of each working day.
  - c. Final Restoration Overlay: After completing all installations, and after testing of the pipe (but no sooner than 30-days after applying the S-I asphaltic surface), final restoration shall be performed. In no event shall final restoration begin after substantial completion. Final restoration shall provide an S-III asphaltic overlay as specified in an uninterrupted continuous operation until completion. Any additional restoration required after testing shall be repaired in a timely manner at no additional cost to the County.
  - d. Maintenance of all restored facilities shall be the Contractor's responsibility. This maintenance shall be performed on an on-going basis during the course of construction. The Contractor's Progress Schedule shall reflect the above restoration requirements.



- e. Additional Restoration for Work in Business or Commercial Districts: The Contractor shall restore all private property, damaged by construction, to its original condition. Access to businesses located adjacent to the project site must be maintained at all times. Contractor may prearrange the closing of business accesses with the business owner. Such prearranged access closing shall not exceed two (2) hours. Property drainage and grading shall be restored within 24-hours of backfilling trench.

#### B. EXISTING UTILITIES

1. The locations of all existing underground piping, structures and other facilities are shown based on information received from the respective owner. The locations are shown without express or implied representation, assurance, or guarantee that they are complete or correct or that they represent a true picture of underground piping, conduit and cables to be encountered. It is the Contractor's responsibility to verify all existing underground piping, structures and other facilities.
2. The Contractor shall, at all times, employ acceptable methods and exercise reasonable care and skill so as to avoid unnecessary delay, injury, damage or destruction of existing utility installations and structures; and shall, at all times in the performance of the Work, avoid unnecessary interference with, or interruption of, utility services; and shall cooperate fully with the owners thereof to that end.
3. When existing facilities are found to be in conflict with the Work, the County reserves the right to modify alignments to avoid interference with existing facilities.
4. All utilities, which do not interfere with the work, shall be carefully protected against damage. Any existing utilities damaged in any way by the Contractor shall be restored or replaced by the Contractor at his expense as directed by the County. Any existing facilities, which require operation to facilitate repairs, shall be operated only by the owner of the respective utility.
5. It is the responsibility of the Contractor to ensure that all utility and/or poles, the stability of which may be endangered by the proximity of excavation, be temporarily stayed and/or shored in position while work proceeds in the vicinity of the pole and that the utility or other companies concerned be given reasonable advance notice of any such excavation.

#### C. NOTICES

1. All governmental utility departments and other owners of public utilities, which may be affected by the Work, will be informed in writing by the Contractor two (2) weeks after the execution of the Contract or Contracts covering the Work. Such notice will be sent out in general, and directed to the attention of the governmental utility departments and other owners of public utilities for such installations and structures as may be affected by the Work.
2. The Contractor shall comply with Florida Statute 553.851 regarding protection of underground gas pipelines. Evidence of notification to the gas pipeline owner shall be furnished to the County within two (2) weeks after the execution of the Contract.
3. It shall be the Contractor's responsibility to contact utility companies at least 72-hours in advance of breaking ground in any area or on any unit of the work so maintenance personnel can locate and protect facilities, if required by the utility company.

4. The Contractor shall give a minimum five (5) working day notice to utility personnel prior to interrupting a utility service (water, sewer, etc.).

#### D. EXPLORATORY EXCAVATIONS

1. Exploratory excavations shall be conducted by the Contractor for the purpose of locating underground pipelines or structures in advance of the construction. Test pits shall be excavated in areas of potential conflicts between existing and proposed facilities and at piping connections to existing facilities a minimum of 48-hours or 1,000-feet in advance of work. If there is a potential conflict, the Contractor shall notify the County/Professional immediately. Information on the obstruction to be furnished by the Contractor shall include: Location, Elevation, Utility Type, Material and Size. Test pits shall be backfilled immediately after their purpose has been satisfied and the surface restored and maintained in a manner satisfactory to the County.

#### E. UTILITY CROSSINGS

1. It is intended that wherever existing utilities must be crossed, deflection of the pipe within specified limits and cover shall be used to satisfactorily clear the obstruction unless otherwise indicated on the Drawings. However, when in the opinion of the County this procedure is not feasible, the County may direct the use of fittings for a utility crossing or conflict transition as detailed on the Drawings.

#### F. RELOCATIONS

1. Relocations shown on the Drawings: Public utility installations or structures, including but not limited to poles, signs, fences, piping, conduits and drains that interfere with the positioning of the work which are shown on the Drawings to be removed, relocated, replaced or rebuilt by the Contractor shall be considered as part of the general cost of doing the Work and shall be included in the prices bid for the various contract items. No separate payment shall be made therefore.
2. Relocations not shown on the Drawings
  - a. Where public utility installations or structures are encountered during the course of the work, and are not indicated on the Drawings or in the Specifications, and when, in the opinion of the County, removal, relocation, replacement or rebuilding is necessary to complete the Work, such work shall be accomplished by the utility having jurisdiction, or such work may be ordered, in writing by the County, for the Contractor to accomplish.
  - b. If such work is accomplished by the utility having jurisdiction, it will be carried out expeditiously and the Contractor shall give full cooperation to permit the utility to complete the removal, relocation, replacement or rebuilding as required.
  - c. If such work is accomplished by the Contractor, it will be paid for as a Change Order.
3. All existing castings, including valve boxes, junction boxes, manholes, hand holes, pull boxes, inlets and similar structures in the areas of construction that are to remain in service and in areas of trench restoration and pavement replacement, shall be adjusted by the Contractor to bring them flush with the surface of the finished work.

4. All existing utility systems which conflict with the construction of the work herein, which can be temporarily removed and replaced, shall be accomplished at the expense of the Contractor. Work shall be done by the utility unless the utility approves in writing that the Work may be done by the Contractor.

## 1.15 RELATED CONSTRUCTION REQUIREMENTS

### A. PUBLIC INFORMATION OFFICER

1. The Contractor shall provide community interaction and coordination through a designated Public Information Officer (PIO). The PIO will provide resolution to complaints and problems from community members affected by the construction for the entire project duration. The PIO will manage a 24-hour hotline phone number for citizens to call. The PIO will field these calls, provide answers to questions, research issues with the project team or appropriate agencies and follow up each complaint in a timely manner. The PIO will maintain a daily diary of call and/or interactions with the community, as well as a complaint log chronicling all issues and proposed resolutions.
2. The PIO shall attend the project progress meetings and provide the project team with a report of public issues since the last progress meeting. The PIO will also disseminate roadway closures, sewer hookups, temporary and permanent restoration and other relevant construction information to the community, as well as, when appropriate, to the media, emergency services personnel and other interested agencies.
3. The designated PIO shall have previous experience in providing similar services on Orange County Utilities, Orange County Public Works or FDOT construction projects. The PIO shall be fluent in English and Spanish and shall visit the construction site, meeting locations and affected resident's homes as required.

### B. TRAFFIC MAINTENANCE

1. Refer to Section 01570 – Maintenance of Traffic

### C. BARRIER AND LIGHTS

1. The Contractor shall exercise extreme care in the conduct of the Work to protect health and safety of the workmen and the public. The Contractor shall provide all protective measures and devices necessary, in conformance with applicable local, state and federal regulations. Protective measures shall include but are not limited to barricades, warning lights/flashers and safety ropes.
2. All equipment and vehicles operating within 10-feet of the roadway shall have flashing strobe lights attached.

### D. DEWATERING AND FLOTATION

1. The Contractor, with his own equipment, shall do all pumping necessary to dewater any part of the work area during construction operations to insure dry working conditions. The Contractor shall take the necessary steps to protect on-site and off-site structures. Damage to any structures due to dewatering shall be repaired or the structures replaced at the Contractor's expense.
2. The Contractor shall be completely responsible for any tanks, wetwells or similar

structures that may become buoyant during the construction and modification operations due to the ground water or floods and before the structure is put into operation. The proposed final structures have been designed to account for buoyancy; however the Contractor may employ methods, means and techniques during construction which may affect the buoyancy of structures. The Contractor shall take the necessary steps to protect structures. Damage to any structures due to floating or flooding shall be repaired or the structures replaced at the Contractor's expense.

3. Contractor shall be responsible for any required permits for the discharge of ground water.

#### E. DUST AND EROSION CONTROL

1. The Contractor shall prevent dust nuisance from his operations or from traffic.
2. Contractor is responsible for providing effective temporary erosion and sediment control measures during construction or until final controls become effective.
3. Temporary erosion controls include, but are not limited to, grassing, mulching, netting, watering and reseeding on-site surfaces and soil and borrow area surfaces and providing interceptor ditches at ends of berms and at those locations which will ensure that erosion during construction will be either eliminated or maintained within acceptable limits as established by the County, FDEP and any other agency having jurisdiction.
4. Temporary sedimentation controls include, but are not limited to; silt dams, traps, barriers, and appurtenances at the foot of sloped surfaces which will ensure that sedimentation pollution will be either eliminated or maintained within acceptable limits as established by the County, FDEP and any other agency having jurisdiction.
5. The construction of temporary erosion and sedimentation control facilities shall be in accordance with the technical provision of section 104 "Prevention, Control, and Abatement of Erosion and Water Pollution" of the FDOT Standard Specifications for Road and Bridge Construction, latest edition.

#### F. LINES AND GRADES

1. All Work under this Contract shall be constructed in accordance with the lines and grades shown on the Drawings, or as given by the County/Professional.
2. When the location of the Work is dimensioned on the Drawings, it shall be installed in that location; when the location of the Work is shown on a scaled drawing, without dimensions, the Work shall be installed in the scaled location unless the County approves an alternate location for the piping. Where fittings are noted on the Drawings, such notation is for the Contractor's convenience and does not relieve the Contractor from laying and jointing different or additional items where required. The County/Professional may require detailed pipe laying drawings and schedules for project control.
3. The Contractor shall, at his own expense, establish all working or construction lines and grades as required from the project control points set by the County, and shall be solely responsible for the accuracy thereof.
4. Water main and forcemain shall be installed to provide long uniform gradient or slope to pipe to minimize air pockets and air release valves. The stationing shown on the Drawings for air and vacuum release valve assemblies are approximate and the Contractor shall field adjust these locations to locate these valves at the highest point

in the pipeline installed. All locations must be accepted by the County.

5. To insure a uniform gradient for gravity pipe and pressure pipe, all lines shall be installed using the following control techniques as a minimum:
  - a. Gravity lines; continuous control, using laser beam technology.
  - b. Pressure lines; control stakes set at 50-foot intervals using surveyors' level instrument.

#### G. TEMPORARY CONSTRUCTION

1. Temporary fences: If, during the course of the Work, it is necessary to remove or disturb any fencing, the Contractor shall at his own expense, provide a suitable temporary fence which shall be maintained until the permanent fence is replaced.
2. Responsibility for Temporary Structures: In accepting the Contract, the Contractor assumes full responsibility for the sufficiency and safety of all temporary structures or work and for any damage which may result from their failure or their improper construction, maintenance or operation.

#### H. DAILY REPORTS

1. The Contractor shall submit to the County's Representative daily reports of construction activities including non-work days. The reports shall be complete in detail and shall include the following information:
  - a. Days from Notice to Proceed; Days remaining to substantial and final completion.
  - b. Weather information
  - c. Work activities with reference to the Critical Path Method (CPM) schedule activity numbers (including manpower, equipment and daily production quantities for each individual activity).
  - d. Major deliveries
  - e. Visitors to site
  - f. Test records
  - g. New problems, and
  - h. Other pertinent information
2. A similar report shall be submitted for/by each Subcontractor.
3. The report(s) shall be submitted to the County Representative within 2 days of the respective report date. Each report shall be signed by the Contractor's Superintendent or Project Manager. Pay request will not be processed unless daily reports are current.
4. If a report is incomplete, in error, or contains misinformation, a copy of the report shall be returned by the County Representative to the Contractor's Superintendent or Project Manager with corrections noted. When chronic errors or omissions occur, the Contractor shall correct the procedures by which the reports are produced.

#### I. CLEANING

1. During Construction
  - a. During construction of the Work, the Contractor shall, at all times, keep the Site free from material, debris and rubbish as practicable and shall remove the same from any portion of the Site if, in the opinion of the County, such material, debris, or rubbish constitutes a nuisance or is objectionable.

- b. Provide on-site containers for the collection of waste materials, debris and rubbish and remove such from the Site periodically by disposal at a legal disposal area away from the Site.
  - c. Clean interior spaces prior to the start of finish painting and continue cleaning on an as-needed basis until painting is finished. Use cleaning materials which will not create hazards to health or property and which will not damage surfaces. Use only those cleaning materials and methods recommended by the manufacturer of the surface material. Schedule operations so that dust and other contaminants resulting from cleaning process will not fall on wet or newly coated surfaces.
  - d. The Contractor shall remove from the site all surplus materials and temporary structures when no longer necessary to the Work at the direction of the County.
2. Final Cleaning
- a. At the conclusion of the Work, all equipment, tools, temporary structures and materials belonging to the Contractor shall be promptly taken away, and the Contractor shall remove and promptly dispose of all water, dirt, rubbish or any other foreign substances. Employ skilled workmen for final cleaning. Thoroughly clean all installed equipment and materials to a bright, clean, polished and new appearing condition. Remove grease, mastic, adhesives, dust, dirt, stains, fingerprints, labels, and other foreign materials from sight-exposed interior and exterior surfaces. Broom clean exterior paved surfaces; rake clean other surfaces of the grounds.
  - b. The Work shall be left in a condition as shown on the Drawings and the remainder of the site shall be restored to a condition equal or better than what existed before the Work.
  - c. Prior to final completion, or County occupancy, Contractor shall conduct an inspection of interior and exterior surfaces, and all work areas to verify that the entire Work is clean. The County will determine if the final cleaning is acceptable.

#### 1.16 CONSTRUCTION NOT PERMITTED

##### A. USE OF EXPLOSIVES

- 1. No blasting shall be done except as approved by the County and the governmental agency or political subdivision having jurisdiction.

#### **PART 2 - PRODUCTS (NOT USED)**

#### **PART 3 - EXECUTION (NOT USED)**

END OF SECTION

**SECTION 01010**  
**SUMMARY OF WORK**

**PART 1 - GENERAL**

**1.01 Section Includes**

Summary of work, other contracts, work sequence, working hours, operation of existing facilities, use of premises, OWNER furnished products, coordination, cutting and patching.

**1.02 Summary of Work**

- A. The Utility work shown on the drawings prepared by CPH, Inc. include the replacement of approximately 700 lineal feet of the County's existing 24-inch ductile iron force main from pump station (PS) 3177 to Sand Lake Road with a 30-inch force main, and approximately 200 lineal feet of the 42-inch ductile iron (DI) force main along Sand Lake Road west of Presidents Drive. This project also includes the replacement of approximately 300 lineal feet of 15-inch gravity sewer main located between the west edge of pavement and the western right-of-way of Presidents Drive from the pump station to just south of the railroad tracks. The 24-inch force main and 15-inch gravity sewer replacements along Presidents Drive will involve the crossing of two sets of railroad spur tracks. The purpose of this project is to replace the existing 24-inch force main with a new 24-inch / 30-inch force main along Presidents Drive from PS 3177 to Sand Lake Road, where it will connect to the existing 30-inch PVC force main coming from the east on Sand Lake Drive, as well as installing a new segment of 42-inch force main along Sand Lake Road west of Presidents Drive to eliminate a leak at the failing connection of the 30-inch force main to the existing 42-inch force main. The leak was discovered at or near the connection of the 30-inch force main to the 42-inch force main in late 2015. The County's Field Services Division has affected a temporary repair but a permanent repair needs to be constructed. The new 15-inch gravity sewer main along Presidents Drive will correct an issue on the existing gravity main. The existing gravity sewer underneath the railroad currently has a negative slope that needs to be corrected.

The work associated with this project involves active water mains, reclaimed water mains and force mains that are within the Rights-Of-Way of Orange County. All work activities shall be required to be in accordance with the permits issued by the respective agencies. All work performed will be required to be done while maintaining the functional operation of the utility lines.

- B. All materials, equipment, skills, tools, and labor which is reasonably and properly inferable and necessary for the proper completion of the Work and in compliance with the requirements stated or implied by these Specifications or Drawings shall

be furnished and installed by the CONTRACTOR without additional compensation, whether specifically indicated in the Contract Documents or not.

- C. The Orange County Utilities Standards and Construction Specifications Manual is incorporated by reference into these specifications. Should any conflicting information exist between these two documents, then the Orange County Utilities Standards and Construction Specifications Manual shall apply and take precedence over this document.
- D. Repair, replace, or otherwise settle with the OWNER or OWNER'S Representative, if damage to property or existing facilities occurs, including damage to pavements, utilities, lawns, structures, etc.
- E. Construct the Project under a Unit Price Contract.
- F. The CONTRACTOR shall perform the work complete, in place, and ready for continuous service, and shall include repairs, testing, permits, clean up, replacements, and restoration required as a result of disruptions caused during this construction.
- G. The materials used to complete the Work shall be listed in the latest edition of "Orange County Utilities Standards and Construction Specifications Manual, Appendix D – List of Approved Products".
- H. Any damage that occurs through the fault of the CONTRACTOR, shall be completely restored at the expense of the CONTRACTOR, based upon current County standards.
- I. Pipe Manufacturer shall provide training for CONTRACTOR's personnel on the proper methods of handling, installing, joining and backfilling of all mains.
- J. Contractor shall verify location and depth of existing utilities there proposed storm will be installed to determine actual need for utility line transitions. If existing mains are not in conflict with proposed storm lines, then the transitions will not be required.

### **1.03 Work Under Other Contracts**

Concurrently, the FDOT Sand Lake Road (SR 482) project is being constructed. Therefore, the CONTRACTOR shall be made aware of the other construction activities and will be required to adjust the work schedule to accommodate for FDOT's roadway project.

### **1.04 Work Sequence**

The CONTRACTOR's sequence of work may be of his choosing in order to complete the work in the allowed time frame and in conjunction with all Roadway Work Activities. The CONTRACTOR shall submit a schedule and work sequence to the OWNER at least five (5) days prior to the Notice to Proceed. Due to the critical nature of the utilities



systems in this area, shut downs of any existing County utility systems will not be allowed. Contractor shall be responsible for keeping all utility services to customers active throughout the duration of the project. See Special Project Procedures in this section for Suggested Sequence of Construction.

### **1.05 Orange County Working Hours**

Normal working hours for the project shall be an eight (8) hour period between the hours of 7:00 a.m. – 7:00 p.m., Monday through Friday. Should the CONTRACTOR request, and the County approve the CONTRACTOR to work periods greater than 8 hours a day, he shall make such requests in writing a minimum of 48 hours prior to such work periods. The CONTRACTOR shall pay the cost of \$50.00 per hour for inspection by the County's inspection representatives for any hours worked in excess of 8 hours per day or 40 hours per week worked outside the normal work hours for the project.

The CONTRACTOR may be required to perform certain work at times of the day or night when system flows, vehicular traffic and pedestrian traffic are at diminished levels and at times appropriate to other activities which are occurring that may affect the project. The CONTRACTOR shall comply with requirements to alter his schedule of work as requested or required by Orange County without change to the contract price or time.

### **1.06 Operation of Existing Facilities**

The proposed work for this project involves the installation of new water mains as well as the removal/abandonment and replacement of operating water mains, force mains and reclaimed water mains in Rights-Of-Way with both vehicular and pedestrian traffic. The CONTRACTOR shall perform their work taking all proper precautions and safety measures to insure a safe work area. The work shall be so conducted to maintain existing utility systems in operation. All utilities that occupy or are adjacent to the subject construction site are to remain in operation. The CONTRACTOR shall coordinate all construction activities with the Orange County Resident Inspectors.

### **1.07 CONTRACTOR Use of Premises**

Confine operations at the site to areas permitted by applicable laws, ordinances, permits, and by the Contract Documents. Do not unreasonably encumber the site with materials or equipment. The CONTRACTOR shall assume full responsibility for protection and safekeeping of products stored on the job site.

### **1.08 Coordination**

- A. The CONTRACTOR shall be fully responsible for the coordination of his work and the work of his employees, subcontractors, and suppliers and to assure compliance with schedules.
- B. The coordination requirements of this Section are in addition to the requirements of this Specification Document.

- C. It is the CONTRACTOR's responsibility to coordinate with all the utilities regarding locates, protection of existing facilities, testing, or relocations.

### **1.09 Cutting and Patching**

- A. Cutting and patching for inspection and testing and the payment therefore shall be as specified in the General Conditions and Supplementary Conditions.
- B. The CONTRACTOR shall, at no additional expense to the OWNER, perform cutting and patching necessary for the completion of the Project. Perform cutting and patching in a manner to prevent damage to the facilities or previously completed work.
- C. Refinish surfaces as necessary to provide an even finish. Refinish continuous surfaces to the nearest intersection.

### **1.10 Drawings and Project Manual**

- A. The Utility Work associated with the new water mains along the Connector Road as well as the relocation of the existing County utility lines on Apopka Vineland Road and Palm Parkway shall be performed in accordance with the Drawings and Specifications prepared by CPH, Inc., 1117 E. Robinson Street, Orlando, Florida 32801.
- B. The CONTRACTOR shall verify all dimensions, quantities and details shown on the Utility Drawings and Roadway Drawings, Supplementary Drawings, Schedules, Specifications or other data received from the ENGINEER, and shall notify the same, in writing, of all errors, omissions, conflicts and discrepancies found therein with adequate notice. Failure to discover or correct errors, conflicts or discrepancies shall not relieve the CONTRACTOR of full responsibility for unsatisfactory Work, faulty construction or improper operation resulting there from, nor from rectifying such conditions at his own expense.
- C. All schedules are given for the convenience of the ENGINEER and the CONTRACTOR and are not guaranteed to be complete. The CONTRACTOR shall assume all responsibility for the making of estimates of the size, kind, and quantity of materials and equipment included in the Work to be done under this Contract.
- D. Intent
  - 1. All work called for in the Specifications applicable to this Contract, but not shown on the Drawings in their present form, or vice versa, shall be of like effect as if shown or mentioned in both. Work not specified in either the Drawings or in the Specifications, but involved in carrying out their implied intent, or in the complete and proper execution of the Work, is required and shall be performed by the CONTRACTOR as though it were specifically delineated or described.

2. Items of material, equipment, machinery, and the like may be specified on the Drawings and not in the Specifications. Such items shall be provided by the CONTRACTOR in accordance with the specification on the Drawings.
3. The apparent silence of the Specifications to any detail, or the apparent omission from them of a detailed description concerning any Work to be done and materials to be furnished, shall be regarded as meaning that only the best general practice is to prevail and that only material and workmanship of the best quality is to be used, and interpretation of these Specifications shall be made upon that basis.

### **1.11 Weather**

During inclement weather, all work which might be damaged or rendered inferior by such weather conditions shall be suspended. The orders and decisions of the ENGINEER as to suspensions shall be final and binding. During suspension of the Work from any cause, the Work shall be suitably covered and protected so as to preserve it from injury by the weather or otherwise; and, if the ENGINEER will so direct, the rubbish and surplus materials shall be removed.

### **1.12 Protection and Restoration**

- A. The CONTRACTOR shall be responsible for the preservation of all public and private property, and shall use every means of protection necessary to prevent damage thereto. If any direct or indirect damage is done to public or private property by or on account of any act, omission, neglect, or misconduct in the execution of the Work on the part of the CONTRACTOR, such property shall be restored by the CONTRACTOR, at his expense, to a condition equal to or better than that existing before the damage was done, or he shall make good the damage in other manner acceptable to the ENGINEER.
- B. Protection of Trees and Shrubs
  1. Protect with boxes or other barricades.
  2. Do not place excavated material so as to injure trees or shrubs.
  3. Support trees to prevent root disturbances during nearby excavation.
- C. Tree and Limb Removal
  1. Tree limbs that interfere with equipment operation and are approved for pruning shall be neatly trimmed and the tree cut coated with tree paint. Trimming and removal of tree limbs shall be incidental.
  2. The OWNER may order the CONTRACTOR, for the convenience of the OWNER, to remove trees along the line or trench excavation. The CONTRACTOR shall obtain any permits required for removal of trees. Ordered tree removal shall be paid for under the appropriate Contract Items.

- D. Trees or shrubs destroyed by negligence of the CONTRACTOR or his employees shall be replaced by him with new stock of similar size and age, at the proper season and at the sole expense of the CONTRACTOR.
- E. Lawn Areas – All lawn areas disturbed by construction shall be replaced with like kind to a condition similar or equal to that existing before construction. Where sod is to be removed, it shall be carefully removed, and the same re-sodded, or the area where sod has been removed shall be restored with new sod in the manner described in the applicable section.
- F. The CONTRACTOR shall be responsible for locating and protecting and/or relocating all utilities lines, including irrigation lines, in the areas of the construction activities. If any existing lines are broken or damaged as a result of construction activities, the CONTRACTOR shall be responsible for repairing the lines at no additional cost to the OWNER.

### **1.13 Delivery and Storage**

#### **A. General**

- 1. The CONTRACTOR shall be responsible for all material, equipment and supplies sold and delivered to the OWNER under this Contract until final inspection of the Work and acceptance thereof by the OWNER.
- 2. All materials and equipment to be incorporated in the Work shall be handled and stored by the CONTRACTOR before, during and after shipment in a manner to prevent warping, twisting, bending, breaking, chipping, rusting, and any injury, theft or damage of any kind whatsoever to the material or equipment.
- 3. Any materials that, in the opinion of the ENGINEER, become damaged to a point where they are unfit for their intended or specified use shall be promptly removed from the site of the Work, and the CONTRACTOR shall receive no compensation for the damaged material or its removal.
- 4. In the event any such material, equipment or supplies are lost, stolen, damaged or destroyed prior to final inspection and acceptance, the CONTRACTOR shall replace the same without additional cost to the OWNER.

#### **B. Delivery – The CONTRACTOR shall**

- 1. Deliver materials in ample quantities to ensure the most speedy and uninterrupted progress of the Work so as to complete the Work within the allotted time.
- 2. Coordinate deliveries in order to avoid delay in or impediment of, the progress of the Work of any related CONTRACTOR.

3. Schedule deliveries to the site not more than one month prior to scheduled installation without written authorization from the ENGINEER.
4. Arrange deliveries of products in accordance with construction schedules coordinated to avoid conflict with work and conditions at the site.
5. Deliver products in undamaged condition, in manufacturer's original containers or packaging, with identifying labels intact and legible.
6. Immediately upon delivery, inspect shipments with the OWNER'S field representative to ensure compliance with requirements of Contract Documents and approved submittals, and that products are properly protected and undamaged.
7. Provide equipment and personnel to handle products by methods recommended by the manufacturer to prevent soiling or damage to products or packaging.
8. Submit operation and maintenance data to the ENGINEER for review prior to shipment of equipment.

C. Storage

1. The CONTRACTOR shall be responsible for securing a location for on-site storage of all material and equipment necessary for completion of this project.
2. All material delivered to the job site shall be protected from dirt, dust, dampness, water and any other condition detrimental to the life of the material from the date of delivery to the time of installation of the material and acceptance by the OWNER.
3. Store products in accord with manufacturer's instructions, with seals and labels intact and legible.
4. When required or recommended by the manufacturer, the CONTRACTOR shall furnish a covered, weather protected storage structure providing a clean, dry, non-corrosive environment for all mechanical equipment, valves, architectural items, electrical and instrumentation equipment, and special equipment to be incorporated into this project.
5. The CONTRACTOR shall arrange the storage area in a manner to provide easy access for inspection. Periodic inspections of stored products shall be done to assure that products are maintained under specified conditions and free from damage or deterioration.
6. The CONTRACTOR shall carefully review and comply with the

manufacturer's storage instructions. These instructions shall be carefully followed and a written record of this kept by the CONTRACTOR.

7. Moving parts shall be rotated a minimum of once weekly to ensure proper lubrication and to avoid metal-to-metal "welding".
8. Mechanical equipment to be used in the Work, if stored for longer than ninety (90) days, shall have the bearings cleaned, flushed and lubricated prior to testing and start-up, at no extra cost to the OWNER.

D. Specific Material Storage Requirements

1. Loose Granular Materials: Store in a well-drained area on solid surfaces to prevent mixing with foreign matter.
2. Cement, Sand and Lime: Stored under a roof and off the ground and kept completely dry at all times.
3. Brick, Block and Similar Masonry Products: Handle and store in a manner to reduce breakage, chipping, cracking and spilling to a minimum.
4. All structural and miscellaneous steel and reinforcing steel: Store off the ground or otherwise to prevent accumulations of dirt or grease, and in a position to prevent accumulations of standing water and to minimize rusting.

Should the CONTRACTOR fail to take proper action on storage and handling of equipment supplied under this Contract, within seven days after written notice to correct the deficiencies, the OWNER retains the right to correct all deficiencies noted in previously transmitted written notice and deduct the cost associated with these corrections from the CONTRACTOR's Contract. These costs may be comprised of expenditures for labor, equipment usage, administrative, clerical, and Engineering and any other costs associated with making the necessary corrections. In any event, equipment and materials not properly stored will not be included in a payment estimate. Any materials not suitable for use will be removed from the site and replaced with new materials.

**1.14 Manufacturer's Instructions for Installation**

- A. Comply with manufacturer's printed instructions, obtain and distribute copies of such instructions to all parties involved in the installation, including two copies for the ENGINEER's use. Maintain one set of complete instructions at the job site during installation and until completion. Copies of all instructions shall also be included in the Operation and Maintenance Manuals, which are provided to the OWNER at the close of the contract.
- B. Contractor shall install all pipes per manufacturer's requirements. The pipe manufacturer will provide at no cost to the Contractor a preconstruction meeting to go over the general assembly requirements and provide certification of training

to Contractors personnel. The Contractor must provide proof of the workers certification to the County that all crews installing pipe have been trained and that all pipe has been installed as instructed by the manufacturer.

- C. Handle, install, connect, clean, condition and adjust products in strict accordance with such instructions and in conformity with specified requirements. Should job conditions or specified requirements conflict with the manufacturer's instructions, consult with the ENGINEER for further instructions. Do not proceed with Work without clear instructions.
- D. Perform Work in strict accordance with manufacturer's instructions. Do not omit any preparatory step or installation procedure unless specifically modified or exempted by Contract Documents.
- E. The CONTRACTOR shall have on hand sufficient proper equipment and machinery of ample capacity to facilitate the installation of the Work and to handle all emergencies normally encountered in Work of this character.
- F. Equipment shall be installed in a neat and workmanlike manner on the foundations at the locations and elevations shown on the Plans, unless directed otherwise in writing by the ENGINEER during installation.
- G. All equipment shall be correctly aligned, leveled and adjusted for satisfactory operation and shall be installed so that proper and necessary connections can be made readily between the various units.
- H. The CONTRACTOR shall furnish, install and protect all necessary anchor and attachment bolts and all other appurtenances needed for the installation of the devices included in the equipment specified. Anchor bolts shall be as approved by the ENGINEER and made of ample size and strength for the purposes intended. The manufacturer shall furnish substantial templates and working drawings for installation.

### **1.15 Construction Field Engineering**

- A. Registered Land Surveyor: The CONTRACTOR shall retain the services of a registered land surveyor licensed in the State of Florida for the following specific services as applicable to the Work:
  - 1. Identify existing rights-of-ways and property lines along or adjacent to the Work;
  - 2. Locate all existing utilities and structures as may be affected by the Work;
  - 3. Locate control points prior to starting the Work;
  - 4. Replace control points or reference points which may be lost or destroyed.

5. CONTRACTOR is to provide a preliminary set of Record Drawings that reflect any changes to the alignment or connections to existing facilities for the purpose of Certification of Construction Completion to FDEP for clearance of the lines. This As-built information is to be provided to the County prior to the pressure testing of the new line.
  6. Prepare a certified survey of the actually constructed facilities based on information concurrent with the construction progress. This site survey shall be in accordance with Section 01720.
- B. CONTRACTOR shall protect control points prior to starting the Work and shall preserve all permanent reference points during construction. Report to the OWNER when any reference point is lost or destroyed, or requires relocation because of necessary changes in grades or locations.

The CONTRACTOR shall bear the cost of re-establishing project control points if disturbed, and bear the entire expense of rectifying Work improperly installed due to not maintaining or protecting and removing without authorization such established points, stakes, and marks.

C. Submittals

1. Certificate signed by a Registered Surveyor certifying that elevations and locations of improvements are in conformance, or non-conformance, with Contract Documents.
2. Certified, signed and sealed drawings, including a PDF file of the signed drawings, showing locations of all structures, piping conduits and other improvements. These drawings are referenced as the Project Record Drawings and shall be included with the Project Record Documents.
3. Completed Record Drawing Tables.
4. Documentation to verify accuracy of field engineering work when requested by the ENGINEER.
5. Electronic version of record drawing survey in the latest version of AutoCAD.

**1.16 Utilities**

A. Utility Construction

1. Public utility installations and structures shall be understood to include all poles, tracks, pipes, wires, conduits, house service connections, vaults, manholes and all other appurtenances and facilities pertaining thereto, whether owned or controlled by governmental bodies or privately owned by individuals, firms or corporations, used to serve the public with transportation, traffic control, gas, electricity, telephone, sewerage,



drainage or water. Other public or private property, which may be affected by the work shall be deemed included hereunder.

2. All open excavations shall be adequately safeguarded by providing temporary barricades, caution signs, lights and other means to prevent accidents to persons, and damage to property. The CONTRACTOR shall, at their own expense, provide suitable and safe bridges and other crossings for accommodating travel by pedestrians and workmen. Bridges provided for access to private property during construction shall be removed when no longer required.
3. The length of open trench will be controlled by the particular surrounding conditions, but shall always be no more than 300 feet. If the excavation becomes a hazard, or if it excessively restricts traffic at any point, the OWNER may require special construction procedures. As a minimum, the CONTRACTOR shall conform to the following restoration procedures:
  - a. Interim Restoration: All excavations shall be backfilled and compacted as specified by the end of each working day. For excavations within existing paved areas, concrete base or soil cement base shall be spread and compacted to provide a relatively smooth surface free of loose aggregate material.

All pipe and fittings shall be stored in a location inside the easement area, which will cause the least disturbance to the public. All debris shall be removed and properly disposed of by the end of each working day.

- b. Maintenance of all restored facilities shall be the CONTRACTOR's responsibility. This maintenance shall be performed on an on-going basis during the course of construction.

The CONTRACTOR's Progress Schedule shall reflect the above restoration requirements.

B. Existing Utilities

1. The locations of all existing underground piping, structures and utilities have been taken from information received from the respective OWNER. The locations are shown without express or implied representation, assurance, or guarantee that they are complete or correct or that they represent a true picture of underground piping to be encountered.
2. The CONTRACTOR shall, at all times in performance of the Work, employ approved methods and exercise reasonable care and skill so as to avoid unnecessary delay, injury, damage or destruction of existing public utility installations and structures; and shall, at all times in the

performance of the Work, avoid unnecessary interference with, or interruption of, public utility services; and shall cooperate fully with the Owners thereof to that end.

3. Pipelines shall be located substantially as indicated on the Drawings, but the OWNER reserves the right to make such modifications in locations as may be found desirable to avoid interference with existing structures or for other reasons. When the location of piping is dimensioned on the Drawings, it shall be installed in that location; when the location of piping is shown on a scaled drawing, without dimensions, the piping shall be installed in the scaled location unless the OWNER approves an alternate location for the piping. Where fittings are noted on the Drawings, such notation is for the CONTRACTOR's convenience and does not relieve him from laying and jointing different or additional items where required. The ENGINEER may require detailed pipe laying drawings and schedules for project control.
4. The CONTRACTOR shall exercise care in any excavation to locate all existing piping and utilities. All utilities, which do not interfere with the completed work shall be carefully protected against damage. Any existing utilities damaged in any way by the CONTRACTOR shall be restored or replaced by the CONTRACTOR at his expense as directed by the OWNER. Any existing facilities that require operation to facilitate repairs shall be performed only by the OWNER of the respective utility.
5. It is the responsibility of the CONTRACTOR to ensure that all utility or other poles, the stability of which may be endangered by the proximity of excavation, be temporarily stayed and/or shored in position while Work proceeds in the vicinity of the pole and that the utility or other companies concerned be given reasonable advance notice of any such excavation by the CONTRACTOR.

#### C. Notices

1. All governmental utility departments and other owners of public utilities which, may be affected by the Work will be informed in writing by the CONTRACTOR within two weeks after the execution of the Contract or Contracts covering the Work. Such notice will be sent out in general, and directed to the attention of the governmental utility departments and other owners of public utilities for such installations and structures as may be affected by the Work.
2. The CONTRACTOR shall also comply with Florida Statute 553.851 regarding notification of existing gas and oil pipeline company owners. Evidence of such notice shall be furnished to the OWNER within two weeks after the execution of the Contract.

3. It shall be the CONTRACTOR's responsibility to contact utility companies at least 48 hours in advance of breaking ground in any area or on any unit of the Work so maintenance personnel can locate and protect facilities, if required by the utility company.
4. The CONTRACTOR shall, not be allowed to interrupt a utility service (water, sewer, etc.) for the purpose of making cut-ins to the existing lines or for any other purposes.

#### D. Exploratory Excavations

Exploratory excavations shall be conducted by the CONTRACTOR for the purpose of locating underground pipelines, other utilities or structures in advance of the construction. Test pits shall be excavated in areas of potential conflicts between existing and proposed facilities and at piping connections to existing facilities a minimum of 48 hours or 1,000 feet in advance of Work. If there is a potential conflict, the CONTRACTOR is to notify the ENGINEER immediately. Information on the obstruction to be furnished by the CONTRACTOR shall include: Location, Elevation, Utility Type, Material and Size. Test pits shall be backfilled immediately after their purpose has been satisfied and the surface restored and maintained in a manner satisfactory to the ENGINEER.

#### E. Utility Crossings

It is intended that whatever existing utilities must be crossed, deflection of the pipe within specified limits and cover shall be used to satisfactorily clear the obstruction unless otherwise indicated on the Drawings. However, when in the opinion of the OWNER this procedure is not feasible, he may direct the use of fittings for a utility crossing or conflict transition as detailed on the Drawings.

#### F. Relocations

1. Relocations shown on the Drawings – Public utility installations or structures, including but not limited to light poles, signs, fences, piping, conduits and drains that interfere with the positioning of the Work which are shown on the Drawings to be removed, relocated, replaced or rebuilt by the CONTRACTOR shall be considered as part of the general cost of doing the Work and shall be included in the prices bid for the various contract items. No separate payment shall be made therefore.
2. Relocation not shown on the Drawings
  - a. Where public utility installations or structures are encountered during the course of the Work, and are not indicated on the Drawings or in the Specifications, and when, in the opinion of the OWNER, removal, relocation, replacement or rebuilding is necessary to complete the Work under this contract, such Work

shall be accomplished by the utility having jurisdiction, or such Work may be ordered, in writing by the OWNER, for the CONTRACTOR to accomplish.

- b. If such Work is accomplished by the utility having jurisdiction, it will be carried out expeditiously and the CONTRACTOR shall give full cooperation to permit the utility to complete the removal, relocation, replacement or rebuilding as required. If such Work is accomplished by the CONTRACTOR, it will be paid for as a Change Order.
3. All existing utility castings, including valve boxes, junction boxes, manholes, hand holes, pull boxes, inlets and similar structures in the areas of construction that are to remain in service and in areas of trench restoration and pavement replacement, shall be adjusted by the CONTRACTOR to bring them flush with the surface of the finished Work.
4. All existing utility systems which conflict with the construction of the Work herein, which can be temporarily removed and replaced, shall be accomplished at the expense of the CONTRACTOR. Work shall be done by the utility unless the utility approves in writing that the Work may be done by the CONTRACTOR.

#### G. Lines and Grades

1. All Work under this Contract shall be constructed in accordance with the line and grades shown on the Drawings, or as given by the ENGINEER. The full responsibility for keeping alignment and grade shall rest upon the CONTRACTOR.
2. The CONTRACTOR shall, at his own expense, establish all working or construction lines and grades as required from the project control points set by the OWNER, and shall be solely responsible for the accuracy thereof.
3. Force mains shall have a minimum of 48-inches of cover over the top of the pipe. Cover shall vary to provide long uniform gradient or slope to pipe to minimize air pockets and air release valves. The stationing shown on the Drawings for air and vacuum release valve assemblies are approximate and the CONTRACTOR shall field adjust these locations to locate these valves at the highest point in the pipeline installed. All locations must be approved by the OWNER.
4. To insure a uniform gradient for gravity pipe and pressure pipe, all lines shall be installed using the following control techniques as a minimum:

- a. Gravity Lines: continuous control, using laser beam technology.
- b. Pressure Lines: control stakes set at 50 ft intervals using surveyors level instrument.

## 1.17 Special Project Procedures

### A. Suggested Sequence of Construction

1. Installation of all proposed force main work.
  - a. Place force main into service after FDEP clearance.
  - b. Removal of all force main per plans.
2. Setup temporary by-pass No. 1 from MH 31770003 to MH 31770001, utilizing the newly abandoned 24" DI force main under the rail road tracks as conduit for by-pass piping.
  - a. Construct proposed gravity sewer from MH #1 to MH #2.
  - b. Installation of CIPP lining
3. Setup temporary by-pass No. 2 from MH 31770088 to wet well. Temporary by-pass No. 1 shall continue to remain in place.
  - a. Install new FRP base liner at MH 31770087.
  - b. Install new manhole No. 3.
  - c. Construct proposed gravity sewer from MH #2 to MH #3.
  - d. Place gravity sewer into service after FDEP clearance, once steps 3a-3c are complete remove temporary by-pass No.1.
4. Setup temporary by-pass No. 3 from MH 31770015 to 31770087, and remove temporary by-pass No. 2.
  - a. Plug existing 18" gravity sewer inside MH 31770088 and line manhole.
5. Remove temporary by-pass No. 3.
6. Remove or abandoned any remaining force main or gravity sewer.

### B. Maintenance of Traffic

1. CONTRACTOR shall provide MOT in accordance with FDOT Standards. CONTRACTOR shall adjust the schedule and/or MOT to provide for utility installations at no additional cost to Orange County.
2. Fourteen (14) days prior to closing a lane, the permittee shall notify Salah Saidallah @ 407-384-4600 of the time, location of the needed lane closure and a description of work being done. The CONTRACTOR shall not close any lanes until receiving approval from FDOT. The CONTRACTOR is not required to report lane closures for emergencies as described in UAM Section 4.1.1

C. Operation of existing Utility Systems

Due to the utility systems providing service to residents and businesses, all Orange County Utility systems shall be required to remain in service and not be shut down to accommodate construction activities. Contractor to sequence all work so that water and sewer service is maintained at all times.

D. Temporary by-pass systems and/or pumping shall be required to accommodate the installation of the proposed force main and gravity sewer in accordance with Section 01516.

E. Any work around the railroad track shall be in accordance with CSX requirements. All work associated with this project shall not impact the railroad spur operation at any time. Any cost associated with CSX related fees, fines, or damages shall be at the cost of the Contractor.

**PART 2 - PRODUCTS (NOT USED)**

**PART 3 - EXECUTION (NOT USED)**

END OF SECTION

**SECTION 01021**  
**SOILS REPORT AND OTHER INFORMATION**

**PART 1 - GENERAL**

1.01 REQUIREMENTS INCLUDED

- A. Identification of reports of existing conditions.

Bidder's/Contractor's responsibilities for investigating and working with existing conditions.

1.02 LAND IN-ADDITION TO THE SITE

- A. Contractor is responsible for obtaining any lands, areas, properties, facilities and easements, in addition to those furnished by the County, that the Contractor considers necessary for temporary facilities, storage, disposal of spoil or waste material or other purposes the Contractor determines necessary to complete the Work. Contractor shall provide written documentation from owner to use such land or facilities. The County/Professional and the Geotech do not assume any responsibility for existing conditions at such lands, areas, properties, facilities and /or easements obtained by the Contractor.

1.03 SUBSURFACE CONDITIONS AND OTHER PHYSICAL CONDITIONS

- A. This Section identifies reports of explorations and tests of subsurface conditions, and drawings of physical conditions of existing surface and subsurface structures that have been used in the preparation of the Contract Documents. Contractor may rely upon any technical information and data in those reports found in Appendix A, "Geotechnical Report (includes geotechnical investigation and dewatering ground water quality values per Chapter 62-621, paragraph 62-621.300(2), F.A.C.)." The Report(s) in Appendix A is designated as Authorized Technical Data, but those reports and drawings are not part of the Contract Documents.
- B. Any conclusions or interpretations made by the Contractor based on any Authorized Technical Data will be at the Contractor's own risk. Contractor's reliance on any non-technical information, data, interpretations or opinions also will also be at Contractor's own risk. The County/Professional assume no responsibility for any understanding reached or representation made about subsurface conditions and physical conditions of existing structures, except as otherwise expressly shown in or represented by the Authorized Technical Data provided.

- C. The only information or data contained in the geotechnical report and used in the preparation of the Contract Documents that may be properly considered authorized technical data concerning subsurface conditions is found in Appendix A "Geotechnical Report". Such technical data are made available to allow the Contractor to have access to the same information available to the County. The County/Professional do not warrant the accuracy or completeness of any such information or that the Contract Documents identify all the existing relevant reports and/or documents.

#### 1.04 UNDERGROUND UTILITIES

- A. Information or data about physical conditions of Underground Utilities, which have been used in the preparation of the Contract Documents, is shown or indicated in the Drawings and technical specifications. Such information and data is based on information and data obtained from record documents or furnished to the County by the owners of those Underground Utilities or by others.

### **PART 2 - PRODUCTS (NOT USED)**

### **PART 3 - EXECUTION**

#### 3.01 EXISTING GROUND SURFACE AND UNDERGROUND CONDITIONS; GENERALLY

- A. Where existing ground conditions are shown on the plans hereto attached, the elevations are believed to be reasonably correct but are not guaranteed to be absolutely so, and, together with any schedule of quantities, are presented only as an approximation. The Contractor shall satisfy itself, however, by actual examination of the site of the Work, as to the existing elevations and the amount of work required under the Contract.
- B. Where test pits and borings have been dug, the results supplied to the County/Professional by the soils Engineer may be given on the plans or are on file in the County/Professional's office and available for review . The County does not guarantee the accuracy or correctness of this information. If the Contractor desires any additional information relating to the soils investigation, contact the County/Professional to obtain such information. County does not guarantee the accuracy or correctness of any such information supplied to the Contractor.



- C. If, upon notice of a differing subsurface or latent physical condition from the Contractor, the County determines there was no unforeseen condition and unnecessary tests and investigations were conducted solely at the Contractor's request, any unnecessary expenses may be deducted from the Final Payment for the Contract. No increase in Contract Amount or Contract Time will be made if the differing site conditions were known or could have been discovered by the types of examinations that the Contractor, as Bidder, was responsible for. Claims based on groundwater table conditions will not be considered unforeseen subsurface conditions and will not be allowed. Any information indicated in the Contract Documents as to the groundwater table conditions has been provided for general information purposes only and is not intended to represent that the same conditions will exist during the execution of the Work. Further, no increase in Contract Amount or Contract Time will be made for costs incurred prior to the Contractor's written notice as required by the Contract Documents. The County will be allowed at least 10-days to investigate any alleged differing site conditions and to take appropriate action, before the Contractor is entitled to any adjustment in Contract Amount or Contract Time for Delay.

### 3.02 UNDERGROUND UTILITIES:

- A. The Contractor will be responsible for the safety and protection of, and providing for the repair of any damage done to the Work and existing surface and subsurface structures. The Contractor will be responsible for any damages and injury resulting from the failure to excavate in a careful and prudent manner.
- B. Contractor shall have full responsibility for locating all underground pipelines, conduits, ducts, cables, wires, manholes, vaults, tanks, tunnels, or other such facilities or attachments, and any encasements containing such facilities, including those that convey electricity, gases, steam, liquid petroleum products, telephone or other communications, cable television, water, wastewater, stormwater, other liquids or chemicals, or traffic or other control systems, shown or indicated in the Contract Documents, in advance of construction, coordinating the Work with the actual locations found and making note of the actual locations on the record Drawings. Contractor shall exercise extreme caution when locating underground facilities to minimize the risk of damage from Contractor's activities. The Contractor will immediately notify the County and the owner of any Underground Utilities that are inaccurately identified or located on the Drawings.
- C. The Contractor will be responsible for any delay and all costs relating to the obligations set forth in this Section, except as provided by allowances specific to Underground Utilities.
- D. The Contractor will promptly notify the County, in writing, whenever the Contractor discovers that actual physical conditions of Underground Utilities differ materially from those indicated by the Contract Documents or Authorized Technical Data provided with the Contract Documents. Further, the Contractor promptly will notify the County, in writing, whenever the Contractor encounters Underground Utilities not shown or indicated in/through the Contract Documents, and which could not reasonably have been foreseen.

- E. The County and Contractor will follow the provisions of the General Conditions with respect to any conclusions reached by the County after the County compares the actual underground utility conditions with those included in the information provided to the Contractor.

### 3.03 ENVIRONMENTAL PROCEDURES FOR HAZARDOUS MATERIALS

- A. The Contractor will not, at any time, cause or permit any Hazardous Materials to be brought upon, stored, manufactured, blended, handled, or used in, on, or about the Project or the Site for any purpose except as lawful and necessary and in accordance with the Contract Documents. The Contractor will not cause or permit Hazardous Materials to be brought on Site unless they have been specifically pre-identified by the Contractor, and approved in writing in advance by the County.
- B. The Contractor will defend, save, indemnify and hold harmless the County, their agents and employees from and against all liabilities, claims, damages, losses and expenses including attorneys' fees, which arise at any time during or after completion of the Work as a result of or in connection with:
  - 1. The Contractor's breach of any prohibition or requirement set forth in this Section or,
  - 2. Any Hazardous Materials discharged, released, deposited or introduced in the soil or surface or groundwater in, on, under, or about the Work, the Site or other properties as a result of the activities of the Contractor, the Subcontractors and their respective agents and employees in connection with the Work.
- C. This Contractor's indemnity obligation includes without limitation, costs incurred in connection with any investigation of site conditions or any cleanup, remediation, removal, or restoration required by the County or any federal, State, or local Public Agency because of:
  - 1. The occurrence of any Hazardous Materials present in the soil or surface or groundwater in, on, under, or about the Work or the Site;
  - 2. The diminution in value of the Work or the Site;
  - 3. Damages for the loss or restriction on use of the Work or of any amenity of the Work or the Property; and/or
  - 4. Amounts paid in settlement of claims, penalties, attorneys' fees, court costs, consultant and laboratory fees and experts' fees.
- D. The Contractor will immediately notify the County in writing of any significant release of Hazardous Materials at the Project or the Site, specifying the nature and quantity of the release, the location of the release, and the measures taken to contain and clean up the release and ensure that future releases do not occur.
- E. The Contractor agrees that insulation and any other construction materials containing asbestos or urea formaldehyde will not be used on the Work, and that all Sub-agreements will prohibit the use of construction materials (including, but not limited to, insulation) containing asbestos or urea formaldehyde.

### 3.04 DIFFERING HAZARDOUS MATERIAL CONDITIONS:

- A. If the Contractor unexpectedly encounters material reasonably believed to be Hazardous Material, the Contractor will immediately stop all affected Work, give written notice to the County and take appropriate health and safety precautions. Unless the Contract Documents require otherwise, the Contractor will conduct an investigation. If upon due investigation, the Contractor determines the material a Hazardous Material that may present a danger to persons or the surroundings, the Contractor will recommend a solution to the County. In any such case, the affected Work will be considered to have been under a suspension of Work.
- B. If the Hazardous Material is not required Work under the Drawings and/or Specifications, the County will proceed to have the Hazardous Material removed or rendered harmless through a Change Order or by means of another contract or as the County otherwise deems expedient. Alternatively, the County will terminate the affected Work or Contract for the County's convenience.
- C. If the County did not elect termination, once the Hazardous Material has been removed or rendered harmless, the affected Work will be resumed as directed in writing by the County. Any determination by the Florida Department of Community Health or the Department of Environmental Quality that the Hazardous Material has been removed or rendered harmless will be binding upon the County and Contractor for the purposes of resuming the affected Work.
- D. If the Contractor is responsible for the Hazardous Material, the Contractor will bear its proportionate share of the delay and costs involved in cleaning up the Site and removing and rendering it harmless to the satisfaction of the County and all Political Subdivisions with jurisdiction. The Contractor will be solely responsible if the Hazardous Material was brought to the Site by the Contractor, or results in whole or in part from any violation by the Contractor of any applicable Laws.
- E. If the Contractor is responsible, but fails to take appropriate action, and the County acts accordingly, the Contractor will defend, save, indemnify and hold harmless the County from and against all claims arising from the County's exercise of appropriate action.
- F. If the Contractor is not responsible, the County will issue a Change Order with the necessary changes. The Change Order will adjust Contract Amount and/or Contract Time as made necessary by the changes and resulting unreasonable delay under the circumstances attributable to the County /Professional.

### 3.05 INCIDENTS WITH ARCHAEOLOGICAL FEATURES:

- A. The Contractor will immediately notify in writing, the County and all Federal, State and local agencies with jurisdiction of any Archaeological Feature deposits encountered or unearthed. The Contractor will protect such Archaeological Features in a proper and satisfactory manner. No further disturbance of the Archaeological Features will take place until work is allowed to resume in the affected areas.

- B. If the County concludes that the Contract Documents require changes because of Archaeological Feature deposits encountered, the County will issue a Change Order with the necessary changes in the Work. The Change Order also will adjust Contract Amount and/or Contract Time as made necessary by those changes and by any resulting unreasonable delay under the circumstances attributable to the County/Professional.

END OF SECTION

## SECTION 01025

### MEASUREMENT AND PAYMENT

#### PART 1 GENERAL

##### 1.01 DESCRIPTION

- A. Payment for all Work done in compliance with the Contract Documents, inclusive of furnishing all manpower, equipment, materials, and performance of all operations relative to construction of this project, will be made under Pay Items listed herein. Work for which there is not a Pay Item will be considered incidental to the Contract and no additional compensation will be allowed.
- B. The OWNER reserves the right to alter the Drawings, modify incidental work as may be necessary, and increase or decrease quantities of work to be performed to accord with such changes, including deduction or cancellation of any one or more of the Pay Items. Changes in the work shall not be considered as a waiver of any conditions of the Contract nor invalidate any provisions thereof. When changes result in changes in quantities of Work to be performed, the Contractor will accept payment according to Contract Unit Prices that appear in the original Contract. A supplemental agreement between the CONTRACTOR and the OWNER will be required when such changes involve a net increase or decrease of more than 25 percent of the estimated quantity of a payment item where the item amounts to 10% or more of the Contract Price.
- C. Quantities necessary to complete the work as shown on the Drawings or as specified herein shall govern over those shown in the Proposal. The CONTRACTOR shall take no advantage of any apparent error or omission in the Drawings or Specifications, and the ENGINEER shall be permitted to make corrections and interpretations as may be deemed necessary for fulfillment of the intent of the Contract Documents.
- D. The ENGINEER will make measurements and determinations as necessary to classify the work within pay items and determine the quantities for pay purposes; such decisions will be final after 3 days if the CONTRACTOR does not submit a written notice as defined in the following paragraph.
- E. If the CONTRACTOR differs with the ENGINEER'S classification of the Pay Items or determination of quantities of the Pay Items, he must notify the ENGINEER in writing within 3 days of the time that the CONTRACTOR is informed of the ENGINEER'S decision. Otherwise the OWNER will not consider any such difference as a claim for payment.
- F. Failure on the part of the CONTRACTOR to construct any item to plan or authorized dimensions within the specification tolerances shall result in reconstruction to acceptable tolerances at no additional cost to the OWNER, acceptance at no pay, or, acceptance at reduced final pay quantity or reduced unit

price, all at the discretion of the ENGINEER.

- G. The quantity for a payment item will be revised only in the event that it is determined to be substantially in error. An error shall be deemed substantial if the quantity will increase or decrease in excess of five percent of the original quantity for that item or the amount due for that item will increase or decrease in excess of \$500 (whichever is smaller). In general, such revisions will be determined by final measurement or plan calculations or both as additions to or deduction from plan quantities specified within these Contract Documents.
- H. Work shall not be considered complete until all testing has been satisfactorily completed and the item of work has demonstrated compliance with plans and specifications.
- I. A preliminary monthly application for payment shall be submitted to the OWNER for review five (5) days prior to the submittal for approval of the CONTRACTOR'S monthly payment request.
- J. All materials supplied for this project shall be in accordance with the latest edition of "Orange County Utilities Standards and Construction Specifications Manual, Appendix D – List of Approved Products". Products that are submitted for use on this project that are not on the approved list will not be considered as acceptable for use.

## **1.02 APPLICATION FOR PAYMENT**

- A. Applications for Payment shall be submitted by the CONTRACTOR to the OWNER'S Resident Project Representative (RPR) in accordance with the schedule established by General Conditions and Agreement between the Owner and the Contractor.
- B. Format
  - 1. Submit applications typed on forms provided by the OWNER. The CONTRACTOR shall prepare itemized continuation sheets using the accepted Schedule of Values and attach them to the Application. Each item shall have an assigned dollar value for the current pay period, and a cumulative value for the project to date. Change Orders executed prior to the date of submission shall be listed at the end of the continuation sheets and shall be totaled separately.
  - 2. The following items shall be included with each copy of the application for payment:
    - a. Progress Schedule
    - b. Stored Material Log
    - c. Partial Release of Liens (for payment for stored material)
    - d. Consent of Surety

- e. Invoices for Stored Material
  - f. Updated record drawings
3. The CONTRACTOR shall certify, for each current pay request, that all previous payments received from the OWNER, under his Contract, have been applied by the CONTRACTOR to discharge in full all obligations of the CONTRACTOR in connection with Work covered by prior applications for payment, and all materials and equipment incorporated into the Work are free and clear of all liens, claims, security interest and encumbrances. CONTRACTOR shall attach to each application for payment like affidavits by all Subcontractors and Suppliers. CONTRACTOR shall also attach a "Consent of Surety" to each application for payment. Additionally, a "Partial Release of Lien" for each subcontractor and supplier shall be attached to each application for payment.
4. Submit seven (7) copies of each application to the Resident Project Representative. Each copy shall include original signatures. The Resident Project Representative shall review the application and verify quantities of installed work and stored materials. Upon RPR approval, the CONTRACTOR shall submit the application to the OWNER for review. When the OWNER finds the application properly completed and correct, the OWNER will make payment to the CONTRACTOR.
- C. Work not installed in accordance with the requirements of the Contract Documents or materials not conforming to the Contract Documents will not be approved by the Resident Project Representative, OWNER or OWNER/ENGINEER for payment.
- D. The Application for Final Payment shall be prepared in accordance with Section 01750 Contract Closeout.
- E. Methods of Measurement
- 1. Units of measurement shall be defined in general terms as follows:
    - a. Linear Feet (LF)
    - b. Square Feet (SF)
    - c. Square Yards (SY)
    - d. Cubic Yards (CY)
    - e. Each (EA)
    - f. Sacks (SK)
    - g. Lump Sum (LS)
  - 2. Unit Price Contracts/Items
    - a. Linear Feet (LF) shall be measured along the horizontal length of the centerline of the installed material, unless otherwise specified.

Pipe shall be measured along the length of the completed pipeline, regardless of the type of joint required, without deduction for the length of valves or fittings. Pipe included within the limits of lump sum items will not be measured.

- b. Square Feet (SF), Square Yards (SY), Cubic Yards (CY), Each (EA) and Sacks (SK) shall be measured as the amount of the unit of measure installed within the limits specified and shown in the Specifications and Drawings. Slope angles and elevations shall be measured by land surveying equipment. CONTRACTOR shall provide supporting documentation (i.e., drawings, truck tickets, invoices, etc.) to verify actual installed quantities.
- c. No measurement is required for Lump Sum (LS) items.

3. Lump Sum Contract/Items

The Measurement of Work for lump sum contracts and/or items shall be based on the information provided in the Contract Documents and compiled through the CONTRACTOR'S own field verifications, investigations and testing prior to Bidding.

- F. The following describes the specific work and methods of measurement for the items listed in the Bid Schedule. Measurement and payment for each Bid Item shall include all labor, materials and equipment required to perform the work included for that respective item to provide a complete and operable installation. Related work not specifically listed or identified, but evidently necessary for satisfactory completion of the item, shall be considered to be included.
- G. No separate payment will be made for the following work, and its cost shall be included in the appropriate payment item:
  - Applications and pulling of all utility and construction permits;
  - Shop drawings, working drawings and samples;
  - Field engineering, surveying and layout;
  - Clearing and grubbing;
  - Trench excavation, sheeting, shoring and bracing;
  - Locating and supporting existing utilities;
  - Structural fill, backfill, compaction and grading;
  - Sodding;
  - Cleanup;
  - Testing materials and apparatus, including provisions for water to fill, flush and test mains;
  - Maintenance of utility service;
  - Fittings and pipe restraints;



## **PART 2 PAY ITEMS**

### **2.01 Mobilization, Demobilization & Bonds (Pay Item 1)**

#### **A. Work Includes**

Locating existing right-of-ways, existing items to remain and/or be removed and staking of proposed structures and piping alignment as necessary to properly construct the project in accordance with the plans. All deviations from the plans must be approved in writing by the Owner prior to construction. Payment of seventy-five percent (75%) of the applicable lump sum price for the item shall be full compensation for the preparatory work and operations in mobilizing for beginning work on the project, including, but not limited to, those operations necessary for the movement of personnel, equipment, supplies and incidentals to the project site, and for establishment of field offices, storage sheds, safety equipment and first aid supplies, sanitary and other facilities, bonds, permits, and fees, construction schedules, project signs, insurance, and any other Preconstruction expense necessary for the start of the work. Payment of the remaining twenty-five percent (25%) of the applicable lump sum price for the item shall include those operations, materials, labor, and equipment necessary for cleanup of storage/laydown yard, demobilization from the site, and associated work to close out the project and will be paid with the final pay request.

B. Unit of measurement is lump sum. The amount of this bid item shall not exceed five percent (5%) of the total base bid.

### **2.02 Indemnification (Pay Item 2)**

In consideration of the CONTRACTOR'S Indemnity Agreement as stated in the Contract Documents, OWNER agrees that such specific consideration shall be \$100.00 and other good and valuable consideration, receipt of which is acknowledged upon signing of the Agreement. To the fullest extent permitted by law, the CONTRACTOR (OR CONSULTANT) shall indemnify, hold harmless and defend the OWNER, its agents, servants, and employees from and against all claims, damages, losses and expenses including, but not limited to, attorney's fees and other legal costs such as those for paralegal, investigative and legal support services and the actual cost incurred for expert witness testimony, arising out of or resulting from the performance of services required under this Agreement, provided that same is caused in whole or part by the error, omission, negligent act, conduct or misconduct of the CONTRACTOR, its agents, servants, employees, or subcontractors. In accordance with Section 725.06, Florida Statutes, adequate consideration has been provided to the CONTRACTOR for this obligation, the receipt and sufficiency of which is hereby specifically acknowledged.

### **2.03 Preconstruction Video (Pay Item 3)**

A. Work Includes

Preconstruction documentation via digital video taping plus all digital or 35 mm color photographs necessary to pick up detail not easily visible or apparent on the digital video tape.

B. Unit of measurement is Lump Sum.

C. Payment for this item shall be divided into equal monthly payments based on the Contract Time.

### **2.04 Record Drawings (Pay Item 4)**

A. Work Includes

The preparation and maintenance of as-built data on a set of Contract Documents to be available on-site as specified in Sections 01300 and 01720, the submittal of updated record drawings with each Application for Payment as specified in Section 01025, and final preparation of Record Drawing Documents in strict accordance with Section 01720.

B. Unit of measurement is lump sum.

C. Payment shall be paid with the Final Pay Request.

### **2.05 Utility Maintenance of Traffic (Utility M.O.T.) (Pay Item 5)**

A. Measurement

Measurement of the Lump Sum item to include all labor, materials and equipment necessary for the construction of the utility work as required by the Maintenance of Traffic Technical Provision (Part H, TP 102) of this construction contract.

B. Payment

Payment of the Lump Sum price shall be full compensation for furnishing all labor, materials and equipment to provide safe and effective maintenance of traffic of vehicular and pedestrian traffic, including but not limited to, preparation and submittal of a complete traffic control plan, temporary lanes, walks or drainage facilities, flagmen, signs, barricades, channelization devices, lights and other protective devices necessary for the construction of the utility work. This work item also includes temporary asphalt to facilitate Orange County Utility work. Open cut and restoration shall be in compliance with FDOT Standards. This

item will be paid based on the percentage of the total value of the work performed to date, proportional to the original contract amount for the respective line item.

## **2.06 Erosion and Sedimentation Control (Pay Item 6)**

### A. Work Includes

Preparation and implementation of stormwater pollution prevention control plan, including monitoring, inspecting, and reporting, providing erosion and sediment control measures, preparing and filing EPA NPDES NOI and NOT forms as necessary, and providing required contractor certifications.

### B. The units of measurement for this item will be Lump Sum.

## **2.07 Furnish & Install Gravity Sewer (Pay Items 7-10)**

### A. Work Includes

The work for this item shall include all labor, materials, and equipment to construct the respective pipeline including coordination with existing utilities, protection of existing utilities including service connections, tree protection, excavation, sheeting, shoring and bracing, dewatering, backfill, compaction, grading, coupling devices, applicable pavement restoration, all testing and clean-up. This item also includes the removal and replacement of fences and gates, mailboxes, trees, shrubs, irrigation sprinklers, sidewalk, curb and gutter, sod and other obstructions. This item also includes C-900 Certa-Lok PVC Pipe when specified for gravity sewer.

### B. The units of measurement for this item is actual linear feet satisfactorily furnished and laid, as measured along the length of the centerline of the completed pipeline without deduction for the length of manholes.

## **2.08 Furnish & Install PVC Force Main (Pay Items 11-13)**

### A. Work Includes:

Furnishing all labor, materials and equipment, and constructing the respective pipeline's complete installation including clearing and grubbing, any MOT that may be required for utility line installation, protection of existing utilities, excavation, sheeting, shoring and bracing, protect and support of any existing force mains or gravity sewers, casing, dewatering including all testing monitoring and proper disposal of groundwater, ultrasonic testing of any existing force mains as specified, backfill, compaction, grading, pipeline identification and warning tape, thrust restraint, sodding, pressure testing, disposal of excess material, and restoration of area. This item also includes all necessary restraining devices, concrete blocking, connections to manholes and polyethylene encasement where

required or shown on the plans, line location wires, removal and replacement of fences, removal and replacement of sidewalks, relocation or replacement of traffic signal fiber optic lines, mailboxes, shrubs, irrigation sprinklers, and other obstructions, tree removal or protection, temporary erosion control, connection to (and mechanical restraint of) existing pipes or structures and all other items incidental to the construction of the pipelines. Replacement of landscaping shall be a “like-for-like” replacement. This pay item also includes open cut and restoration of roadway.

- B. Units of measurement for this item will be linear feet of force main actually installed.

## **2.09 Furnish & Install Ductile Iron Fittings (Pay Items 14-21)**

### **A. Work Includes:**

Furnishing all labor, materials, and equipment for the installation of all fittings, including but not limited to excavation, sheeting, shoring and bracing, dewatering, backfill, compaction, grading, temporary erosion control, surveyed record drawings, thrust restraint devices, bolts, nuts, reducers, tees, bends, caps/plugs, sleeves, wyes, accessories, required coatings for water and wastewater service, and appurtenances, identification devices and warning tap, disinfection, bacteriological (where required) and leakage testing, restoration, sodding and clean up.

- B. Unit of measurement is each.

## **2.10 Furnish & Install Plug Valves (Pay Items 22-24)**

### **A. Work Includes:**

Furnishing all labor, materials and equipment necessary to dewater, excavate, sheet, shore, brace, install valve, valve nut extension, valve box, cover and concrete collar; connection to new and/or existing pipes; thrust restraint; accessories; temporary erosion control; pressure testing and restoration.

- B. Unit of measurement is the number of plug valves with the valve nut extension and valve boxes satisfactorily furnished and installed complete with covers and concrete collars.

## **2.11 Furnish & Install Tapping Sleeve and Tapping Valve (Pay Items 25-27)**

### **A. Work Includes:**

Furnishing all labor, materials and equipment, including dewatering, excavation, sheeting, shoring, bracing, installation backfill, compaction, valve boxes adjusted to grade, valve nut extensions and cover, concrete collars and pads, identification

discs, locating wires, accessories, temporary erosion control, connection to new and/or existing pipes, thrust restraint, leakage testing and restoration, installation of tapping sleeve, tapping valve and valve box, tapping of main line, thrust restraint, and testing. This work includes tapping of existing potable water mains and existing force mains. Payment will only be made for those tapping sleeves and valves that are actually installed. The County reserves the right to delete in the locations where they are not used during construction.

- B. Unit of measurement is each sleeve and valve satisfactorily furnished and installed.

## **2.12 Furnish and Install Line Stops & Cap (Pay Items 28-30)**

- A. Work Includes

Furnishing all labor, materials and equipment necessary to install each line stop assembly including pipe boring, temporary valves or plugs, restraint of all existing pipe per restrained pipe tables, recovery of the temporary valves and plugs, and sealing of the bore hole with a permanent plug and properly capping of the existing line. Restraint information shall be provided with shop drawing submittal. This item also includes clearing and grubbing, temporary erosion control, excavation, sheeting, shoring and bracing, dewatering, backfill, compaction, protection of existing potable water system and force mains, disinfection for water system, restoration, sodding and clean up.

- B. Unit of measurement: The quantity for payment shall be the actual number of line stop assemblies satisfactorily furnished and installed including all restraints to existing lines.

## **2.13 Furnish and Install Steel Casing Via Jack & Bore (Pay Items 31-32)**

- A. Work Includes:

The work for this bid item consists of furnishing all labor, equipment, and materials required for installation of the steel casing by the method of installation as shown on the plan. This item includes excavation, steel casing pipe, all carrier pipe through casing shall be restrained, all specialty equipment, end seals, spacers for all pipes within casing including gravity to maintain slope, locate wire, dewatering, sheeting, shoring and bracing, backfilling, compaction, restoration, supporting existing utilities, providing surveyed record drawings and all other incidental work associated with the installation. Also, includes any fees associated with CSX related activities including any required field representative.

- B. Basis of payment for this bid item will be the actual number of linear feet measured along the centerline of the steel casing.

## **2.14 Furnish & Install Air Release Valve Assembly (Pay Item 33)**

### **A. Work Includes:**

Furnish all labor, materials and equipment for the installation of air release vacuum assembly including off set piping, vaults and enclosures as required, connections, final adjustments, dewatering, excavation, sheeting, shoring, bracing, installation, backfill, compaction, valves, accessories, temporary erosion control, locate wire, ID disk on valve box, concrete collar, connection to new pipes, thrust restraint, surveyed record drawings, sodding and clean up.

### **B. The quantity for payment shall be the actual number of vac/air assemblies satisfactorily furnished and installed complete.**

## **2.15 Furnish & Install Lined Manhole (Pay Item 34)**

### **A. Work Includes**

Furnishing all labor, materials, and equipment, and constructing manholes (regardless of depth) as necessary for the complete installation including manholes (all diameters), drop manholes per plans, HDPE liner where required per plans, lids, covers, frames, final adjustments of all manholes to constructed grades, excavation, pavement removal and replacement, protection of existing utilities, excavation, connections (existing on or proposed) sheeting, shoring and bracing, dewatering, sodding, backfill, compaction, locate wire, ID disk on valve box, grading, temporary erosion control, survey, layout, MOT, all testing, disposal of unsuitable or excess material, restoration of the area, and providing surveyed record drawings. This item also includes line location, removal and replacement of fences, mailboxes, shrubs, irrigation sprinklers, and other obstructions, tree removal or protection, and all other items incidental to the construction of the manholes. All excavated areas shall be restored to existing conditions or better. Substantial restoration of the area shall be done and completed within two days of completion of the pipe installation. The manhole liner and/or drop structures shall be included in the line item as called for on the bid form.

### **B. Basis of payment for this bid item will be per each manhole satisfactorily installed.**

## **2.16 Removal of Existing PVC, DI, and Clay Pipes (Pay Items 36-38)**

### **A. Work Includes**

The work of this item shall include all labor, materials and necessary equipment for the removal of existing and temporary water mains, gravity mains or force mains as called for on the plans, which includes draining and proper disposal of pipe and contents, disconnection from existing mains or structures, and

installation of any ductile iron caps or plugs that may be required. **Includes removal of any concrete blocking or diaphragms in its entirety.** Also included in this item is the removal of existing valve boxes or ARVs located on valves connected to piping designated to be retired. Valve boxes shall be removed, backfilled and compacted with suitable material. This item also includes all clearing and grubbing, any MOT that may be required for utility line removal, protection of existing utilities, excavation, sheeting, shoring and bracing, dewatering including all testing monitoring and proper disposal of groundwater, backfill, compaction, grading, sodding, disposal of excess material, and restoration of area as well as the removal and disposal of any service lines connected to the pipes as well as the proper disposal of removed materials and restoration after completion of construction operations. Removal of the existing and/or temporary mains shall occur following new line installations and FDEP clearance. This pay item also includes open cut and restoration of roadway.

- B. Basis of payment for this bid item will be the actual number of linear feet measured along the centerline of the removed pipe.

#### **2.17 Grout and Abandoned in Place Existing Pipe (Pay Items 39-42)**

- A. Work Includes:

The work of this item shall include all labor, materials and necessary equipment for the grouting of existing force main and gravity sewer as called for on plans including grout, plug existing inverts, ductile iron caps, tanker trucks, draining of pipe and contents and properly disposing of pipe contents. Existing valve collars and air release valves shall be removed and disposed. This item also includes identification on the surveyed record drawings for pipe placed out of service and grouted, the proper disposal of removed materials and restoration after completion of construction operations and additional MOT if needed. All grouted pipe to be as-built.

- B. Basis of payment for this bid item will be the actual number of linear feet measured along the centerline of the grouted pipe.

#### **2.18 Abandon-in-Place Manhole (Pay Item 43)**

- A. Work Includes

The work of this item shall include all labor, materials, and equipment to sheet, shore, and brace, dewater, completely drain and properly dispose of manhole contents, remove manhole top riser, grout fill, and cap existing manhole designated "to be abandoned" on the Drawings. Also included in this item is backfilling and compaction complete in place to finish grade of road or natural ground (including additional soil to replace volume of removed manhole).

- B Basis of payment for this bid item will be made per actual number of existing manholes satisfactorily abandoned-in-place in accordance with the County requirements and specifications.

#### **2.19 Remove and Dispose of Manhole (Pay Item 44)**

- A. Work Includes

Furnishing all labor, materials, and equipment to remove an existing complete manhole including removal of contents, excavation, sheeting, shoring and bracing, dewatering, backfill, compaction, disposal of manhole, and final grading, and applicable pavement restoration. This item also includes removal and replacement of fences and gates, mailboxes, trees, shrubs, irrigation sprinklers, sidewalk, curb and gutter, sod and other obstructions as needed for each manhole.

- B. The unit of measurement is Each sanitary manholes shall be made per actual number of manholes satisfactorily excavated and removed in accordance with the County requirements and specifications.

#### **2.20 Open-Cut and Restore Existing Concrete Driveway (Pay Item 45)**

- A. Work Includes:

The work for this item shall include all labor, materials, and equipment for saw-cutting, removal and proper disposal of existing concrete, compaction, form work, concrete replacement, restoration, and clean-up for a complete installation.

- B. Unit of measurement is square yards. Work performed outside of payment limit lines shall not be measured for payment.

#### **2.21 Furnish & Install Cured-In-Place Pipe (CIPP) Liner (Pay Item 46)**

- A. Work Includes:

The work for this item shall include but is not necessarily limited to, all labor, materials, and equipment necessary for a complete CIPP liner installation including pre and post CCTV inspection, sanitary sewer cleaning (medium cleaning), qualified personnel, providing and processing of liner material, service connection and manhole/wall interface sealing, all costs associated with providing cured CIPP samples for testing, blocking or plugging of incoming lines, grouting, leakage testing, reinstate service laterals, protection of existing utilities, structures, and property, restoration and clean-up.

- B Basis of payment for this item will be made per actual linear feet of furnished and satisfactorily installed cured-in-place liner in the sanitary sewer main from center of manhole to center of manhole, regardless of depth, in accordance with the



County requirements and specifications (Section 02771). CIPP liner installation shall be measured along the length of the centerline of the rehabilitated sanitary sewer.

**2.22 Furnish & Install FRP Base Liner and PP Wall Liner (Pay Item 47)**

A. Work Includes:

The work for this item shall include all labor, materials and equipment necessary for the cleaning and proper installation of the FRP base liner and PP wall liner including cleaning and debris removal, removal of existing liner if necessary, removal and replace corbel, grouting, placement and finishing of concrete, full site restoration (including concrete pavement restoration) and clean-up. This item also includes any fees associated with the Predl System Field Service Representative, all specialty equipment, all by-passing and any additional by-pass that may be necessary, testing, and link pipe connection required for installation of the FRP baseliner. Contractor is responsible for coordination and obtaining all manhole flow analysis. Contractor shall account for lead time for this specialty order product.

B. Basis of payment for this bid item will be the actual number of manhole base liners satisfactorily installed in accordance with the Drawings and specifications.

**2.23 Furnish and Install Fiberglass Manhole Insert (Pay Item 48)**

A. Work Includes

The work for this item shall include all labor, materials, and equipment necessary for the installation of the complete rehabilitation system as specified, including qualified personnel, excavation, sheeting, shoring and bracing, dewatering, backfill, and compaction, cleaning and debris removal, removal and replacement of existing manhole corbel and riser section, removal of existing liner if necessary, fiberglass liner installation, benching, grout, pipe connections and stubouts, new frame and cover with brick or adjustment rings, protection of existing utilities and structures, clean-up, sodding, full site restoration (including concrete pavement restoration), and adjustment of the manhole rim to finished grade.

B. Basis of payment for this bid item will be made per actual number of fiberglass manhole insert rehabilitation systems satisfactorily furnished and installed, regardless of depth or diameter of manhole.

**2.24 Remove & Replace 8' CMU wall (Pay Item 49)**

A. Work Includes

The work for this item shall include all labor, materials, and equipment to remove and properly dispose of existing concrete block and construct a new concrete block wall including replacement concrete block with concrete fill for a complete installation.

- B Basis of payment for this bid item will be made per actual linear feet removed and replaced as measured along the centerline of the wall within the construction excavation. Any additional wall damaged shall be replaced by the Contractor at his own expense.

#### **2.25 Furnish & Install Swing Gate (Pay Item 50)**

- A. Work includes:

The work for this item shall include all labor, materials, and equipment to install the swing gate in accordance with the Drawings and specifications.

- B. Unit of measurement is each swing gate satisfactorily furnished and installed.

#### **2.26 Temporary By-pass System (Pay Item 51)**

- A. Work includes:

Furnishing all labor, equipment, and materials, as required in 2.08, 2.09, 2.10 & 2.11 including the removal of all temporary piping and restoration. This item also includes all necessary piping, pipe fittings including reducers, bends, line stops, tapping sleeves & valves, and restraining devices in order to properly install the temporary by-pass system. All temporary piping, fittings, line stops, and tapping sleeve & valves shall not become the property of the OCU.

- B. The units of measurement for this item will be Each section of temporary bypass system installed.

**END OF SECTION**

**SECTION 01027**  
**APPLICATIONS FOR PAYMENT**

**PART 1 - GENERAL**

1.01 REQUIREMENT

- A. This Section specifies administrative and procedural requirements governing the Contractor's Applications for Payment.
- B. Prior to submitting a monthly payment application, the Contractor's progressive As-Built Drawings, As-Built Asset Attribute Data, Gravity Main, and Pipe Deflection Tables for the period covered by the monthly payment application shall be submitted and accepted by the County.

1.02 FORMAT

- A. Format and Content: Use the accepted Schedule of Values.
  - 1. Arrange the Schedule of Values in a tabular form with separate columns to indicate the following for each item listed:
    - a. Generic name
    - b. Related specification section
    - c. Name of subcontractor
    - d. Name of manufacturer or fabricator
    - e. Name of supplier
    - f. Dollar value
  - 2. Round amounts off to the nearest whole dollar. The total shall equal the Contract Amount.

1.03 PREPARATION OF APPLICATION

- A. Each Application for Payment shall be consistent with previous applications for payments as certified and paid for by the County.
- B. Payment Application Times: As stated in the General Conditions, Payment Applications shall be submitted monthly on a day of the month established by the County at the Pre-Construction Conference.
- C. Application Preparation: Contractor shall complete every entry on the Pay Application form. The form shall be executed by a person authorized to sign legal documents on behalf of the Contractor and the signature notarized. Incomplete applications will be returned without action. The following procedure shall be followed by the Contractor:
  - 1. Submit applications typed on forms provided by the County.
  - 2. Use data on Bid Form and approved Schedule of Values. Provide dollar value in each column for each line item for portion of Work performed and for stored products.

3. List each authorized Change Order and use additional sheets if necessary, list Change Order number and dollar amount for the original item of work.
  4. Each item shall have an assigned dollar value for the current pay period and a cumulative value for the project to-date.
  5. Submit stored material log, partial waivers of claims and mechanic liens, and Consent of Surety with each application, as further explained below.
- D. Contractor shall submit a stored material log with each application for payment that identifies the type, quantity, and value of all stored material that tracks when the stored materials were installed and deducts the installed material from the stored quantity at that time. Include original invoices for all stored materials for which payment is requested.
- E. Waivers of Claims and Mechanics Lien (Waivers): With each Application for Payment the Contractor shall submit waivers of claims and mechanic liens from Subcontractors, Sub-subcontractors, and suppliers for the construction period covered by the previous application.
1. The Contractor shall submit partial waivers on each item for the amount requested, prior to deduction for retainage, on each item.
  2. When an application shows completion of an item, the Contractor shall submit final or full waivers.
  3. The Contractor shall submit the final Application for Payment with, if not already submitted, the final waivers from every entity involved with performance of work covered by the Application that could lawfully be entitled to a payment claim or lien.
  4. Format of Waiver Forms: The Contractor shall submit executed waivers of claims and liens on forms acceptable to the County.
  5. The County reserves the right to designate which entities involved in the Work must submit waivers.
- F. Transmittal of Pay Applications: Contractor shall submit four (4) executed copies of each Application for Payment to the County. One (1) copy shall include all waivers of lien and similar attachments.
1. The Contractor shall transmit each Pay Application package with a transmittal form that lists attachments and all appropriate information related to the application. The transmittal form shall be acceptable to the County.
  2. The Contractor shall include a certification with each application stating that all previous payments received from the County under the Contract have been applied by the Contractor to discharge, in full, all obligations of the Contractor in connection with the Work covered by prior applications for payment. The Contractor shall also certify that all materials and equipment incorporated into the Work are free and clear of all liens, claims, security interest, and encumbrances.
- G. Initial Application for Payment Submittal: Administrative actions and submittals that must precede or coincide with submittal of the initial Application for Payment include the following:
1. List of Subcontractors
  2. List of principal suppliers and fabricators
  3. Schedule of Values
  4. Contractor's Construction Progress Schedule (accepted)

5. List of Contractor's staff assignments
  6. Copies of building permits
  7. Copies of authorizations and licenses from governing authorities for performance of the Work
  8. Certificates of insurance and insurance policies
  9. Performance and Payment bonds (if required)
  10. Data needed to acquire County's insurance
- H. Monthly Application for Partial Payment Submittals: Administrative actions and submittals that must precede or coincide with submittal of Monthly Applications for Partial Payment include the following, as applicable:
1. Relevant tests
  2. Progressive As-builts (one (1) paper copy and electronic copy)
  3. Table 01050-2 Asset Attribute Data Form Examples (one (1) paper copy and electronic copy)
  4. Table 01050-3 Pipe Deflection Table (one (1) paper copy and electronic copy)
  5. Table 01050-4 Gravity Main Table (one (1) paper copy and electronic copy)
  6. An electronic copy of all survey field notes
  7. Partial Release of Lien
  8. Partial Consent of Surety
  9. Site photographs
  10. Updated Progress Schedule: submit one (1) electronic copy and five (5) copies
  11. Summary of Values
  12. Pay Request
  13. On-Site Storage of materials
- I. Substantial Completion Application for Payment Submittal: Following issuance of the Certificate of Substantial Completion, Contractor shall submit an Application for Payment. This Application shall reflect any Certificates of Partial Substantial Completion issued previously for the County's occupancy of designated portions of the Work.
1. Administrative actions and submittals that shall precede or coincide with this application include:
    - a. Occupancy permits and similar approvals
    - b. Warranties (guarantees) and maintenance agreements
    - c. Test/adjust/balance records
    - d. Maintenance instructions
    - e. Meter readings
    - f. Start-up performance reports
    - g. Change-over information related to the County's occupancy, use, operation and maintenance
    - h. Final Cleaning
    - i. Application for reduction of retainage and consent of surety
    - j. Advice on shifting insurance coverage
    - k. List of incomplete Work, recognized as exceptions to County's Certificate of Substantial Completion

- J. Final Completion Application for Payment Submittal: Administrative actions and submittals which must precede or coincide with submittal of the final payment Application for Payment include the following:
1. Prior to submitting a request for final payment or the County issuing a Certificate of Completion for the Work, the Contractor shall submit the final Record Documents to the County for approval. Retainage funds will be withheld at the County's discretion based on the quality and accuracy of the final Record Documents.
  2. Written signed statements by the Contractor
    - a. Completion of project close-out requirements
    - b. Completion of items specified for completion after Substantial Completion
    - c. Assurance that unsettled claims are settled
    - d. Assurance that work not complete and accepted is now completed
  3. Transmittal of Record Documents to the County
  4. Proof that taxes, fees, and similar obligations have been paid
  5. Removal of temporary facilities and services has been completed
  6. Removal of surplus materials, rubbish, and similar elements
  7. Prepare Application for Final Payment as required in General Conditions

#### 1.04 PAY APPLICATION SUBSTANTIATING DATA

- A. When the County requires substantiating data for a Pay Application, submit data justifying Pay Application line item amounts in question.
- B. Provide one (1) copy of data with a transmittal letter for each copy of Pay Application submittal. The Pay Application number, date, and line item by number and description shall be clearly stated.

#### **PART 2 - PRODUCTS (NOT USED)**

#### **PART 3 - EXECUTION (NOT USED)**

END OF SECTION

**SECTION 01050**  
**SURVEYING AND FIELD ENGINEERING**

**PART 1 - GENERAL**

1.01 DESCRIPTION

- A. Professional Surveyor: Provide professional surveying and mapping work required for the execution of the Contract, including verification of existing survey data, construction layout, and production of the As-Built Drawings. This Work shall be performed by a Surveyor that is licensed by the State of Florida as a Professional Surveyor and Mapper pursuant to Chapter 472, F.S.
- B. Professional Engineer: The Contractor shall provide the services of a Registered Professional Engineer currently licensed in the State of Florida for the required field engineering services as applicable to the work.

1.02 REQUIREMENTS

A. Survey Services

- 1. The Contractor shall retain the services of a registered Surveyor and Mapper licensed in the State of Florida to provide professional surveying and mapping services necessary for the construction including a control survey and an as-built survey during construction. The Surveyor will identify control points (monuments and benchmarks noted on the Drawings). The construction layout survey shall be established from the control points shown on the Construction Drawings. The control points shall be confirmed by the contractor prior to start of construction. The accuracy of any method of staking shall be the responsibility of Surveyor. All staking shall be done to provide for easy verification of the work by the County.

B. Field Engineering Services

- 1. The Engineer shall be of the discipline required for the work.
- 2. The Engineer shall be responsible for duties during Construction to include, but not limited to:
  - a. Inspections, testing, witnessing requiring a licensed Professional Engineer.
  - b. Design of temporary shoring, bridging, scaffolding or other temporary construction, formwork and protection of existing structures.
  - c. Other requirements as specified herein.
- 3. Engineering related designs and inspections shall be signed by the licensed Professional Engineer as required by the County.

1.03 SUBMITTALS

A. Provide qualifications of the Surveyor or Engineer.

- 1. A Florida Registered Professional Engineer or Registered Surveyor and Mapper, who is proposed by the Contractor to provide services for the work, shall be acceptable to the County prior to field services being performed.

2. Submit name, address and telephone number of the Surveyor and/or Engineer, as appropriate to the County for acceptance before starting survey or engineering work.
  3. Submit written acknowledgement from the Surveyor stating that he has the hardware, software and adequate scope of services in his agreement with the Contractor to fully comply with the requirements of this specification.
- B. On request, submit documentation verifying accuracy of survey work.
- C. Surveyor shall submit certified Tables 01050 – 2, 3 and 4.

## **PART 2 - PRODUCTS**

### **2.01 SURVEY DOCUMENTS**

- A. Survey documents shall comply with the Minimum Technical Standards of Chapter 5J-17 of the Florida Administrative Code (FAC) and Table 01050-1 Minimum Survey Accuracies, whichever are more stringent. All coordinates shall be geographically registered in the Florida State Plane Coordinate System using the contract Drawings control points for horizontal and vertical controls.
- B. The Surveyor shall not copyright any of their work related to this project.
- C. For ease of calculating pipe deflections in Table 01050-3, begin by providing a unique asset ID for each utility (water, wastewater or reclaimed water) type, numbered sequentially along the pipe run (including changes in direction) from start to finish of the pipe in Table 01050-2 (Pipe Worksheet). Then branches and services of the same utility type can be numbered. It is recommended that each utility numbering format be distinguishable from the other. This will allow organization and convenient sorting after the individual asset table worksheet tabs are combined in the spreadsheet program prior to copying and pasting to the deflection table spreadsheet. The Microsoft Excel spreadsheet template shall be provided by the County.. The numbering system shall be approved by the County before commencing with production of the spreadsheet.



**Table 01050-1  
Minimum Survey Accuracies**

Type	Horizontal Accuracy (feet)	Elevation Accuracy (feet)	Location: Horizontal Center and Vertical Top, unless otherwise specified
Bench Marks	0.01	0.01	Point
Baseline Control Locational Accuracy	0.01	N/A	Point
Tract and Easement Corners	*	N/A	Survey Monuments
Pipe, at 100-foot maximum intervals	0.1	0.1	Pipe, Pipe at Valves, Pipe at Bore & Jack Casing
Pipe, (PVC) >16-inch at every pipe joint	0.1	0.1	Pipe, Pipe at Valves, Pipe at Bore & Jack Casing
Fittings, Sleeves, Tapping Saddle, Service Saddles, Cap or Plugs.	0.1	0.1	
Pipe, Restrained	0.1	0.1	Restrained Joint Limits
Connections	0.1	0.1	Pipe
Bore & Jack Casing	0.1	0.1	Top of Casing at the Casing Limits
Directional Drill	0.1	0.1	10-foot intervals during the directional drill operation or intervals not to exceed the drilling rod length
Hydrants	0.1	0.1	Operating Nut
Valves (Operating Nut)	0.1	0.1	Operating Nut
Valve (Pipe Location)	0.1	0.1	Top of Pipe at Valve location
Air Release, Blow off, and Backflow Valves	0.1	0.1	Valve Enclosure
Master Meters, Deduct Meters & Wastewater Meters	0.1	0.1	Register
Meter Box	0.1	0.1	
Clean out -	0.1	0.1	
Manhole Rim	0.1	0.1	Manhole – top of rim
Manhole Inverts	N/A	0.01	Pipe Inverts
Pump Station (Public & Private)	0.1	0.01	Wetwell top of slab and Pipe Inverts
Production Well or Monitoring Well	0.1	0.1	Well – top of casing
Grease Interceptor	0.1	0.1	
Oil / Water Separators	0.1	0.1	
Pipe, abandoned in place or removed	0.1	0.1	Limits of Abandoned or Removed Pipe
Existing Utilities and appurtenant structures**	0.1	0.1	underground feature or structure
<p>* Shall conform to the requirements of the "Chapter 5J-17, 'Minimum Technical Standards', FAC", certified by a SURVEYOR.</p> <p>** Existing utilities including but not limited to water, wastewater, reclaimed water, stormwater, fiber optic cable, electric, gas and structures within the limits of construction.</p> <p>*** Fittings rotated in X,Y,Z plane or vertical shall be shot to maintain flowline for the horizontal and vertical locations of the coordinate</p>			
<p>Note: All survey values to be reported to second decimal point (x.xx)</p>			

**TABLE 01050-2**  
**Asset Attribute Data Examples**

**Hydrants Worksheet**

Asset Attribute Table Examples								
A	C	D	E	F	G	H	I	
ID Number	Plan Sheet #	Easting	Northing	Elevation	Manufacturer	Model #	Comments	
1								
2	FH-1	C-7	518456.40	1483743.63	49.53	Brand B	XJ7-B	
3	FH-2	C-9	518477.68	1483758.95	54.23	Brand B	XJ7-B	
4								
5								

**Valves Worksheet**

Asset Attribute Table Examples															
A	C	D	E	F	G	H	I	J	K	L	M	N	O	P	Q
ID Number	Plan Sheet #	Easting	Northing	Elevation	Valve Type	Main Type	Valve Size	Valve Manufacturer	Valve Model #	# of Turns to Close	Gear Actuator	Gear Ratio	Side Actuator	Actuator Manufacturer	Comments
2	ARV-1	C300	518060.09	1483231.33	81.72	ARV - Combination	Water Main	2	Brand H	100XT					
3	ARV-1	C303	518083.55	1483280.50	81.15	ARV - Vacuum	Force Main	4	Brand G	1000					
4	BFP-1	C303	518086.00	1483282.88	78.21	Backflow Preventer	Reclaimed Water Main	8	Brand F	2000 fgs					
5	BO-9	C405	518088.83	1483289.43	78.20	Blowoff	Water Main	2	Brand E	14 turbo					
6	BFV-1	C405	518088.11	1483295.00	81.95	Butterfly	Water Main	30	Brand D	230 vls	200	Yes	3 to 1	Yes	Brand C
7	GV-3	C405	518132.54	1483372.75	81.23	Gate	Water Main	16	Brand C	2225846	300	Yes	3 to 1	NO	
8	LS-W1	C405	576779.36	1539706.97	64.30	Line Stop	Water Main	16	Brand B	76r44					
9	PV-22	C405	576880.60	1539718.32	64.52	Force Main	Water Main	12	Brand A	Z100	200	Yes	3 to 1	Yes	Brand A

**Manhole Worksheet**

Asset Attribute Table Examples															
A	C	D	E	F	G	H	I	J	K	L	M	N	O	P	
ID Number	Plan Sheet #	Easting	Northing	Rim Elevation	Invert Elev N	Invert Elev NE	Invert Elev E	Invert Elev SE	Invert Elev S	Invert Elev SW	Invert Elev W	Invert Elev NW	Manufacturer	Comments	
2	SAN-MH01	AT-2	475216.00	1501637.12	115.89					110.22		110.12	Del Zotto		
3	SAN-MH02	AT-2	474895.63	1501636.02	114.98								Del Zotto		
4	SAN-MH03	AT-2	474849.33	1501600.22	115.18		109.96			109.86			Del Zotto		
5	SAN-MH04	AT-2	474850.21	1501416.85	115.91	109.19				110.42			Del Zotto		
6	SS-1	C1.05A	478117.70	1501622.99	118.13					113.73			Del Zotto Products of Florids Inc.	Del Zotto Products of Florids Inc.	
7	SS-2	C1.05A	478116.77	1501534.19	117.79	113.41				113.38			Del Zotto Products of Florids Inc.	Del Zotto Products of Florids Inc.	
8	SS-3	C1.05	478111.28	1501152.49	116.45	111.98				111.94			Del Zotto Products of Florids Inc.	Del Zotto Products of Florids Inc.	
9	SS-4	C1.05A	478105.19	1500781.07	115.72	110.76				110.75			Del Zotto Products of Florids Inc.	Del Zotto Products of Florids Inc.	

**Meter Worksheet**

Asset Attribute Table Examples							
A	C	D	E	F	G	H	
ID Number	Plan Sheet #	Easting	Northing	Elevation	Main Type	Comments	
2	MM-1	C-6	576533.64	1539520.08	58.01	Water Main	
3	RWMM-1	C-6	576937.42	1539598.78	64.84	Reclaimed Water Main	

**Fitting Worksheet**

Asset Attribute Table Examples								
A	C	D	E	F	G	H	I	
ID Number	Plan Sheet #	Easting	Northing	Elevation	Main Type	Fitting Type	Comments	
2	FM-1	C-3	572399.28	1539339.13	46.27	Force Main	Bend 11 1/4°	
3	FM-2	C-3	574840.74	1539856.91	51.73	Force Main	Bend 22-1/2°	
4	RW-1	C-4	574887.22	1539849.64	51.75	Reclaimed Water Main	Cross	
5	RW-2	C-4	574904.30	1539849.56	48.98	Reclaimed Water Main	Reducer	
6	WM-1	C-5	572532.38	1539848.16	54.42	Water Main	Tapping Saddle	
7	WM-2	C-5	572631.00	1539337.10	45.27	Water Main	Tee	

**Cleanout Worksheet**

Asset Attribute Table Examples					
A	C	D	E	F	G
ID Number	Plan Sheet #	Easting	Northing	Elevation	Comments
2	CO-1	C-6	576533.64	1539520.08	58.01
3	CO-2	C-6	576937.42	1539598.42	64.84

## Pipes Worksheet

Asset Attribute Table Examples												
A	C	D	E	F	G	H	I	J	K	L	M	
ID Number	Plan Sheet #	Easting	Northing	Elevation	Main Type	Type of Shot	Construction Method	Material	Pressure Class	Manufacturer	Comments	
1												
2	CSNG-1	C-4	517827.57	1482195.46	78.83	Force Main	Bore & Jack (Casing)	PVC	DR18	Brand A		
3	CSNG-2	C-4	517848.20	1482195.31	78.38	Force Main	Bore & Jack (Casing)	PVC	DR18	Brand A		
4	RW-1	C-7	517731.98	1482237.24	80.42	Reclaimed Water Main	Restraint Joint Limit	Open Cut	DIP	Class 250	Brand B	
5	RW-2	C-7	517732.85	1482338.10	80.94	Reclaimed Water Main	Restraint Joint Limit	Open Cut	DIP	Class 250	Brand B	
6	WM-1	C-9	573309.07	1539372.90	56.10	Water main	Shot on Pipe	Open Cut	PVC	DR18	Brand C	
7	WM-2	C-9	573308.75	1539375.00	54.66	Water main	Shot on Pipe	Open Cut	PVC	DR18	Brand C	
8	FMDD-1	C-4	504345.94	1488969.20	114.14	Force Main	Shot on Pipe	Directional Drill	HDPE	DR17	Brand X	
9	FMDD-2	C-4	504360.86	1488970.50	112.74	Force Main	Shot on Pipe	Directional Drill	HDPE	DR17	Brand X	
10	FMDD-3	C-4	504377.19	1488971.20	106.14	Force Main	Shot on Pipe	Directional Drill	HDPE	DR17	Brand X	
11	FM-9	C-4	504480.47	1488952.90	105.24	Force Main	Shot on Pipe	Open Cut	PVC	DR18	Brand C	
12												

## Pump Station Worksheet

Asset Attribute Table Examples					
A	C	D	E	F	G
ID Number	Plan Sheet #	Easting	Northing	Elevation	Comments
1					
2	PS-1	C-40	517914.35	1482906.56	83.91
3					

## Well Worksheet

Asset Attribute Table Examples						
A	C	D	E	F	G	I
ID Number	Plan Sheet #	Easting	Northing	Elevation	Well Type	Comments
1						
2					Well	
3					Monitoring Well	
4						

## Easements Worksheet

Asset Attribute Table Examples							
A	C	D	E	F	G	H	
ID Number	Plan Sheet #	Easting	Northing	Elevation	Boundary Corner Type	Comments	
1							
2	Corner-1	C-8	463484.59	1511029.72	Pump Station Tract	N.W. CORNER	
3	Corner-2	C-8	463523.24	1511040.01	Pump Station Tract	N.E. CORNER	
4	Corner-3	C-8	463480.45	1511015.23	Pump Station Tract	S.W. CORNER	
5	Corner-4	C-8	463526.97	1511025.49	Pump Station Tract	S.E. CORNER	
6					Easement		
7					Property		
8							

## Existing OC Utility Crossing

Asset Attribute Table Examples								
A	C	D	E	F	G	H	I	
ID Number	Plan Sheet #	Easting	Northing	Existing Pipe Elevation	Proposed Crossing Elevation	Existing Main Type	Comments	
1								
2								
3	CR-02	AT-1	474767.95	1500585.09	98.20	106.20	Force Main	
4	CR-03	AT-1	475239.63	1500596.35	99.10	113.88	Force Main	
5	CR-04	AT-1	475239.61	1500588.49	94.30	112.45	Reclaimed Water Main	
6	Conf-1	C-750	463464.47	1511013.75	100.54	104.88	Water main	
7	Conf-2	C-750	463163.91	1510693.49	98.32	103.57	Storm Main	
8								

## Grease Interceptor

Asset Attribute Table Examples							
A	C	D	E	F	G	H	
ID Number	Plan Sheet #	Easting	Northing	Elevation	Volume (Gallons)	Comments	
1							
2	GI-1	C-400	508387.30	1487203.18	89.70	1000.00	
3							
4							

**TABLE 01050-3  
Pipe Deflection Data EXAMPLE**

<b>Project</b> <b>Contractor:</b> <b>Progress Mtg Date:</b> <b>Contract #</b> <b>Dwg Sheet #</b> <b>Utility Type</b> <b>Pipe Manufacturer</b> <b>Pipe size &amp; material</b> <b>PVC Manufacturer Deflection</b> <b>County Allowable Deflection</b> 75% <b>Allowable Angle of Offset</b> <b>Allowable Radius of Curvature</b> <b>Laying Length of Pipe</b>	FM National Pipe 16" PVC C905 6 inches 4.5 inches 1.5 degrees 764 feet 20 feet	
--	---	--

ID	Size and Type	Northing	Easting	Elev.	Calculations Including Elevation (XYZ)							
					Distance between points AB	Distance between points BC	Distance between points AC	Total Deflection ø <sup>a</sup>	Radius of Curve <sup>a</sup>	Average Offset Angle <sup>***</sup>	Average Offset <sup>****</sup>	
					Length AB ft	Length BC ft	Length AC ft	XYZ (w elevation) degrees	XYZ (w elevation) ft	per laying length degrees	per laying length inches	
14041	16" FM	1505131.50	468948.53	107.68	-	-	-	-	-	-	-	-
7000	16" FM	1505059.60	468932.08	108.15	73.76	38.93	112.66	5.48	1,178.35	0.97	4.07	
2128	16" FM	1505022.11	468921.60	108.55	38.93	39.61	78.54	2.29	1,961.65	0.58	2.45	
2127	16" FM	1504983.85	468911.35	108.29	39.61	38.35	77.96	1.78	2,505.50	0.46	1.92	
2126	16" FM	1504946.67	468901.96	107.81	38.35	39.13	77.42	8.79	505.16	2.27	9.51	
2125	16" FM	1504908.11	468895.31	107.48								

Data that has been inputted     
  Values in yellow are over spec

<sup>a</sup> Uses law of cosines to determine angle ABC and ø.  
 angle ABC = arccos((AB<sup>2</sup>+BC<sup>2</sup>-AC<sup>2</sup>)/(2\*AB\*BC))  
 180-ø/2 = angle ABC  
 Calculate the total deflection ø.  
 to the outer point (A or C) is equal in angle to the approach from the next point along the

<sup>\*\*</sup> Uses law of sines, using the chord length AC and radius R.  
 Since sin((ø/2)\*(PI/180))=(Chord/2)/R and length AC=Chord  
 R=AC/(2\*sin(ø\*PI/360))  
 This calculation assumes an average radius over the bend between three points.

<sup>\*\*\*</sup> Adds the lengths of AB + BC / 20ft to get an approximate number of bends over the span.  
 This value is divided by the total deflection angle to calculate the average bend angle of  
 This assumes that the bend angle consistent across the entire length.

<sup>\*\*\*\*</sup> Uses average offset angle and laying length of pipe.

**TABLE 01050-4  
Gravity Main Table**

Downstream		Upstream		Length (ft)	Gravity Main Diameter (inches)	Design Slope (%)	Const. Slope (%)	Allowable Minimum Constructed Slope (%)
Manhole Number	Invert Elev.	Manhole Number	Invert Elev.					
					8	0.31		0.28
					10	0.24		0.21
					12	0.20		0.17

**PART 3 - EXECUTION**

**3.01 SURVEY FIELD WORK**

- A. Locate, reference, and preserve existing horizontal and vertical control points and property corners shown on the Drawings prior to starting any construction. If the Surveyor performing the work discovers any discrepancies that will affect the Project, the Contractor must immediately report these findings to the County. All survey work shall meet the requirements as defined in Florida Administrative Code 5J-17. Reference and preserve all survey pins/monuments during Construction. If survey pins/monuments are disturbed, it is the responsibility of the Surveyor to reset the pins/monuments at the Contractor's expense. If the monuments are disturbed, any Work that is governed by these monuments shall be held in abeyance until the monuments are reestablished by the Surveyor and approved by the County. The accuracy of all the Contractor's stakes, alignments and grades is the responsibility of the Contractor. However, the County has the discretionary right to check the Contractor's stakes, alignments, and grades at any time. Copies of the Surveyor's field notes and/or electronic files for point replacement shall be provided to the County.
  
- B. The construction layout shall be established from the reference points shown or listed on the Drawings. The accuracy of any method of staking shall be the responsibility of the Contractor. All construction layout staking shall be done such as to provide for easy verification of the Work.
  
- C. The Surveyor shall locate all improvements for the project As-Built Asset Attribute Data using State Plane Coordinates as the horizontal datum and the benchmark referenced on the Drawings as the vertical datum. The County will provide electronic files of the Drawings to

be used by the Surveyor.

- D. Use survey control points to layout such work tasks including but not limited to:
  - 1. Clearing, grubbing, work limits, right-of-way lines and easements
  - 2. Locations for pipelines and all associated structures and appurtenances
- E. The Surveyor shall reference and replace any project control points, boundary corners, benchmarks, section corners, and right-of-way monuments that may be lost or destroyed, at no additional cost to the County based on the original survey control.

### 3.02 SURVEY DOCUMENTS DELIVERABLES

- A. All survey documents required under Section 01720 Project Record Documents, Part 2 – Products, paragraphs 2.01 and 2.02.

END OF SECTION

**SECTION 01065  
PERMITS AND FEES**

**Part 1 – GENERAL**

**1.01 REQUIREMENTS**

A. General

The Contractor shall:

1. Obtain and pay for all permits and licenses as provided for in the General Conditions, except as otherwise provided herein.
2. Schedule all inspections and obtain all written approvals of the agencies required by the permits and licenses.
3. Comply with all conditions specified in each of the permits and licenses.
4. The Contractor shall, within 14 days of the date of the Notice-to-Proceed, prepare for and attend a meeting with representatives from the Owner and the Engineer to review requirements for preparation of a Florida Department of Environmental Protection (FDEP) Notice-of-Intent (NOI) application and Storm Water Pollution Prevention Plan (SWPPP) for compliance with the USEPA's NPDES General Permit for construction activities.

B. Permits by Contractor

If necessary the Contractor shall apply and pay for at least the following permits and pay costs to keep permits active.

1. FDEP Notice of Intent to use the Generic Construction NPDES permit (See Section 02270)
2. St. John's River Water Management District Dewatering Permit. Refer to Section D below.
3. Orange County Division of Building Safety – Commercial Building Permit (s).
  - a. General Commercial Building Permit – The County will pay all fees associated with the General Commercial Building Permit from the Orange County Division of Building safety. Orange County Utilities Engineering will provide Resident Project Representatives for inspection services associated with the Utilities Engineering Division.

- b. Sub-trade Commercial Building Permit (s) – The Contractor shall pay for and obtain all the Sub-trade Commercial Building Permits associated with the General Building Permit. The Contractor shall be responsible for scheduling and paying for all inspection services associated with the Building Permit in order to obtain final approval.
- c. Fire Alarm System – The Contractor is responsible for paying for and submitting fire alarm drawings signed and sealed by an electrical engineer registered in the state of Florida. These drawings shall be submitted to the Orange County Division of Building Safety within six (6) weeks of issuance of the Notice to Proceed for this project. The Contractor will be responsible for providing timely responses to any comments received from the Building Department to avoid delaying issuance of the Building Permit. The Contractor shall be responsible for scheduling and paying for all inspection services associated with the Fire Alarm System in order to obtain final approval.
- d. Fence Permit – The Contractor shall pay for and obtain a permit for the chain link fence surrounding the proposed improvements.

#### C. Permits by County

- 1. The County will apply and pay for the following permits:
  - a. Florida Department of Environmental Protection (FDEP) Domestic Wastewater Facility Permit.
  - b. Florida Department of Transportation (FDOT) Utility Permit
- 2. A copy of the FDEP permits obtained by the County will be furnished to the Contractor at the time when the Notice to Proceed is issued.
- 3. The County will pay all fees associated with the General Commercial Building Permit from the Orange County Division of Building Safety. Orange County Utilities Engineering will provide Resident Project Representatives for inspection services associated with Utilities Engineering Division. The Contractor shall pay for and obtain all the Sub-trade Commercial Building Permits associated with the General Building Permit. The Contractor shall be responsible for scheduling and paying for all inspection services associated with the Building Permit in order to obtain final approval.

#### D. Dewatering Activities

If dewatering is required, the Contractor shall coordinate with the St. John's River Water Management District regarding the applicable rules and regulation. If a



dewatering permit is required, the Contractor shall prepare an application to the District and pay any fee.

END OF SECTION

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**SECTION 01091**  
**REFERENCE SPECIFICATIONS**

**PART 1 - GENERAL**

1.01 GENERAL

- A. Applicable Publications: Whenever in these Specifications references are made to published specifications, codes, standards, or other requirements, it shall be understood that wherever no date is specified, only the latest specifications, standards, or requirements of the respective issuing agencies which have been published as of the date that the Work is advertised for bids, shall apply; except to the extent that said standards or requirements may be in conflict with applicable laws, ordinances, or governing codes. No requirements set forth herein or shown on the Drawings shall be waived because of any provision of or omission from said standards or requirements.
  
- B. Assignment of Specialists: In certain instances, specification test requires (or implies) that specific work is to be assigned to specialist or expert entities who must be engaged for the performance of the Work. Such assignments shall be recognized as special requirements over which the Contractor has no choice or option. These requirements shall not be interpreted so as to conflict with the enforcement of building codes and similar regulations governing the Work. They are not intended to interfere with local union jurisdiction settlements and similar conventions. Such assignments are intended to establish which party or entity involved in a specific unit of Work is recognized as "expert" for the indicated construction processes or operations. Nevertheless, the final responsibility for fulfillment of the entire set of Contract requirements remains with the Contractor.

1.02 REFERENCE SPECIFICATIONS, CODES, AND STANDARDS

- A. Without limiting the generality of other requirements of the Specifications, all Work specified herein shall conform to or exceed the requirements of such referenced documents which are not in conflict with the requirements of these Specifications or applicable codes.
  
- B. References herein to "Building Code" shall mean the Florida Building Code. The latest edition of the code shall apply to the Work herein, including all addenda, modifications, amendments, or other lawful changes thereto.
  
- C. In case of conflict between codes, reference standards, Drawings, and the other Contract Documents, the most stringent requirements shall govern. All conflicts shall be brought to the attention of the Engineer for clarification and directions prior to ordering or providing any materials or labor. The Contractor shall bid the most stringent requirements.

D. Applicable Standard Specifications: The Contractor shall construct the Work specified herein in accordance with the requirements of the Contract Documents and the referenced portions of those referenced codes, standards, and specifications listed.

**PART 2 - PRODUCTS (NOT USED)**

**PART 3 - EXECUTION (NOT USED)**

END OF SECTION

## SECTION 01101

### SPECIAL REQUIREMENTS (GRAVITY INSPECTION ONLY)

#### PART 1 - GENERAL

##### 1.01 REQUIREMENTS

- A. The Contractor shall meet these minimum qualifications for closed circuit televising (CCTV) inspections, manhole inspections and smoke testing of gravity sewers. Attend coordination meeting, provide proper notifications, and maintain an accurate weekly schedule. Contractor shall abide by the causes for rejection of Work in this section and other provisions described in other sections.

##### 1.02 MINIMUM CONTRACTOR QUALIFICATIONS

- A. The following requirements shall be met to qualify for the CCTV project.
  - 1. Company
    - a. A minimum total of 500,000 LF shall be previously completed within the previous 10-years.
    - b. Documented company QA/QC plan and procedures
  - 2. Company equipment
    - a. At least one (1) pan and tilt CCTV camera with rotating lights
    - b. At least one (1) push type lateral cameras with footage counter and ability to display footage on screen and/or lateral launch type lateral camera with footage counter and ability to display footage on screen
    - c. Digital video capture system capable of capturing MPEG or Windows Media Video files on board the camera truck
    - d. PACP compliant inspection data logging software
    - e. At least one (1) jetter/vacuum truck
- B. The following requirements shall be met to qualify for the manhole inspection project:
  - 1. Company
    - a. Five (5) reference manhole inspection projects with a minimum total of 1,000 manholes
    - b. Documented company QA/QC plan and procedures
    - c. Listing of management personnel (minimum of two (2) certified personnel with PACP certifications)
      - (1) Minimum of one (1) person with PACP certification that will lead or supervise each field manhole inspection crew and a minimum of 2-years in the role of lead person or supervisor
      - (2) Minimum of one (1) person with PACP certification serving in the role as a QA/QC management supervisor

2. Company equipment
  - a. At least one - 2 Mega Pixel digital camera with strobe flash
  - b. Camera attached to pole
  - c. Traffic control equipment
  - d. Confined space entry equipment
- C. The following requirements shall be met to qualify for the smoke testing project.
  1. Company
    - a. Five (5) reference smoke testing projects with a minimum of 500,000 LF of smoke testing performed for wastewater gravity mains
    - b. Documented company QA/QC plan and procedures
    - c. Listing of management personnel (minimum of two (2) certified personnel with PACP certifications)
      - (1) Minimum of one (1) person with PACP certification that will lead or supervise each field manhole inspection crew and a minimum of 2-years in the role of lead person or supervisor
      - (2) Minimum of one (1) person with PACP certification serving in the role as a QA/QC management supervisor
  2. Company equipment
    - a. At least one - 2 Mega Pixel digital camera
    - b. At least one (1) self contained portable 4,500 cubic feet per minute blower designed for smoke testing with smoke fluid
    - c. At least one (1) hand held Geographic Positioning System (GPS) unit, Trimble Model GeoXH, or equal with sub-meter accuracy

### 1.03 SUBMITTALS

- A. The CCTV Inspection Contractor shall submit a completed qualification form with the required information (see Table A - CCTV Inspection Contractor Qualification Form).
- B. Previous Work Products: The Contractor shall submit one (1) example of previous closed circuit televising (CCTV) inspections, manhole inspections and smoke testing of gravity sewers work for approval. The submitted example shall be the work of the field supervisor or foreman to be used on this Project.



**TABLE - A**  
**ORANGE COUNTY UTILITIES**  
**CCTV INSPECTION CONTRACTOR**  
**QUALIFICATION FORM**

Contractors that desire to be added to the approved list shall submit a request to the Standards Committee via e-mail to [standards.committee@ocfl.net](mailto:standards.committee@ocfl.net). For other information, please contact a Standards Committee representative at 407-254-9900.

<i>Company Reference Projects</i>		<i>Total Footage</i>	<i>Project Completed</i>	<i>Client Company</i>	<i>Contact Name</i>	<i>Contact (Phone Number and/or E-mail Address)</i>
<i>Listing of Company Management Personnel</i>	<i>PACP (Certification #)</i>	<i>MACP (Certification #)</i>	<i>Years of Experience in CCTV</i>	<i>Years of Experience as Supervisor</i>	<i>QA/QC Mgmt Supervisor (Y or N)</i>	<i>Position Title</i>
<i>Company Equipment Item</i>	<i>Manufacturer</i>	<i>Model No.</i>	<i>Description</i>			
Main Line CCTV Camera						
Lateral Camera (push type)						
Lateral Camera (launch type)						
Video Capture System						
PACP-Compliant Inspection Data Logging System						
Combination Jetter/Vacuum Truck						

Para más information, por favor llame al Departamento de Servicios Públicos del Condado de Orange y pida hablar con un representante en español. El número de teléfono es 407-254-9903. Website: [www.ocfl.net/utilities/](http://www.ocfl.net/utilities/)

(Rev.6/27/2011)

**PART 2 - PRODUCTS (NOT USED)**

**PART 3 - EXECUTION**

**3.01 CONTRACT COORDINATION MEETING**

- A. Prior to commencing field activities, the Contractor shall attend a Coordination Meeting with the County. Contractor shall be prepared to discuss the following agenda items:
  1. Project contacts
  2. County notification procedures
  3. Public notification requirements
  4. Inspection QA/QC
  5. Deliverables
  6. Schedule

### 3.02 GENERAL PROGRESSION OF WORK

- A. Contractor shall submit an updated schedule of inspection activities on a weekly basis.
- B. Contractor shall notify the County a minimum of 48-hours prior to any inspection work.
- C. All work shall be performed in an orderly, organized fashion, progressing through the project area(s) in a systematic manner. Contractor shall adhere to submitted and communicated schedules.

### 3.03 QUALITY ASSURANCE

- A. The Contractor shall have a QA/QC plan and procedures to ensure accurate data collection, documentation and submittal.
- B. The County has adopted the NASSCO PACP quality control procedures as the minimum standard to be applied to all submitted CCTV and Manhole Inspection data. All submitted data shall be quality checked in accordance with these procedures.
- C. The County will perform QA/QC checks on a minimum 5% of submitted inspection data.
- D. All submitted data will be subject to County QA/QC following the same procedures set forth herein following in paragraph 3.04 "CCTV and Manhole Inspection QA/QC Procedures."

### 3.04 CCTV AND MANHOLE INSPECTION QA/QC PROCEDURES

- A. The Contractor shall determine the approximate number of inspections performed by each inspection field supervisor/foreman that submitted data on a weekly basis to determine the quality control sampling population. A review of a minimum of 5% of the total inspections is required.
- B. The Contractor shall number the inspection reports in the order they were inspected.
- C. The Contractor shall utilize a random number generator to determine the inspection report numbers for review.
- D. Each inspection report that corresponds to the random numbers will be marked for review, the inspection report printed and the video copied to the QA/QC directory.
- E. Each selected inspection report will be reviewed in detail against the inspection digital video.
- F. Each field that is populated and those that should have been populated will be counted to produce a "number of fields checked" for the required header information and detailed inspection information. The fields with errors, or missing data, regardless of the error will be totaled to determine the "error count". The accuracy level will then be calculated as follows:  $100 - ((\text{error count} / \text{number of fields checked}) * 100) = \text{accuracy percentage}$ .



- G. The percentage accuracy shall be entered onto a graph so that the on-going accuracy of each supervisor (operator) can be seen.
- H. The accuracy of each field supervisor/foreman's data shall exceed 90%.
- I. The Contractor shall submit, along with the inspection deliverables, quality control forms that include a hard copy print out of the inspection reports checked with errors and omissions clearly marked.
- J. The Contractor shall enter the accuracy level calculations in each supervisor (operator) quality control log.

### 3.05 SMOKE TESTING QUALITY ASSURANCE

- A. Smoke testing will be performed in the presence of the County.
- B. The Contractor shall submit for approval a QA/QC plan. Non-compliance with the Contractor plan shall result in the re-testing of areas with suspect quality at the County's discretion.

### 3.06 REJECTION OF WORK

- A. Failure of County QA/QC checks will result in a "quality deficiency" notification to request from the Contractor how the rejected Work shall be addressed.
- B. Failure to notify County prior to field work being performed in accordance with the County notification procedures may constitute rejection of Work that was performed without notification.
- C. Payment shall be withheld for inspection work not passing the County QA/QC check, until such time that the data is re-submitted and verified accurate.
- D. Subsequent failures of County QA/QC checks may result in the County requiring a change in field supervisor.

END OF SECTION



**SECTION 01200**  
**PROJECT MEETINGS**

**PART 1 - GENERAL**

**1.01 REQUIREMENTS INCLUDED**

- A. Contractor participation in pre-construction conferences, progress meetings and specially called meetings.

**1.02 MEETINGS CALLED BY THE COUNTY**

- A. The County will schedule and administer a pre-construction conference, periodic progress meetings and specific topic meetings throughout the progress of the Work. The County will:
  - 1. Prepare and distribute a notification of the meeting to required attendees.
  - 2. Establish, prepare and distribute an agenda with the notification.
  - 3. Make physical arrangements for the meetings.
  - 4. Preside at meetings.
  - 5. Prepare and distribute minutes of meetings including significant proceedings and decisions, within 15 working days after each meeting. Minutes will be forwarded to all participants and to parties affected by decisions made at the meeting.
- B. Representatives of the Contractor, Subcontractors and suppliers attending meetings shall be qualified and authorized to act on behalf of the entity each represents.
- C. The meeting location will generally be a central site, convenient for all parties, designated by the County.
- D. All meetings shall be digitally recorded with files provided to all requesting parties.

**1.03 PRE-CONSTRUCTION CONFERENCE**

- A. Attendance:
  - 1. County
  - 2. Contractor and superintendent
  - 3. Subcontractors as appropriate to the agenda
  - 4. Representatives of suppliers and manufacturers as appropriate to the agenda
  - 5. County MBE/WBE representative
  - 6. Other agency representatives (FDEP, EPA, City, etc.)
  - 7. Surveyor – recommended but required if Surveyor has not previously performed work for the County
  - 8. Others as requested by the County or Contractor

B. Suggested Agenda:

1. Distribution and discussion of:
  - a. List of major Subcontractors and suppliers
  - b. Construction schedules
  - c. Contact information
2. Organizational arrangement of Contractor's forces and personnel, and those of Subcontractors, material and equipment suppliers, and the County
3. Critical work sequencing
4. Major equipment deliveries
5. Project coordination
  - a. Designation of responsible personnel
  - b. Channels and procedures for communication
6. Procedures and processing of:
  - a. Field decisions
  - b. Proposal requests
  - c. Submittals
  - d. Change orders
  - e. Applications for payment/Schedule of Values
  - f. Contractor quality control
  - g. Submittal of Shop Drawings, project data and samples
7. Adequacy of distribution of Contract Documents
8. Procedures for maintaining as built and record documents
9. Use of premises:
  - a. Office, work and storage areas
  - b. County's requirements
  - c. Housekeeping
10. Temporary construction facilities
11. Temporary utilities
12. Safety and first aid procedures
13. Rules and regulations
14. Security procedures
15. Place, date and time for regular progress meetings
16. Completion time for Contract and liquidated damages

1.04 PROGRESS MEETINGS

- A. The County shall schedule progress meetings at least once per month as required by progress of the Work with the first meeting approximately one (1) month after the pre-construction meeting.
- B. Attendance:
  1. County
  2. Contractor
  3. Subcontractors as appropriate to the agenda
  4. Suppliers as appropriate to the agenda
  5. Others as appropriate

- C. The Contractor's representative is to attend the project meetings and have the authority to act on behalf of the entity represented on field related matters. Contractor's representative is to study previous meeting minutes and current agenda items, in order to be prepared to discuss pertinent topics and provide specific information including but not limited to:
  - 1. Status of submittals and actions necessary to expedite them
  - 2. Status of activities behind schedule and actions necessary to regain the approved schedule
  - 3. Status of materials and equipment deliveries and action necessary to expedite materials and equipment and maintain the approved schedule
  - 4. Status of open RFI's and actions necessary to address them
  
- D. To the maximum extent practicable, the Contractor is to assign the same personnel to represent the Contractor at Progress Meetings throughout the progress of the work.
  
- E. The Contractor is to provide a current Shop Drawing submittal log at each progress meeting.
  
- F. The Contractor is to provide copies of the updated Progress Schedule at each project meeting in accordance with the General Conditions including a 3 week look ahead schedule for upcoming events.
  
- G. Suggested Agenda:
  - 1. Review and approve minutes from previous meeting
  - 2. Review of work progress since previous meeting to include current As-Builts
  - 3. Contractor's/Subcontractor's workforce and equipment
  - 4. Progressive As-Built Drawings
  - 5. Surveyor's submittals
  - 6. Field observations, problems and conflicts
  - 7. Construction progress and problems which impede construction schedule
  - 8. Shop Drawing submittal status
  - 9. Requests for Information (RFI) status
  - 10. Change Order status
  - 11. Review of off site fabrication and delivery schedules
  - 12. Corrective measures and procedures to regain approved schedule
  - 13. Revisions to construction schedule
  - 14. Job progress and schedule for succeeding work period
  - 15. Coordination of schedules
  - 16. Maintenance of quality standards
  - 17. Review submittal schedule; expedite as required
  - 18. Pending requests for information, changes and substitutions
  - 19. Review proposed changes for effect on construction schedule and completion date
  - 20. Pay application status
  - 21. Other business

H. Revision to Minutes:

1. Unless minutes are challenged, in writing, prior to the next regularly scheduled Progress Meeting, they will be accepted as properly summarizing the discussions and decisions of the meeting.
2. Persons challenging minutes shall reproduce and distribute copies of the challenge to all indicated recipients of the particular set of minutes.
3. Challenge to minutes shall be settled as priority portion of "old business" at next regularly scheduled meeting.

**PART 2 - PRODUCTS (NOT USED)**

**PART 3 - EXECUTION (NOT USED)**

3.01 PRE-CONSTRUCTION MEETING

- A. Pre-construction Meeting: At the pre-construction meeting the Contractor shall be provided with a blank electronic version of the spreadsheets for: Asset Attribute Data and Pipe Deflection tables. The Contractor's Surveyor shall use these tables to input the data and shall not alter the table format or formulas.

3.02 CONSTRUCTION PROGRESS MEETINGS

A. Contractor shall provide the following:

1. Progressive As-Built Drawings
2. Surveyor submittals
  - a. As-Built Asset Attribute Data Table (see Specification Section 01050 "Surveying and Field Engineering" Table 01050-2)
  - b. Pipe Deflection Table (see Specification Section 01050 "Surveying and Field Engineering" Table 01050-3)
  - c. Gravity Main Table (see Specification Section 01050 "Surveying and Field Engineering" Table 01050-4)
  - d. Boundary Surveys of fee simple and permanent easements for pump stations, treatment facilities, and constructed pipe in easements
3. Construction Contract, As-Built Drawings, Specifications, General Conditions, Supplemental Conditions, Bid Proposal, Instruction to Bidders, Addenda, and all other Contract Documents
4. Specifications and Addenda: Record manufacturer, trade name, catalog number and supplier of each product and item of equipment actually installed as well as any changes made by Field Order, Change Order or other
5. Change orders, verbal orders, and other modifications to Contract
6. Written instructions by the County as well as correspondence related to Requests for Information (RFIs).
7. Accepted Shop Drawings, samples, product data, substitution and "or-equal" requests.
8. Field test records, inspection certificates, manufacturer certificates and construction photographs.

9. As-Built Asset Attribute Data: Surveyor shall obtain field measurements of vertical and horizontal dimensions of constructed improvements. The monthly submittal shall include the Surveyor's certified statement regarding the constructed improvements being within the specified accuracies as described in Specification Section 01050 "Surveying and Field Engineering", Table 01050-1 Minimum Survey Accuracies or if not, indicating the variances.
10. Gravity Main Table: Surveyor shall prepare and update a Gravity Main Table to include as a minimum the pipe segment identification, pipe lengths, manhole inverts and tops, and slopes for gravity mains. Surveyor shall certify the data entered are correct and indicate if the minimum slopes have not been met.
11. Pipe Deflection Table: Surveyor shall input the type of pipe, pipe manufacturer, PVC manufacturer deflection allowance, allowable angle of offset and radius of curvature, laying length of pipe, and coordinates. Surveyor shall certify the data entered are correct and indicate if the deflection allowance, offset or radius of curvature exceeds the manufacturer's recommendations.

END OF SECTION

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## SECTION 01300

### SUBMITTALS

#### PART 1 - GENERAL

Work completed without approved Shop Drawings and/or samples shall be considered installed at the Contractor's risk.

##### 1.01 SHOP DRAWINGS AND DATA

- A. Shop Drawings defined in the General Conditions, shall complement design and construction Drawings, and shall contain sufficient detail to clearly define all aspects of the Construction. These Drawings shall be complete and detailed.
- B. Contractor and Supplier's catalog sheets, brochures, diagrams, illustrations and other standard descriptive data shall be clearly marked with specification title and numbers to identify pertinent materials, product or models. Delete information which is not applicable to the Work by striking or cross-hatching.
- C. If Shop Drawings show variations from Contract requirements because of standard shop practice or for other reasons, the Contractor shall describe such variations in the letter of transmittal. If acceptable, proper adjustment in the Contract shall be implemented where appropriate. If the Contractor fails to describe such variations, the Contractor shall not be relieved of the responsibility for executing the Work in accordance with the Contract, even though such Drawings have been reviewed.
- D. Data on materials and equipment shall include, without limitation, materials and equipment lists, catalog data sheets, cuts, performance curves, diagrams, verification of conformance with applicable standards or codes, materials of construction and similar descriptive material. Materials and equipment list shall, for each item, give the name and location of the Supplier or manufacturer, trade name, catalog reference, size, finish and all other pertinent data.
- E. For all equipment furnished, the Contractor shall provide a list including the equipment name and address and telephone number of the Supplier's representative and service company so that service and/or spare parts can be readily obtained.
- F. The Contractor will obtain an installation list from suppliers and equipment suppliers who propose to furnish equipment or products for submittal to County/Professional along with the required Shop Drawings. The installation list shall include at least 5 installations where identical equipment has been installed and has been in operation for a period of at least 1-year.

## 1.02 REVIEW OF SHOP DRAWINGS AND SAMPLES

- A. The County /Professional's review of Shop Drawings, Data, and Samples as submitted by the Contractor will be to determine if the items(s) generally conform(s) to the information in the Contract Documents and is/are compatible with the design concept. The County/Professional's review and exceptions, if any, will not constitute an approval of dimensions, connections, quantities, and details of the material, equipment, device, or item shown.
- B. The review of drawings and schedules will be general, and shall not be construed:
  - 1. As permitting any departure from the Contract Documents
  - 2. As relieving the Contractor of responsibility for any errors, including details, dimensions, and materials
  - 3. As approving departures from details furnished by the County/Professional, except as otherwise provided herein
- C. If the drawings or schedules as submitted describe variations and show a departure from the Contract Documents which the County/Professional finds to be in the interest of the County and to be so minor as not to involve a change in Contract Price or Contract Time, the County/Professional may return the reviewed drawings without noting an exception.
- D. "Approved As Noted": Contractor shall incorporate County/Professional's comments into the submittal before release to manufacturer. The Contractor shall send a letter to the County/Professional acknowledging the comments and their incorporation into the Shop Drawing.
- E. "Amend and Resubmit": Contractor shall resubmit the Shop Drawing to the County/Professional. The resubmittal shall incorporate the County/Professional's comments highlighted on the Shop Drawing.
- F. "Rejected": Contractor shall correct, revise and resubmit Shop Drawing for review by County/Professional.
- G. Resubmittals will be handled in the same manner as first submittals. For resubmittals the Contractor shall direct specific attention, in writing or on resubmitted Shop Drawings, to revisions other than the corrections requested by County/Professional on previous submissions. The Contractor shall make any corrections required by the County/Professional.
- H. If the Contractor considers any correction indicated on the Drawings to constitute a change to the Drawings or Specifications, the Contractor shall give written notice thereof to the County/Professional.

- I. When the Shop Drawings have been completed to the satisfaction of the County/Professional, the Contractor shall carry out the Construction in accordance therewith and shall make no further changes therein except upon written instructions from the County/Professional.
- J. No partial submittals will be reviewed. Submittals not deemed complete will be stamped "Rejected" and returned to the Contractor for resubmittal. Unless otherwise specifically permitted by the County/Professional, make all submittals in groups containing all associated items for:
  - 1. Systems
  - 2. Processes
  - 3. As indicated in specific Specifications Sections  
All drawings, schematics, manufacturer's product data, certifications, and other Shop Drawing submittals required by a system specification shall be submitted at one time as a package to facilitate interfaces checking.
- K. Only the County/Professional shall utilize the color "red" in marking Shop Drawing submittals.
- L. Failure to comply with any of the above may result in the rejection of Shop Drawings.

#### 1.03 PRODUCT DATA

- A. Submit not less than 6-copies, unless approved by the County/Professional. Mark each copy to identify applicable products, models, options and other data. Supplement manufacturers' standard data to provide information unique to the Work.

#### 1.04 MANUFACTURERS' INSTRUCTIONS

- A. When required in an individual Specification Section, submit manufacturer's printed instructions for delivery, storage, assembly, installation, start-up, adjusting and finishing, in quantities specified for product data.

#### 1.05 SAMPLES

- A. Submit full range of manufacturers' standard colors, textures and patterns for the County's selection. Submit samples for selection of finishes within 30-days after Award of Contract. All color and finish selections must be submitted by the Contractor in a single submission, properly labeled and identified.
- B. Submit samples to illustrate functional characteristics of the product, with integral parts and attachment devices. Coordinate submittal of different categories for interfacing work.

- C. Submit the number of samples specified in the respective Specification section, but no less than two (2). After review one (1) will be retained by the County. Reviewed samples that may be used in the Work are indicated in the Specification Section.
- D. Samples shall be delivered to the County as directed. The Contractor shall prepay shipping charges on samples. Materials or equipment for which samples are required shall not be used in the Work until approved by the County/Professional.
- E. Samples shall be of sufficient size to clearly illustrate:
  - 1. Functional characteristics of the product, with integrally related parts and attachment devices
  - 2. Full range of color, texture and pattern
  - 3. Each sample shall have a label indicating:
    - a. Name of Project
    - b. Name of Contractor and Subcontractor
    - c. Material or equipment represented
    - d. Place of origin
    - e. Name of product and brand (if any)
    - f. Location in Project
    - g. Specification title and number
    - h. Submittal number
    - i. Note: Samples of finished materials shall have additional marking that will identify them under the finished schedules.
- F. The Contractor shall prepare a transmittal letter, in triplicate (3) for each shipment of samples containing the information required in paragraph herein. The Contractor shall enclose a copy of this letter with the shipment and send a copy of this letter to the County/Professional. Approval of a sample shall be only for the characteristics or use named in such approval and shall not be construed to change or modify any Contract requirements.
- G. Approved samples not destroyed in testing shall be sent to the County or stored at the site of the Work. Approved samples of the hardware in good condition may be incorporated in the Work if requested in writing by the Contractor and approved in writing by the County/Professional. Samples that failed testing or were not approved will be returned to the Contractor at the Contractor's expense, if so requested at time of submission.

#### 1.06 FIELD SAMPLES

- A. Provide field samples of finishes as required by individual Specifications sections. Install the sample completely and finished. Acceptable samples in place may be retained in completed Work.

#### 1.07 DRAWINGS, PRODUCT DATA AND CERTIFICATES

- A. Each letter of transmittal shall identify each and every item transmitted by title, drawing number, revision number and date.

- B. The County generally will not check dimensions, quantities or schedules, except in cases where the information is lacking in the Specifications.
- C. The following is applicable to submitted drawings, data and certificates:
  - 1. Show relation to adjacent structures or materials.
  - 2. Clearly identify field dimensions.
  - 3. Show required dimensions and clearances.
  - 4. Performance characteristic and capabilities shall accompany original Shop Drawing submittals.
  - 5. Wiring diagrams and controls shall accompany original Shop Drawing submittals.
  - 6. Installation instructions shall accompany original Shop Drawing submittals.
  - 7. Each submittal shall identify applicable Standards, such as ASTM number or Federal Specification number.
  - 8. All information not pertinent shall be removed from the submittal, or shall be crossed out.
- D. When resubmission is required, the County/Professional will return only two (2) marked up copies. A third submission from the same manufacturer will not be accepted.

#### 1.08 SUBSTITUTIONS

- A. The substitution requirements of this Section are in addition to the requirements of the General Conditions and Supplementary Conditions.
- B. When a particular product is specified or called for, it is intended and shall be understood that the proposal tendered by the Bidder includes those products in his Bid. Substitutions will only be considered in cases where original materials are unavailable or in an instance where substitute can be proven superior in its planned application
- C. The intent of these specifications is to provide the County with a quality facility without discouraging competitive bidding. For products specified only by reference standards, performance and descriptive methods, without naming manufacturer's products, the Contractor may provide the products of any manufacturer complying with the Contract Documents, subject to the review of product data by the County/Professional as specified herein.
- D. The County/Professional's approval is required for substitutions.
- E. The Contract is based on the materials, equipment and methods described in the Contract Documents.
- F. The County/Professional will consider proposals for substitution of materials equipment and methods only when such proposals are accompanied by full and complete technical data and all other information required by the County/Professional to evaluate the proposed substitution.

- G. Do not substitute materials, equipment or methods unless such substitution has been specifically approved for this Work by the County/Professional in writing. The Contractor must provide a submittal per this Section specifically requesting approval of the substitution. Failure to specifically identify the requested substitution may invalidate approval of a submittal.

#### 1.09 AVAILABILITY OF SPECIFIED ITEMS

- A. Verify prior to bidding that all specified items will be available in time for installation during Construction for orderly and timely progress of the Work.
- B. In the event that specified items will not be available, notify the County/Professional prior to receipt of proposals.

#### 1.10 OPERATING MANUALS

- A. Submit all manuals in accordance with requirements of Divisions 2 through 16 of the Contract Specifications and Section 01700 "Project Closeout."

#### 1.11 WARRANTIES, GUARANTEES AND BONDS

- A. Provide as required by Technical Sections of the Specifications and Sections 01700 "Project Closeout" and Section 01740 "Warranties and Bonds."

#### 1.12 CADD FILES

- A. The Professional's CADD files will be available on a limited basis to qualified firms at the County's prerogative. The procedure for requesting such files is noted elsewhere in these documents and there is a cost associated with handling and reproduction. Recipients are cautioned that these files may not accurately show actual conditions as constructed. Users are responsible to verify actual field conditions.
- B. The Professional's Drawings are to be used only for background information. If the Professional's Drawings are just reproduced and resubmitted (e.g. for ductwork drawings) they will be rejected.
- C. Copies of data furnished by the County/Professional to Contractor or Contractor to County/Professional that may be relied upon are limited to the printed copies (also known as hard copies). Files in electronic media format of text, data, graphics, or other types are furnished only for the convenience of the receiving party. Any conclusion or information obtained or derived from such electronic files will be at the user's sole risk. If there is a discrepancy between the electronic files and the hard copies, the hard copies govern.

- D. Because data stored in electronic media format can deteriorate or be modified inadvertently or otherwise without authorization of the data's creator, the party receiving electronic files agrees that it will perform acceptance tests or procedures within 60-days, after which the receiving party shall be deemed to have accepted the data thus transferred. Any errors detected within the 60-day acceptance period will be corrected by the transferring party.
- E. When transferring documents in electronic media format, the transferring party makes no representations as to long-term compatibility, usability, or readability of documents resulting from the use of software application packages, operating systems, or computer hardware differing from those used by the data's creator.

### 1.13 PROGRESS PHOTOGRAPHS

- A. Photographs and digital pictures shall be in color. Provide 1 copy of each digital picture on each of three (3) CDs and provide 1 print of each photograph in two (2) separate albums.
- B. Photographs shall be from locations to illustrate the condition of Construction and state of progress adequately.
- C. Provide up to 12 digital photographs of views randomly selected by the County, taken prior to any construction and prior to each scheduled Application for Payment.
- D. Deliver electronic images, prints, and negatives to the County.
- E. Each print shall be single weight paper with glossy finish and the overall dimension shall be 7-1/2-inch x 10-inches (19.05 x 25.4 cm). The print shall be clear, sharp and free of distortion after the enlargement from the negative.
- F. Provide loose-leaf albums for each set of photographs to hold prints with a maximum of 50-leaves per binder.
- G. Each print shall be protected by flexible, transparent acetate or plastic sheet protector leaves with metal reinforced holes. Two (2) extra leaves shall be provided in each binder.
- H. Capture and provide digital, ortho-rectified, true-color, aerial photographs of the complete project site prior to start of Construction and at final completion. A final 6-inch or less ground pixel resolution is required. If using traditional photography, the photos will need to be captured at an appropriate scale and scanned at a high enough dpi to yield a final ground pixel size of 6-inches or less. If captured digitally, a final 6-inches or less ground sample distance is required. The final orthorectified photos shall use a projection of NAD 27, State Plane West and all vertical reference shall be NAVD 88, US feet. All orthophoto mosaics shall meet a final accuracy of plus or minus 5-feet.

- I. Provide a total of four (4) true-color, color balanced orthophoto mosaic prints. Three (3) prints each of the pre and post construction (final completion) orthophoto mosaics, for a total of six (6). Each orthophoto mosaic print shall be on double-weight paper with glossy finish and shall have overall dimensions of 36-inches x 58-inches. Two (2) copies of each of the digital orthophoto mosaics shall be supplied in Geotiff format on disk for each time period (pre and post construction). The final color balanced, true-color orthophoto mosaics will be projected in NAD 27, State Plane West and all vertical reference shall be NAVD 88, US feet and shall meet a final accuracy of plus or minus 5-feet.
- J. The Contractor shall provide before and after photographs of each portion of the site. The below ground facilities shall include all equipment, walls, floor, piping, supports and entrance. At major locations, photographs shall include before, during, and after prints and all prints shall be placed in binders in ascending date order to show the Work as it progresses.
- K. Descriptive Information:
  - 1. Each photograph shall have a permanent title block on the back and shall contain the typed information and arrangement as follows:
    - a. ORANGE COUNTY, FLORIDA
    - b. (ENTER PROJECT NAME)
    - c. BID No. (Enter Bid Number)
    - d. CONTRACTOR: (Name of Contractor)
    - e. DATE: (When photo was taken)
    - f. PHOTO NO.: (Consecutive Numbers)
    - g. PHOTO BY: (Firm Name of Photographer)
    - h. LOCATION: (Description of Location and View)
  - 2. The Contractor shall provide the Professional with a written description of each photograph. This description shall be included in the binders and a copy shall be submitted with the CDs.

#### 1.14 PROJECT RECORD DOCUMENTS

Project Record Documents shall be submitted in accordance with Section 01720 "Project Record Documents" of these specifications.

### **PART 2 - PRODUCTS (NOT USED)**

### **PART 3 - EXECUTION**

#### 3.01 SUBMITTAL PROCEDURES

- A. Article 9 of the General Conditions contains additional provisions regarding submittals.



- B. Preliminary Shop Drawing Data: Within 20-days after the Award of the Contract or before the Pre-Construction Meeting, the Contractor shall submit to the County/Professional a complete listing of manufacturers for all items for which Shop Drawings are to be submitted.
- C. Shop Drawing Submittal Schedule: Within 30-days after the Notice to Proceed, the Contractor shall submit to the County/Professional a complete schedule of Shop Drawings submittals with the respective dates for submission, the beginning of manufacture, testing and installation of materials, supplies and equipment, noting those submittals critical to the progress schedule.
- D. Submittal Log: An accurate updated log of submittals will be maintained by the Contractor and subject to review by the County/Professional at each scheduled progress meeting.
- E. If the Contractor considers any correction indicated on the Drawings to constitute a change to the Contract Drawings or specifications, the Contractor shall give written notice thereof to the County/Professional. This does not constitute a change order until accepted by the County.
- F. Shop Drawing and submittal data shall be reviewed by the County/Professional for each original submittal and first resubmittal; thereafter review time for subsequent resubmittals shall be charged to the Contractor. The Contractor shall reimburse the County for services rendered by the County/Professional at the rate multiplied by the County's Professional multiplier based on the fee schedule provided to the County for this Project. If a County engineer is performing any portion of the review, this fee is based upon the hourly rate of the engineer times the County's multiplier for overhead, benefits, and expenses. The Contractor agrees that the County shall deduct such charges from the Contract Amount by a deductive Change Order.
- G. Contractor Shop Drawing and Sample submittals shall include 5 copies in addition to any other copies that the Contractor wants returned. The County will retain 5 copies of approved submittals.
- H. Identify Project, Project Number, date, dates of previous submittals, Contractor, Sub-Contractors, suppliers with their addresses, pertinent Drawings by sheet and detail number, and Specification Section number, as appropriate. Identify all deviations from the Contract Documents. Provide space for Contractor and Professional review stamps.
- I. Contractor's delivery of Shop Drawings for review shall follow a reasonable sequence, as is necessary to support the dates on the Progress Schedule and avoid an overload of Shop Drawings awaiting review at any one time. Coordinate submittal of related items.

- J. Submit Shop Drawings per the schedule of Shop Drawing submittals, inserted in 1 loose-leaf binder, with tabs and index to the County/Professional. All individual submittal sheets inserted in said binder must be clearly marked and referenced to proper paragraph and subparagraph of specifications. Cross out any items on sheets which constitute information not pertaining to equipment specified. Clearly mark all components that are provided as "optional" by manufacturer. Shop Drawings shall be approved by the Contractor prior to submittal to the County/Professional. Shop Drawings will be reviewed by the County/Professional. After County/Professional approval, reproduce and distribute in accordance with requirements herein.
- K. All submissions of Shop Drawings, brochures and catalog cuts shall be accompanied by a transmittal letter listing the Drawings submitted by number and title.
- L. When engineering calculations and/or professional certification of performance criteria of materials, systems, and/or equipment are required, the County is entitled to rely upon the accuracy and completeness of such calculations and certifications submitted by the Contractor. Calculations, when required, shall be submitted in a neat, clear and in an easy to follow format. Such calculations and/or certifications shall be signed and sealed by a Professional Engineer registered in the State of Florida.
- M. Distribute copies of reviewed submittals to concerned parties. Instruct recipients to promptly report any inability to comply with provisions.
- N. Prior to submission of Shop Drawings and samples, the Contractor shall stamp and sign the submittals. Any submission which, upon examination by the County, shows evidence of not having been thoroughly checked, or is not in compliance with the provisions of this Section will be returned to the Contractor for completion before it will be considered for review.
- O. Notify the County of the need for making any changes in the arrangement of piping, connections, wiring, manner of installation, etc., which may be required by the material or equipment Contractor proposes to supply.
- P. On resubmittals, direct specific attention in writing or on the revised Drawings or sample to revisions other than the corrections required by County on previous submissions.
- Q. All drawings, schematics, manufacturer's product data, certifications and other drawing submittals required for a system specification shall be submitted at one time as a package to facilitate interface checking.
- R. The County will distribute Shop Drawings as follows for the indicated action taken:

## SHOP DRAWING SUBMITTAL DISTRIBUTION

Representative Party	No Exception Taken or Make Correction Noted			Rejected or Revise & Resubmit		
	Submittal Transmittal	Shop Drawing	Review Comment Sheet	Submittal Transmittal	Shop Drawing	Review Comment Sheet
Engineer	2 Copies	File Copy	1 Copy	Original	File Copy	1 Copy
Contractor (see Note 1)	2 Copies	1 Copy Each Submittal	1 Copy	1 Copy	All Copies Except Engineers	1 Copy
County	1 Copy	1 Copy Each Submittal	1 Copy	1 Copy	None	1 Copy
Inspector	2 Copies	1 Copy Each Submittal	1 Copy	1 Copy	None	1 Copy
Project Record Data (see Note 2)	1 Copy	1 Copy Each Submittal	1 Copy	1 Copy	None	1 Copy

**NOTES:**

1. Contractor shall distribute additional copies to Subcontractors as required.
2. Stored by Contractor to be furnished to County upon closeout.

- S. All Shop Drawings shall be accompanied with a transmittal letter providing the following information:
1. Project Title and Contract Number
  2. Date
  3. Contractor's name and address
  4. The number of each Shop Drawing, project data, and sample required
  5. Notification of Deviations from Contract Documents
  6. Submittal Log Number conforming to specification section numbers
    - a. Submit each specification section separately.
    - b. Identify each Shop Drawing item required under respective specification section.
    - c. Identify resubmittal using specification section followed by A (first resubmittal), B (second resubmittal)...etc.

### 3.02 CONTRACTOR'S REVIEW

- A. Contractor's Responsibility for Coordination: Where the dimension, size, shape, location, capacity or other characteristic affects another item, and where the Contractor selects, fabricates or installs related or adjacent products to be used, the Contractor shall be responsible for coordination of related items. The Contractor shall insure that a proper exchange of information takes place prior to or during preparation of each submittal and that submittals reflect such coordination. The notation "verify" or "coordinate" on the Drawings indicates the necessity for Contractor coordination in the particular instances used.

- B. Contractor's Checking: When checking submittals from Subcontractors and suppliers, the Contractor shall mark all sets, indicating his corrections and comments in blue or green. Copies marked in red may be returned for revision.
- C. The Contractor is responsible to deliver and pick-up all submittals in a timely manner at the County/Professional's designated office. The Contractor is responsible for all related costs and expenses for the transmittal of such submittals.

### 3.03 COUNTY'S / PROFESSIONAL'S REVIEW

- A. Corrections or comments made on Shop Drawings during review do not relieve the Contractor from compliance with the requirements of Drawings and Specifications. This check is only for review of general conformance with the design concept of this Project and general compliance with information given in Contract Documents. Any substitutions or changes shall be properly noted.
- B. No action will be taken on "rough-in" Shop Drawings for plumbing and electrical connections when the items of equipment are not included in the same submittal.
- C. Review Time:
  - 1. On a normal basis, each submittal will be returned to the Contractor within 15 working days of the date it is received. Some submittals may require additional time.
  - 2. If, for any reason, the above schedule cannot be met, the Contractor will be so informed within a reasonable period and the Schedule of Submittals revised. If the specific submittal affects the critical path, the Contractor shall immediately notify the County/Professional in writing. In the event of separate submittals of individual components of a system, these submittals may be held until all components of the system are submitted, and the Contractor will be so notified.

END OF SECTION

**SECTION 01301**  
**PRODUCT SUBSTITUTIONS**

**PART 1 - GENERAL**

1.01 SUMMARY

A. General

1. Base all bids on materials and equipment specified in the Appendix D Orange County Utilities List of Approved Products.
2. Certain types of equipment and kinds of material are described in specifications by means of references to names of manufacturers and vendors, trade names, or catalog numbers.
  - a. When this method of specifying is used, it is not intended to exclude from consideration other products bearing other manufacturer's or vendor's names, trade names, or catalog numbers, provided said products are "or-equals," as determined by County/Professional.
3. Other types of equipment and kinds of material may be acceptable substitutions under the following conditions:
  - a. Or-equals are unavailable due to strike, discontinued production of products meeting specified requirements, or other factors beyond control of Contractor; or,
  - b. Contractor proposes a cost and/or time reduction incentive to the Owner.

1.02 QUALITY ASSURANCE

A. In making request for substitution or in using an approved product, Contractor:

1. Has investigated proposed product, and has determined that it is adequate or superior in all respects to that specified, and that it will perform the function for which it is intended.
2. Will provide same guarantee for substitute item as for product specified.
3. Waives all claims for additional costs related to substitution which subsequently arise.

1.03 DEFINITIONS

- A. Product: Manufactured material or equipment.

1.04 PROCEDURE FOR REQUESTING SUBSTITUTION

A. Substitution shall be considered only:

1. After award of Contract
2. Under the conditions stated herein

- B. Written request through Contractor only.

C. Transmittal Mechanics

1. Follow the transmittal mechanics prescribed for Shop Drawings in Specification Section 01300 "Submittals."
  - a. Product substitution will include in the transmittal letter, either directly or as a clearly marked attachment, the items listed in Paragraph D below.

D. Transmittal Contents

1. Product identification:
  - a. Manufacturer's name
  - b. Telephone number and representative contact name
  - c. Specification Section or Drawing reference of originally specified product, including discrete name or tag number assigned to original product in the Contract Documents.
2. Manufacturer's literature clearly marked to show compliance of proposed product with Contract Documents.
3. Itemized comparison of original and proposed product addressing product characteristics including but not necessarily limited to:
  - a. Size
  - b. Composition or materials of construction
  - c. Weight
  - d. Electrical or mechanical requirements
4. Product experience
  - a. Location of past projects utilizing product.
  - b. Name and telephone number of persons associated with referenced projects knowledgeable concerning proposed product.
  - c. Available field data and reports associated with proposed product.
5. Data relating to changes in construction schedule.
6. Data relating to changes in cost.
7. Samples
  - a. At request of County/Professional.
  - b. Full size if requested by County/Professional.
  - c. Held until substantial completion.
  - d. County/Professional is not responsible for loss or damage to samples.

1.05 APPROVAL OR REJECTION

- A. Written approval or rejection of substitution to be given by the Engineer.
- B. Engineer reserves the right to require proposed product to comply with color and pattern of specified product if necessary to secure design intent.
- C. In the event the substitution is approved, the resulting cost and/or time reduction will be documented by Change Order in accordance with the General Conditions.
- D. Substitution will be rejected if:
  1. Submittal is not through the Contractor with his stamp of approval.
  2. Request is not made in accordance with this Specification Section.

3. In the County/Professional's opinion, acceptance will require substantial revision of the original design.
  4. In the County/Professional's opinion, substitution will not perform adequately the function consistent with the design intent.
- E. Contractor shall reimburse the County for the cost of the evaluation whether or not substitution is approved.

**PART 2 - PRODUCTS - (NOT USED)**

**PART 3 - EXECUTION - (NOT USED)**

END OF SECTION

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**SECTION 01310**  
**PROGRESS SCHEDULES**

**PART 1 - GENERAL**

**1.01 REQUIREMENT**

- A. The Contractor will submit precedence method cost loaded Critical Path Method (CPM) Progress Schedules to the County depicting the approach to prosecution and completion of the Work. This requirement includes, but is not limited to the Contractor's approach to Activity cost loading, recovering schedule and managing the effect of changes, substitutions and Delays on Work sequencing.
- B. The Progress Schedule shall show how the Contractor's priorities and sequencing for the Work (or Work remaining) conform to the Contract requirements and the sequences of Work indicated in or required by the Contract Documents; reflect how the Contractor anticipates foreseeable events, site conditions and all other general, local and prevailing conditions that may affect cost, progress, schedule, furnishing and performance of the Work; and show how the Contractor's Means and Methods translate into Activities and logic.
- C. The Progress Schedule will consist of the Initial Submittal, Payment Submittals and Revision Submittals. Upon acceptance by the County, the Initial submittal will become the As-Planned Schedule for the Work. Revision submittals upon acceptance will become the As-Planned Schedule for the Work remaining to be completed as of the submittal date for that Revision.
- D. References to the Critical Path Method (CPM) are to CPM construction industry standards that are consistent with the requirements of this Section.

**1.02 GLOSSARY OF TERMS**

- A. The following terms, whether or not already defined elsewhere in the Contract Documents, have the following intent and meanings within this Section:
  - 1. Activity Value (Value): That portion of the Contract Price representing an appropriate level of payment for the part of the Work designated by the Activity.
  - 2. As-Planned Schedule: The first, complete Initial Progress Schedule submitted by the Contractor with the intent to depict the entire Work as awarded and accepted by the County or returned as no resubmittal required.
  - 3. Contract Float: Days between the Contractors anticipated date for completion of the Work, or of a specified portion of the Work, if any, and the corresponding Contract Time.

4. CPM Schedule: The Progress Schedule based on the Critical Path Method (CPM) of scheduling. The term Critical Path means any continuous sequence of Activities in the Progress Schedule controlling, because of their sum duration, the Early Date of a pertinent, specified Contract Time.
5. Early/Late Dates: Early/late times of performance, based on CPM calculations, for an Activity in the Progress Schedule. Early Dates will be based on proceeding with all or part of the Work on the date when the corresponding Contract Time commences to run. Late Dates will be based on completing all or part of the Work on the corresponding Contract Time, even if the Contractor plans early completion.
6. Milestones: Key, pre-determined points of progress in the completion of a facility, denoting interim targets in support of the Contract Times. Milestones may pinpoint targets for key excavation and substructure events, significant deliveries, critical path transition from superstructure to piping and electrical rough in and building enclosure. Also, hook-up of mechanical and electrical equipment, availability of power for testing, equipment shakedown, training of County personnel, start-up, Substantial Completion and other events of like import.
7. Official Schedule: The Initial or most recent Revision Submittal accepted by the County or returned as no resubmittal required and the basis for Payment Submittals until another Revision Submittal is submitted and accepted. The accepted Initial Submittal is also the As-Planned Schedule.
8. Payment Submittal: A monthly Progress Schedule update reflecting progress and minor adjustments on the Activities, sequencing and restraints for Work remaining.
9. Total Float: Days by which an activity may slip from its Early Dates without necessarily extending a pertinent Contract Time. Total Float at least equals Contract Float. Total Float may also be calculated and reported in working Days. When an activity is delayed beyond Early Dates by its Total Float it becomes a Critical Path activity and if delayed further will impact a Contract Time.

### 1.03 QUALITY ASSURANCE

- A. The Contractor may self-perform the Work covered by this Section or employ a Subcontractor, subject to the County's consent. Employment of a scheduling Subcontractor shall not in any way alter or reduce the Contractor's obligations under the Contract Documents.
- B. The Contractor will obtain a written interpretation from the County, if the Contractor believes that the selection of activities, logic ties and/or restraints requires a written interpretation of the Contract Documents. With each submission, the Contractor will point out by specific, written notation, any Progress Schedule feature that may reflect variations from any requirements of the Contract Documents.
- C. It is the Contractor's responsibility to obtain information directly from each Subcontractor and Supplier when scoping their respective Activities, Values, logic ties and restraints.

- D. Neither Acceptance nor Review of any Progress Schedule will relieve the Contractor from the obligation to comply with the Contract Times and any sequence of Work indicated in or required by the Contract Documents and to complete, within the Contract Times, any Work omitted from that Progress Schedule.
- E. Neither Acceptance nor Review of any Progress Schedule will imply approval of any interpretation of or variation from the Contract Documents, unless expressly approved by the County through a written interpretation or by a separate, written notation on the returned Progress Schedule Submittal.

#### 1.04 MILESTONES AND SCHEDULE RECOVERY

- A. The County will select Milestones and Milestone Dates on the basis of the As-Planned Schedule. As the Official Schedule is revised, Milestone Dates will be revised accordingly. Milestone Dates will serve as target dates.
- B. Whenever any Activity slips by 14 or more Days from the Late Date for an activity in the Official Schedule, Milestone Dates selected by the County, or a pertinent Contract Time, the Contractor will deliver a Revision Submittal documenting the Contractor's schedule recovery plan and/or a properly supported request for an extension in the Contract Time. The narrative will identify the Delay and actions taken by the Contractor to recover schedule, whether by adding labor, Subcontractors or construction equipment, activity re-sequencing, expediting of submittals and/or deliveries, overtime or shift Work, and so forth. Activity shortening and overlapping shall be explained as to their basis (and be supported by increases in resources).
- C. Upon evaluation of that Revision Submittal, if the County determines there is sufficient cause, the County may withhold liquidated damages or provide a notice of intent to do so, if schedule is indeed not recovered, and/or may give a notice of default.

#### 1.05 PROGRESS SCHEDULE SOFTWARE

- A. The scheduling software employed by the Contractor to process the Progress Schedule will be the current version of Primavera P6.0®, or Primavera® Contractor 5.0 CPM scheduling software.
- B. If the Contractor intends to use companion schedule reporting, analysis or graphics software tools, the Contractor will furnish to the County descriptive materials and samples describing such software tools.

#### 1.06 NON-PERFORMANCE

- A. The County may refuse to recommend all or any part of any payment, if the Contractor fails, refuses or neglects to provide the required Progress Schedule information on a timely basis. Partial payments without a properly updated Progress Schedule shall be returned to the Contractor as non-conforming.

- B. If justified under the circumstances, the County also may prepare alternate Progress Schedules, as appropriate, and deduct from the Contract Amount all related costs by Change Order and/or take other action commensurate with the breach.

#### 1.07 REPORTS, SCHEDULES AND PLOTS

- A. Schedule Reports will include Activity (ID) code and description, duration, calendar, Early Dates, Late Dates and Total Float. Separate Schedule Reports will tabulate, for each Activity, all preceding and succeeding logic types and lead times, whether CPM Plots displaying logic ties are appended or not.
- B. CPM Schedule Plots will be plotted on a suitable time scale and identify the Contract Times, Critical Paths, phases and work areas on 24-inch x 36-inch or smaller sheets. Activities will be shown on the Early Dates with Total Floats noted by Late Date flags. For Payment and Revision Submittals plot a target comparison based on the current Official Schedule.
- C. The Activity Value report will tabulate Activity code and description and Activity Value, percent complete and earned value as calculated by the scheduling software. Cash flow plots shall be provided showing the monthly and cumulative actual and planned earned values with curves shown for Early and Late Dates in the schedules. For Payment and Revision Schedule submittals, the cash flow curves shall also plot the most current Official Schedule planned earnings curves.
- D. Each submittal shall include listings of all added and deleted activities, logic, constraints, Activity Value changes and update information vs. the previous Progress Schedule submittal. This list may be manually prepared or generated by accessory software that will generate such listings.

#### 1.08 NARRATIVE REQUIREMENTS

- A. The Initial Submittal narrative will describe the Contractor's approach to prosecution of the Work and the basis for determination of activity durations, sequence and logic, including the Contractor's management of the site, e.g., lay down, staging, parking, etc.; Contractor's phasing of the Work; use of crewing and construction equipment; identification of non-work County/Professional's, shifts, weekend Work and multiple calendars applied to activities and an explanation of the basis for restraint dates.
- B. Revision and Payment Submittal narratives will explain any changes to the approach or planning referred to in Paragraph A above on account of any change, delay, schedule recovery, substitution and/or Contractor-initiated revision occurring since the previous submittal.
- C. Each narrative will list the Critical Path Activities and compare Early and Late Dates against Contract Times and Milestone Dates. Narratives shall also recap progress and Days gained or lost vs. the current Official Schedule, and identify delays, their extent and causes.

- D. The Initial Submittal narrative will describe all delays occurring since Contract Award and all pending and anticipated "or equal" and substitution proposals. Payment and Revision Submittal narratives will describe any new delays and shall certify that the Contractor has not been delayed, as of the cut off date, by any acts or omissions of the County, except as otherwise specifically stated.

#### 1.09 ACTIVITY REQUIREMENTS

- A. Separate activities will identify permits, design when included in the Work, construction, Submittal preparation and review (and resubmission and re-review), deliveries (site or storage), testing, start-up, commissioning and Punch List.
- B. Activities will be detailed to the extent required to show the transition of trade Work. Activities will delineate the progression of the Work.
- C. Activities will not combine separate or non-concurrent items of Unit Price or lump sum Work.
- D. Activity durations will equal the Work Days required to sufficiently complete the Work designated by the Activity, (i.e., when finish-to-start successors could start, even if the Activity is not quite 100% complete). Installation Activities will last from 10 to 40 workdays. Submittal review activity durations shall conform to specified timeframes.
- E. Activities will be assigned consistent descriptions and identification codes. Sort codes will group Activities by meaningful schemes.
- F. Activities will be assigned Activity Values as appropriate and needed to reasonably allocate the Contract Amount to the time periods that they will be earned and eligible for payment based on the Progress Schedule and Schedule of Values. Separate pay activities may be used to simplify cost loading of the Progress Schedule. When used, pay activities shall be loaded with the cost of Work that is included, at no cost, in related (generally, concurrent) CPM activities. Pay activities shall not control the rate of progress; however, their start and finish dates shall be consistent with those of their related CPM activities to ensure accurate Early Date and Late Date cash-flow plots.

#### 1.10 FLOAT TOLERANCES AND FLOAT OWNERSHIP

- A. Any Progress Schedule with Early Dates after a Contract Time will yield negative Total and Contract Floats, whether shown/calculated or not. Any Revision Submittal with less than negative 20-days of Float will be returned as "Revise and Resubmit," unless a time extension is requested or the County assesses liquidated damages or gives notice of intent to do so, in the event schedule is not recovered.
- B. Float calculated from the definitions given in this Section supersede any conflicting Float values in any early completion Progress Schedule.

- C. Neither the County nor the Contractor own the Float time, the Project owns the Float time. Neither the County nor the Contractor use of positive Total Float will impact a Contract Completion Date or justify an extension of Contract Time.

#### 1.11 SUBMITTALS

- A. Each Progress Schedule Submittal will consist of a narrative, 5 copies of the required reports and plots and an optical ROM data disk with the Contractor's corresponding schedule and schedule layout files in Primavera ".XER" format.
- B. The County will review Progress Schedule Submittals and return a review copy within 14-days after receipt and the Contractor shall, if required, resubmit within 7-days after return of the review copy.
- C. Requirements for the Initial Submittal:
  - 1. Within 20-days after receipt of Notice to Proceed and prior to commencing Work on the Project, prepare and submit to the County the Initial Submittal of the Progress Schedule for the Work. The Initial Submittal will show the Work as awarded, without delays, Change Orders or substitutions.
    - a. Activity Values will prorate Schedule of Values costs and/or pay items through to Activities. Provide a cross-reference listing with two parts; a part that will list each activity with the respective amounts allocated from each Schedule of Values and Unit Price Item making up the total value of each activity and a second part that will list the Schedule of Values and Unit Price Items with the respective amounts allocated from each activity that make up the total value of each item.
  - 2. After the As-Planned Schedule is established, the County will select Milestones and record the Milestone Early and Late Dates. As the Official Schedule evolves, Milestone Dates will be revised accordingly.
  - 3. If the County refuses to endorse the Initial Submittal (or a resubmission) as "Resubmittal Not Required," the As-Planned Schedule will not be established. In that event, the Contractor will continue to submit Payment and Revision Submittals reflecting progress and the Contractor's approach to remaining Work. The County will rely on the available Payment and Revision Submittals, subject to whatever adjustments it determines appropriate.
- D. Requirements for Payment Submittals:
  - 1. Payment Submittals with progress up to the closing date and updated Early Dates and Late Dates for progress and remaining Activities will be due with each Progress Payment. As-built data will consist of actual dates, percent complete, earned payment, changes, Delays and other significant events occurring before the closing date.
  - 2. Activity percent complete and earned value should indicate a level of completion that corresponds to the Application for Progress Payment for the same period. The earned value should be calculated by the scheduling software as Activity Value times percent complete. Explanation should be provided whenever the cumulative earned value of activities in a Payment Submittal is not within 10% of the value of Work completed as represented in the corresponding Application for Progress for Payment.

3. At the Contractor's option, a Payment Submittal may overlay minor adjustments on activities and sequencing for Work remaining. This excludes Activity re-scoping to reflect Delays, changes, schedule recovery or substitutions.

E. Requirements for Revision Submittals:

1. Revision Submittals will be submitted when necessary because of major changes or delays affecting activities, sequencing or restraints for Work remaining and/or to put forth a schedule recovery plan. Revision Submittals may also be required because of Contractor-initiated re-planning, or when Contractor plans to perform Work ahead or out-of-sequence that will require additional testing or inspection personnel, or when requested by the County when Work is performed out-of-sequence from the current Official Schedule such that the number of Days gained or lost can not be determined or the scheduled dates of completion of the Work in a Payment Submittal are not viewed as reliable.
2. If requesting a time extension, the Revision Submittal should show the impact of the delay after incorporating reasonable mitigation to minimize the impact and illustrate how the number of Days requested time extension was determined. The delay should be determined as the change in the forecast Contract Completion Date(s) resulting solely from delays that entitle the Contractor to a time extension as provided in the General Conditions. Any and all Contractor slippage and delay occurring prior to and concurrent with the delay potentially entitling the Contractor to a time extension shall be incorporated in the Revision and explained such that the concurrent and non-concurrent periods of delay are indicated. If the Contractor does not follow the procedures contained in this Section or, if the Contractor's analysis is not verifiable by an independent, objective evaluation by the County using the electronic files and data furnished by the Contractor, any such extension in Contract Time will not be granted.

F. Retrospective Delay Analysis.

1. If the County/Professional refuses to endorse any Revision Submittal as "Resubmittal Not Required," the Contractor and County will use the latest Official Schedule when evaluating the effect of Delays on Contract Time and/or Contract Price. The procedure to be used will consist of progressively updating the latest Official Schedule at key closing dates corresponding to starting and finishing dates of the delays and/or dates the delays became critical or dates the Critical Path may have changed for other reasons. For each Progress Schedule iteration, slippage between actual Milestone Dates and Initial Milestone Dates will be correlated to Delays occurring solely in that iteration.
2. For each iteration, revisions in Activities, logic ties and restraints affecting Work after the closing date will be included in that Progress Schedule only if they meet any of the following conditions. First, they are Progress Schedule revisions that the County consented to contemporaneously (i.e., before the closing date) in writing. Second, they reflect comments or objections raised by or on behalf of the County and that were actually confirmed by the as-built progress. Lastly, they represent Contractor's schedule recovery plans or other Progress Schedule revisions that were actually confirmed by the as-built progress.

**PART 2 - PRODUCTS (NOT USED)**

**PART 3 - EXECUTION (NOT USED)**

END OF SECTION



**SECTION 01370**  
**SCHEDULE OF VALUES**

**PART 1 - GENERAL**

1.01 DEFINITION

- A. Schedule of Values: Schedule that divides the Contract Amount into pay items, such that the sum of all pay items equals the Contract Amount for the Work, or for any portion of the Work having a separate specified Contract Amount.

1.02 REQUIREMENT

- A. The Schedule of Values established as provided in the General Conditions will serve as the basis for progress payments and will be incorporated into a form of Application for Payment acceptable to the County. Progress payments on account of Unit Price Work will be based on the number of units completed and shall be prorated by the percent complete on the number of units installed not meeting all requirements of the Contract including testing
- B. No payment will be made for Work performed on a lump sum contract or a lump sum item until the appropriate Schedule of Values is approved by the County.
- C. The equitable value of Work deleted from a lump sum contract or lump sum item shall be determined from the approved Schedule of Values.

1.03 SUBMITTALS

- A. Submit 3 copies of a Preliminary Schedule of Values within 15-days after the recommended award of the Contract.
- B. Submit 3 copies of a proposed final Schedule of Values within 20-days after receipt of Notice to Proceed as per the General Conditions.
- C. Submit the Schedule of Values, typed, on EJCDC 1910-8-E form or Orange County forms or spreadsheets provided by County. The Contractor's standard form or electronic media printout will be considered for acceptability by the County.
- D. List installed value of each major item of Work and each subcontracted item of Work as a separate line item to serve as a basis for computing values for Progress Payments. Round off values to nearest dollar.
- E. Coordinate listings with the Progress Schedule.
- F. For items on which payments will be requested for stored materials or equipment, list sub-values for cost of stored products with taxes paid and provide corresponding schedule of value item number. Stored materials quantities shall not exceed installed quantities on bid tab or as required by the Contract Documents.

- G. Submit a sub-schedule for each separate stage of Work specified in Section 01010 "Summary of Work."
- H. The sum of values listed shall equal the total Contract Amount for the Work or the Contract Amount for a part of the Work with a separate Contract Amount provided for by the Contract Documents.
- I. When the County requires substantiating information, submit data justifying line item amounts in question.

#### 1.04 UNIT PRICE CONTRACTS

- A. For unit price contracts, the bid item prices on the Project Bid Schedule shall be used as the basis for the schedule of values. The Contractor shall resubmit the bid item prices in the format described herein, and may, at its option, or if requested by the County, divide the items in the Project Bid Schedule into sub-items to provide a more detailed basis of payment.

#### 1.05 LUMP SUM CONTRACTS

- A. For lump sum contracts, if the Work involves separate facilities, e.g. multiple pump stations, the cost of the Work shall be separated by each facility and into schedule of value items. Break principal subcontract amounts down into these items; The lump sum cost for each facility shall be submitted individually and split into the schedule of values listed in items 1 through 17.
  - 1. Mobilization/Demobilization at 5% of the base bid for the pump station.
  - 2. Project Record Documents at 1% of the base bid for the pump station.
  - 3. Indemnification at \$100.00 divided by the number of pump stations in the project.
  - 4. Demolition of existing pump station
  - 5. Bypass pumping
  - 6. Wetwell structure, liner, top slab, hatch covers and appurtenances
  - 7. Valve vault structure, hatch covers and appurtenances, drain piping and appurtenances
  - 8. Wetwell (mechanical): 316 stainless steel piping and appurtenances, pumps and base plates
  - 9. Valve vault (mechanical): piping, valves, and appurtenances
  - 10. Yard piping, fittings, valves, and appurtenances (outside of structures)
  - 11. Site work and access drive
  - 12. Chain link fence and gates
  - 13. Masonry walls and gates
  - 14. Odor control equipment, related piping, monitoring equipment, etc.
  - 15. Generator, fuel storage tank and related piping
  - 16. Electrical control panel, wiring, and connections
  - 17. Start-up and testing

### **PART 2 - PRODUCTS (NOT USED)**

### **PART 3 - EXECUTION (NOT USED)**

END OF SECTION

**SECTION 01380**  
**AUDIO – VISUAL DOCUMENTATION**

**PART 1 - GENERAL**

1.01 PURPOSE AND DESCRIPTION OF WORK

- A. The purpose of the audio - visual documentation is to provide the County with regularly documented audio - visual records of the Construction process from the existing conditions through final completion.

1.02 PRE-CONSTRUCTION VIDEO REQUIREMENTS INCLUDED

- A. The Contractor shall employ a professional videographer to take a Pre-Construction video of the entire site including the areas of adjacent properties within 100-feet of the limits of Work and shall be made within 30-days of Work beginning. Special attention shall be made to show the existing paved roads, shoulders, signs, and other existing features.
- B. The Contractor shall submit a quality audio-video recording documenting Pre-Construction field conditions for the entire project. When the Work includes construction of water, wastewater, reuse, or other lines in the vicinity of any street or road, the Contractor shall take digital audio-video recordings of existing conditions along both sides of the street or road. The Pre-Construction video shall be submitted to the County and accepted prior to commencing any Work or using any Contractor laydown areas.
- C. Electronic digital photography shall also be used as necessary to record and facilitate resolution of on-site issues through the transmission of electronic photographs by e-mail from the site to the Professional's and County's offices.

**PART 2 - PRODUCTS**

2.01 AUDIO-VIDEO RECORDING

- A. Each audio-video recording shall be saved on appropriate DVD media viewable on standard DVD players or computer.

- B. Each DVD shall contain the following information and arrangement at the beginning as a title screen:
- Orange County, Florida
  - PROJECT NAME
  - PROJECT NUMBER
  - CONTRACTOR: (Name of Contractor)
  - DATE: (When photo was taken)
  - VIDEO BY: (Firm Name of Videographer)
  - LOCATION: (Description of Location(s) and View(s))
- C. Each DVD recording section shall begin with an audio description of the County's name, Contract name and number, Contractor's name, date and location information such as street name, direction of travel, viewing side, etc.
- D. Information appearing on the video recording must be continuous and run simultaneously by computer generated transparent digital information. No editing or overlaying of information at a later date will be acceptable.
- E. Digital information to appear in the upper left corner shall be as follows:
1. Name of Contractor
  2. Day, date and time
  3. Name of Project & Specification Number
- F. Time must be accurate and continuously displayed on the video record
- G. Written documentation must coincide with the information on the DVD so as to make easy retrieval of locations at a later date.
- H. The video system shall have the capability to transfer individual frames of video electronically into hard copy prints or photographic negatives.
- I. Audio shall be recorded at the same time as the video recording and shall have the same information as on the viewing screen. Special commentary shall be given for unusual conditions of buildings, sidewalks and curbing, foundations, trees and shrubbery, structures, equipment, pavement, etc.
- J. All DVDs and boxes shall bear labels with the following information:
1. DVD Number
  2. County's Name
  3. Date of Recording
  4. Project Name and Number
  5. Location and Standing Limit of Video

## 2.02 CONSTRUCTION PHOTOGRAPHS

- A. The Contractor shall employ a competent photographer to take construction record photographs periodically during the course of the Work.

- B. Prints: Date imprinted 8-inch x 10-inch high resolution glossy single weight color print paper; 5 sets, bound in 3-ring binders to be provided to the County with each respective Application for Payment and distributed by the County as follows:
  - 1. County (2 sets)
  - 2. Engineer (1 set)
  - 3. Contractor (1 set)
  - 4. Project Record Data (1 set stored by Contractor to be furnished to County upon Closeout)

### **PART 3 - EXECUTION**

#### **3.01 VIDEO VIEWS REQUIRED**

- A. Complete coverage shall include all surface features within 100-feet of the Work area to be used by the Contractor and shall be supported by appropriate audio description made simultaneously with video coverage. Such coverage shall include, but not be limited to, all existing driveways, sidewalks, curbs, ditches, roadways, landscaping, trees, culverts, headwalls, and retaining walls, equipment, structures, pavements, manholes, vaults, handrails, etc. located within the work zone. Video coverage shall extend to the maximum height of all structures within this zone.
- B. The video recorder shall take special efforts to point out and provide audio commentary on cracking, breakage, damage, and other defects in existing features.
- C. All video recording shall be done during times of good visibility. No video recording shall be done during periods of visible precipitation, or when more than 10% of the ground area is covered with standing water, unless otherwise authorized by County.
- D. Prior to commencement of audio-video recording, the Contractor shall notify the County in writing within 48-hours of the audio-video recording. The County may provide a designated representative to accompany and observe all video recording operations. Audio-video recording completed without a County Representative present will be unacceptable unless specifically authorized by the County.

#### **3.02 AUDIO-VIDEO REQUIREMENTS**

- A. Major Locations:
  - 1. The Contractor shall provide color digital video of each major facility and structures and facilities adjacent to the Construction before construction starts.
  - 2. All videos shall be recorded with character generator operating with date, time, and location on screen. During video recording, the Contractor shall narrate video explaining what is being shown. All master videos shall be delivered to the County.

3. The audio and video portions of the recording shall maintain viewer orientation. To this end, overall establishing views of all visible house and business addresses shall be used. In areas where the proposed construction location will not be readily apparent to the video recording viewer, highly visible yellow flags shall be placed, by the Contractor, in such a fashion as to clearly indicate the proposed centerline of Construction. When conventional wheeled vehicles are used as conveyances for the recording system, the vertical distance between the camera lens and the ground shall not exceed 10-feet. The camera shall be firmly mounted such that transport of the camera during the recording process will not cause an unsteady picture.
4. All video recording shall be done during time of good visibility. No video recording shall be done during precipitation, mist or fog. The recording shall only be done when sufficient sunlight is present to properly illuminate the subjects of recording and to produce bright, sharp video recordings of those subjects.
5. The average rate of travel during a particular segment of coverage shall be directly proportional to the number, size and value of the surface features within that construction area's zone of influence. The rate of speed in the general direction of travel of the vehicle used during taping shall not exceed 44-feet per minute.

### 3.03 PHOTOGRAPHS

- A. A minimum of 3 views (top, upstream, and downstream) each shall generally be taken prior to backfilling pipelines or structures. Photographs shall be provided for:
  1. Utility conflicts/relocations
  2. Manholes
  3. Pump stations
  4. Boring and jacking
  5. Directional drilling pipe entrance and exit
  6. Valve installation
  7. Air release valve installation
  8. Fire hydrant assembly
- B. Photo Identification
  1. Name of Project
  2. Name of Structure
  3. Orientation of View
  4. Date & Time of Exposure
  5. Film numbered identification of exposure

END OF SECTION

**SECTION 01400**  
**QUALITY CONTROL**

**PART 1 - GENERAL**

1.01 SITE INVESTIGATION AND CONTROL

- A. Contractor shall verify all dimensions in the field and check field conditions continuously during construction. Contractor shall be solely responsible for any inaccuracies built into the Work due to Contractor's failure to comply with this requirement.
- B. Contractor shall inspect related and appurtenant Work and report in writing to County any conditions which will prevent proper completion of the Work. Failure to report any such conditions shall constitute acceptance of all site conditions, and any required removal, repair, or replacement caused by unsuitable conditions shall be performed by the Contractor at Contractor's sole cost and expense.

1.02 INSPECTION OF THE WORK

- A. The Work shall be conducted under the general observation of representatives of the County acting on behalf of the County to ensure strict compliance with the requirements of the Contract Documents. Such inspection may include mill, plant, shop, or field inspection, as required. The County shall be permitted access to all parts of the Work, including plants where materials or equipment are manufactured or fabricated. Inspection by the County are in addition to the inspections required of Contractor by his QC Representatives.
- B. The presence of the County, however, shall not relieve the Contractor of the responsibility for the proper execution of the Work in accordance with all requirements of the Contract Documents. Compliance is a duty of the Contractor, and said duty shall not be avoided by any act or omission on the part of the County. Further, no requirement of this Contract may be waived or modified except by change order or formal (written) substitution approval.
- C. All materials and articles furnished by the Contractor shall be subject to rigid inspection, and no materials or articles shall be used in the Work until they have been inspected and accepted by the County. No Work shall be backfilled, buried, cast in concrete, hidden, or otherwise covered until it has been inspected. Any Work so covered in the absence of inspection shall be subject to uncovering. Where uninspected Work cannot be uncovered, such as in concrete cast over reinforcing steel, all such Work shall be subject to demolition, removal, and reconstruction under proper inspection and no additional payment will be allowed therefore.

- D. The Contractor is responsible for the Quality of his own work and shall designate a qualified individual, to be approved by the County, who will ensure that all work is performed in strict accordance with the Contract Documents. This quality representative shall inspect the work for the Contractor and provide to the County and the Contractor a report outlining all work accomplished, all inspections, and all testing performed for all days when work is performed. The objective of this report is to provide "Objective Evidence of Compliance" by the Contractor with the requirements of the Contract.

#### 1.03 TIME OF INSPECTION AND TESTS

- A. Samples and testing required under these Specifications shall be furnished and prepared in ample time for the completion of the necessary tests and analyses before said articles or materials are to be used. Except as otherwise provided in the Contract Documents, performance of the required tests will be by the Contractor and all costs therefore will be borne by the Contractor at no cost to the County. Whenever the Contractor is ready to backfill, bury, cast in concrete, hide, or otherwise cover any Work under this Contract, the County shall be notified not less than 24-hours in advance to request inspection before beginning any such Work of covering. Failure of the Contractor to notify the County at least 24-hours in advance of any such inspections shall be reasonable cause for the County to order a sufficient delay in the Contractor's schedule to allow time for such inspection, any remedial, or corrective work required, and all costs of such delays, including its impact on other portions of the Work, shall be borne by the Contractor.

#### 1.04 SAMPLING AND TESTING

- A. When not otherwise specified, all sampling and testing shall be in accordance with the methods prescribed in the current standards of the ASTM, as applicable to the class and nature of the article or materials considered. However, the County reserves the right to use any generally accepted system of inspection which, in the opinion of the County, will ensure the County that the quality of the workmanship is in full accord with the Contract Documents.
- B. Any waiver of any specific testing or other quality assurance measures, whether or not such waiver is accompanied by a guarantee of substantial performance as a relief from the specified testing or other quality assurance requirements as originally specified, and whether or not such guarantee is accompanied by a performance bond to assure execution of any necessary corrective or remedial work, shall not be construed as a waiver of any technical or qualitative requirements of the Contract Documents.
- C. Notwithstanding the existence of such waiver, the County shall reserve the right to make independent investigations and tests as specified in the following paragraph and, upon failure of any portion of the Work to meet any of the qualitative requirements of the Contract Documents, shall be reasonable cause for the County to require the removal or correction and reconstruction of any such Work.



- D. In addition to any other inspection or quality assurance provisions that may be specified, the County shall have the right to independently select, test, and analyze, at the expense of the County, additional test specimens of any or all of the materials to be used. Results of such tests and analyses shall be considered along with the tests or analyses made by the Contractor to determine compliance with the applicable specifications for the materials so tested or analyzed provided that wherever any portion of the Work is discovered, as a result of such independent testing or investigation by the County which fails to meet the requirements of the Contract Documents, all costs of such independent inspection and investigation and all costs of removal, correction, reconstruction, or repair of any such Work shall be borne by the Contractor.

#### 1.05 RIGHT OF REJECTION

- A. The County shall have the right at all times and places to reject any articles or materials to be furnished hereunder which, in any respect, fail to meet the requirements of the Contract Documents, regardless of whether the defects in such articles or materials are detected at the point of manufacture or after completion of the Work at the site. If the County or inspector, through an oversight or otherwise, has accepted materials or Work which is defective or which is contrary to the Contract Documents, such material, no matter in what stage or condition of manufacture, delivery, or erection, may be rejected by County.
- B. Contractor shall promptly remove rejected articles or materials from the site of the Work after notification or rejection.
- C. All costs of removal and replacement of rejected articles or materials, as specified herein, shall be borne by the Contractor.
- D. If the Contractor fails to remove or replace defective work after notification to do so, the County may have the work removed and replaced by others and deduct all costs from the Contractor's pay requests.

#### 1.06 TESTING LABS

- A. All geotechnical testing laboratory services for field testing will be paid by the County. The lab(s) shall function as independent lab(s) and report independently to the County and the Contractor. The test lab(s) may not approve or allow any deviation from the Contract Documents.

#### **PART 2 - PRODUCTS (NOT USED)**

#### **PART 3 - EXECUTION (NOT USED)**

END OF SECTION

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**SECTION 01410**  
**TESTING AND TESTING LABORATORY SERVICES**

**PART 1 - GENERAL**

1.01 DESCRIPTION

A. Scope of Work:

1. County will employ and pay for services of an Independent Testing Laboratory to perform Testing specifically indicated on the Contract Documents or specified in the Specifications and may at any other time elect to have materials and equipment tested for conformity with the Contract Documents.
2. Contractor shall cooperate with the laboratory to facilitate the execution of its required services.
3. Employment of laboratory by County shall in no way relieve Contractor's obligations to perform the Work.

B. Related Requirements Described Elsewhere:

1. Conditions of the Contract.
2. Respective section of Specifications: Certification of products.
3. Each Specification section listed: Laboratory tests required and standards for testing.

1.02 CONTRACTOR'S RESPONSIBILITIES

- A. Cooperate with County's personnel; provide access to work and manufacturer's operations.
- B. Secure and deliver to the County adequate representational samples of materials proposed to be used and which require testing.
- C. Provide to the County the preliminary design mix proposed to be used for concrete, and other materials mixes which require control by the testing laboratory.
- D. Materials and equipment used in the performance of work under this Contract are subject to inspection and testing at the point of manufacture or fabrication. The County may require the Contractor to provide statements or certificates from the manufacturers and fabricators that the materials and equipment provided by them are manufactured or fabricated in full accordance with the standard specifications indicated in the Contract Documents. All costs of this testing and providing statements and certificates shall be a subsidiary obligation of the Contractor, and no extra charge to the County shall be allowed on account of such testing and certification.
- E. Contractor shall not have direct contact with laboratory or laboratory personnel. All testing shall be coordinated through County.
- F. Furnish incidental labor and facilities:

1. To provide access to work to be tested.
2. To obtain and handle samples at the Project site or at the source of the product to be tested.
3. To facilitate inspections and tests.
4. For storage and curing of test samples.

G. Notify County sufficiently in advance of operations to allow for laboratory assignment of personnel and scheduling of tests. When tests or inspections cannot be performed after such notice, reimburse County for laboratory personnel and travel expenses incurred.. The following field testing schedule summarizes the responsibilities of various tests that may be required by the Contract Documents.

<b>TEST</b>	<b>NOTES</b>	<b>PAID FOR</b>
Soil Compaction	A. Pipe Work: Every 300 ft. at each lift of compaction B. Structures: As a minimum one test per 2000 SF of fill area per lift, or at least 2 tests per structure, per lift. As specified in material specifications sections	County
Low Pressure Air Exfiltration	Each section of gravity sewer pipe between manholes or lift station	Contractor
Hydrostatic Pressure	All segments of pressure piping (24-hour test).	Contractor
Hydrostatic Leakage	All segments of pressure piping (2-hour test).	Contractor
Bacteriological	As required by local and state agencies	County
Asphaltic Concrete Paving	As required by County	County
LBR	Each 600 SY of pavement	County
Concrete	Slump test each delivery, cylinders every 20 CY	County
Asbestos	Environmental testing of materials	County
All Other Testing	As specified in various sections of the Project Manual	As Indicated

H. Employ and pay for the services of the same or a separate, equally qualified independent testing laboratory to perform additional inspections, sampling and testing required for the Contractor's convenience.

I. If the test results indicate the material or equipment complies with the Contract Documents, the County shall pay for the cost of the testing laboratory. If the tests and any subsequent retests indicate the materials and equipment fail to meet the requirements of the Contract Documents, the Contractor shall pay for the laboratory costs directly to the County or the total costs shall be deducted from any payments due to the Contractor.

**PART 2 - PRODUCTS (NOT USED)**

**PART 3 - EXECUTION (NOT USED)**

END OF SECTION

**SECTION 01516**  
**COLLECTION SYSTEM BYPASS**

**PART 1 - GENERAL**

1.01 SCOPE OF WORK

- A. The Work covered by this section consists of providing all temporary bypassing to perform all operations in connection with the flow of wastewater around pipe segment(s) or pump stations. The purpose of bypassing is to prevent wastewater overflows and provide continuous service to all wastewater customers. The Contractor will maintain wastewater flow in the construction area in order to prevent backup and/or overflow and provide reliable wastewater service to the users of the wastewater system at all times.
- B. The pump station receives flow from two gravity sewers 15” from the south and 36” from the north. The 15” gravity sewer flow has a calculated peak flow of 1,000 gpm and the 36” gravity sewer has a calculated peak flow of 5,000 gpm. By-pass plan will address each line and include phasing for each in the Bypass submittal. System by-pass will remain in place for the duration of the project based on the contractor’s own schedule.

1.02 SUBMITTALS

- A. Prior to implementation of any bypass, the Contractor will submit and receive County acceptance of a bypass plan. The Contractor will submit to the County a comprehensive written plan for approval and acceptance that describes the intended bypass for the maintenance of flows during construction. The Contractor will also provide a sketch showing the location of bypass pumping equipment for each pump station or line segment(s) around which flows are being bypassed. The plan will include proposed tanker(s), pump(s), bypass piping, backup plan and equipment, work schedule, monitoring log for bypass pumping, monitoring plan of the bypass pumping operation, and maintenance of traffic plan.

**PART 2 - PRODUCTS**

2.01 GENERAL

- A. The Contractor will provide and maintain adequate equipment, piping, tankers, and other necessary appurtenances in order to maintain continuous and reliable wastewater service in all wastewater lines as required for construction. The Contractor will have tankers, backup pump(s), piping, and appurtenances ready to deploy immediately.
- B. All piping will be designed to withstand at least twice the maximum system pressure or a minimum of 50-psi, whichever is greater.

- C. When bypassing a pump station, one (1) back-up pump equal to the primary unit will be provided by the Contractor. Bypass pumps shall have a maximum rating of 55 decibels for sound attenuation.
- D. The Contractor shall provide an auto dialer to contact responsible parties when either of the pumps are activated and deactivated, the primary pump or secondary pump stops functioning, and the water level is over the highest set float.

## **PART 3 - EXECUTION**

### **3.01 GENERAL**

- A. The Contractor shall have all materials, equipment and labor necessary to complete the repair, replacement, or rehabilitation on the job site prior to isolating the gravity main segment, manhole, or pump station. The Contractor will demonstrate that the temporary bypass pumping system is in good working order and is sufficiently sized to successfully handle flows by performing a test run for a period of 72-hours prior to beginning the Work and shall be monitored 24-7 during that time.

### **3.02 TRAFFIC CONSIDERATIONS**

- A. The Contractor shall locate bypass pumping suction and discharge lines so as to not cause undue interference with the use of streets, private driveways, and alleys, to include the possible temporary trenching of piping at critical intersections. Additional traffic maintenance requirements are found in Section 01570 "Maintenance of Traffic".

### **3.03 BYPASS OPERATION**

- A. The Contractor shall submit a bypass plan to the County and the bypass plan must be approved before the bypass is operational to perform the Work. Contractor shall maintain the wastewater system flow and no surcharging will be allowed to occur out of the system.
- B. Where Work requires the main or pump station to be taken out service after normal working hours and bypass pumping is being used; the Contractor shall be responsible for monitoring the bypass operation 24-hours per day, 7-days per week. Any electronic monitoring in lieu of on-site monitoring must be detailed in the comprehensive written bypass plan.
- C. The Contractor shall ensure that no damage will be caused to private property as a result of bypass pumping operations. The Contractor will complete the Work as quickly as possible and pass all tests and inspections before discontinuing bypassing operations and returning flow to the wastewater manhole, main, or pump station.
- D. During bypassing, no wastewater will be leaked, dumped, or spilled in or onto, any area outside of the existing wastewater system.

- E. The Contractor shall immediately notify the County should a sanitary sewer overflow (SSO) occur. The Contractor shall take the necessary action to wash down, clean up and disinfect the spillage area to the satisfaction of the County or other governmental agency.
- F. The Contractor shall cease bypass operations and return flows to the new and/or existing sewer when directed by the County. When bypass operations are complete, all bypass piping shall be drained into the wastewater system prior to disassembly.

#### 3.04 CONTRACTOR LIABILITY

- A. The Contractor shall be responsible for all required pumping, equipment, piping, and appurtenances to accomplish the bypass and for any and all damage that results directly or indirectly from the bypass pumping equipment, piping and/or appurtenances. The Contractor shall also be liable for all County personnel labor and equipment costs, penalties and fines resulting from sanitary sewer overflows. It is the intent of these specifications to require the Contractor to establish adequate bypass pumping as required regardless of the flow condition.

END OF SECTION

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**SECTION 01560**  
**EROSION AND SEDIMENTATION CONTROL**

**PART 1 - GENERAL**

1.01 WORK INCLUDED

- A. The Work specified in this Section consists of designing, providing, maintaining and removing temporary erosion and sedimentation controls as necessary to protect the Work and prevent sedimentation from the Contractor's activities from entering water bodies or enter other parts of the County's or other property owners sites outside the Construction limits.
- B. Temporary erosion controls include, but are not limited to; grassing, mulching, netting, watering and reseeded on-site surfaces and soil and borrow area surfaces, and providing interceptor ditches at end of berms and at those locations which will ensure that erosion during Construction will be either eliminated or maintained within acceptable limits as established by the regulatory agencies having jurisdiction.
- C. Temporary sedimentation controls include, but are not limited to; silt dams, traps, barriers, and appurtenances at the foot of sloped surfaces which will ensure that sedimentation pollution will be either eliminated or maintained within acceptable limits as established by the regulatory agencies having jurisdiction.

1.02 REQUIREMENTS

- A. The Contractor is responsible for providing effective temporary erosion and sediment control measures during Construction or until final controls become effective.
- B. The Contractor shall be responsible for filing Notice of Intent for Construction Activities with regulatory agencies (SJRWMD, SFWMD, and FDEP) as required by law, if thresholds are expected to be exceeded.
- C. The areas of unstabilized soil cover shall be minimized at all times to limit erosion and sedimentation.

1.03 SUBMITTALS:

- A. The Contractor shall prepare and submit an Erosion and Sedimentation Control Plan (Stormwater Pollution Prevention Plan) for County review and approval. The Plan shall be in effect throughout the Construction duration.

## **PART 2 - PRODUCTS**

### **2.01 EROSION CONTROL**

- A. Seed: Scarified Argentine Bahia.
- B. Sod: Bermuda grass, Argentine Bahia grass, Pensacola Bahia grass or St. Augustine. Grassing and Sodding Materials: As specified in Section 981 FDOT Specification for Road & Bridge Construction.
- C. Netting: Polypropylene mesh netting 5/8-inch x 3/4-inch (16 x 19mm) mesh with interwoven curlex fibers as manufactured by American Excelsior Company or equal. Netting: Fabricated of material in conformance with Section 985 FDOT Specification for Road & Bridge Construction.

### **2.02 SEDIMENTATION CONTROL**

- A. Bales: Clean, synthetic hay type. Minimum dimensions of 14-inch by 18-inch by 36-inches at the time of placement.
- B. Netting: Fabricated of material in conformance with Section 985 FDOT Specification for Road & Bridge Construction.
- C. Sediment Control Fencing (Silt Fencing): As manufactured by American Excelsior Company or equal.
- D. Filter stone: Crushed stone conforming to Florida Department of Transportation Specifications.
- E. Concrete block: Hollow, non-load bearing type.
- F. Concrete: Exterior grade not less than 1-inch thick.
- G. Turbidity Barriers: Floating or staked as required.

## **PART 3 - EXECUTION**

### **3.01 TEMPORARY EROSION CONTROL**

- A. See Section 02578 "Solid Sodding."

### **3.02 SEDIMENTATION CONTROL**

- A. Install and maintain silt fences and dams, traps, barriers, and appurtenances as shown on the approved descriptions and working Drawings. Replace deteriorated hay bales and dislodged filter stone. Repair portions of any devices damaged at no additional expense to the County.

- B. Install all sediment control devices in a timely manner to ensure the control of sediment. At sites where exposure to sensitive areas is likely, complete installation of all sediment control devices before starting earthwork.
- C. Use approved temporary erosion control features to correct conditions that develop during Construction that were not foreseen when the Erosion and Sedimentation Control Plan was first approved.

### 3.03 PERFORMANCE

- A. Should any of the temporary erosion and sediment control measures employed by the Contractor fail to produce results that comply with the requirements of the Regulatory agency having jurisdiction, the County or the Professional, the Contractor shall immediately take whatever steps necessary to correct the deficiency at its own expense to protect the Work and any adjacent property to the site, as well as to prevent contamination of any river, stream, lake, tidal waters, reservoir, canal or other water impoundments.
- B. The side slope areas with unstabilized or unprotected soil cover shall be minimized at all times to limit erosion and sedimentation.
- C. Incorporate permanent erosion control features into the Project at the earliest practical time.
- D. Remove temporary erosion and sedimentation controls when the Work is complete and in accordance with the Erosion and Sedimentation Control Plan (Stormwater Pollution Prevention Plan) and the Notice of Intent for Construction Activities filed with regulatory agencies.

### 3.04 MAINTENANCE OF EROSION AND CONTROL FEATURES

- A. Provide routine maintenance of permanent and temporary erosion control features, at no expense to the County, until the Project is complete and accepted.

END OF SECTION



**SECTION 01570**  
**MAINTENANCE OF TRAFFIC**

**PART 1 - GENERAL**

**1.01 DESCRIPTION**

This section includes identifying safety hazards and then furnishing all necessary labor, materials, tools, and equipment including, but not limited, to signs, barricades, traffic drums, cones, flashers, construction fencing, flag persons, variable message boards, uniformed police officers, warning devices, temporary pavement markings, temporary sidewalk, delineators, etc., to maintain vehicular and pedestrian traffic through and adjacent to the project area. These measures and actions shall be taken to safely maintain the accessibility of public and construction traffic by preventing potential construction hazards. . All materials, work and incidental costs related to Maintenance of Traffic will be paid for at the contract lump sum price.

**1.02 REQUIREMENTS**

- A. The Traffic Control Plan shall conform to the following standards:
  - 1. Standard Specifications for Road and Bridge Construction, latest edition including all subsequent supplements issued by the Florida Department of Transportation, (FDOT).
  - 2. Manual on Uniform Traffic Control Devices for Streets and Highways by U.S. Department of Transportation, Federal Highway Administration.
  - 3. Right-of-Way Utilization Regulations, Orange County, Florida, latest edition.
- B. All references to the respective agencies in the above referenced standards shall be construed to also include the municipality as applicable for this Work.
- C. Sequence the Work in a manner that will minimize disruption of vehicular and pedestrian access through and around the construction area.
- D. Traffic planning and control for the maintenance and protection of pedestrian and vehicular traffic affected by the Contractor's Work includes, but is not limited to:
  - 1. Construction and maintenance of any necessary detour equipment and facilities.
  - 2. Providing necessary facilities for access to residences and businesses.
  - 3. Furnishing, installing, and maintenance of traffic control and safety devices (e.g. signage, barricades, barriers, message boards, etc.), and flag persons as appropriate during Construction.
  - 4. Control of water runoff, dust and any other special requirements for safe and expeditious movement of traffic.

- E. Planning, maintenance and control of traffic shall be provided at the Contractor's expense. The Contractor will bear all expense of maintaining the vehicle and pedestrian traffic throughout the work area.
- F. The Contractor will ensure all personnel involved in traffic control are and capable of communicating with the public. The Contractor may be required to hire off-duty uniformed police officers, in addition to flag persons, to direct and maintain traffic. Locations and conditions requiring such uniformed police officers shall be as directed by the County. The Contractor shall be required to utilize uniformed police officers for work within FDOT maintained ROW, road closures affecting school traffic and during all night work involving a road closure or crossing on nonresidential roads.
- G. The Contractor will remove temporary equipment and facilities when no longer required, restore grounds to original, or to specified conditions.

### 1.03 SUBMITTALS

- A. Submit at Contractor's own expense a Traffic Control Plan for approval by the controlling roadway agency (FDOT, Orange County Public Works or other local government) having jurisdiction over the road for approval.
  - 1. The Traffic Control Plan will detail procedures and protective measures proposed by the Contractor to provide for protection and control of traffic affected by the Work consistent with the following applicable standards:
    - a. Standard Specifications for Road and Bridge Construction, latest edition including all subsequent supplements issued by the Florida Department of Transportation, (FDOT Spec.).
    - b. Manual of Traffic Control and Safe Practices for Street and Highway Construction, Maintenance and Utility Operations, FDOT.
    - c. Right-of-Way Utilization Regulations, Orange County, Florida, latest edition.
- B. All references to the respective agencies in the above referenced standards shall be construed to also include the municipality as applicable for this Work.
- C. The Traffic Control Plan will be signed and sealed by a Professional Engineer registered in the state of Florida and shall include proposed locations and time durations of the following, as applicable:
  - 1. Pedestrian and public vehicular traffic routing.
  - 2. Lane and sidewalk closures, other traffic blockage and lane restrictions and reductions anticipated to be caused by construction operations. Show and describe the proposed location, dates, hours and duration of closure, vehicular and pedestrian traffic routing and management, traffic control devices for implementing pedestrian and vehicular movement around the closures, and details of barricades.
  - 3. Location, type and method of shoring to provide lateral support to the side of an excavation or embankment parallel to an open travel-way.
  - 4. Allowable on-street parking within the immediate vicinity of worksite.
  - 5. Access to buildings immediately adjacent to worksite.
  - 6. Driveways blocked by construction operations.

7. Temporary traffic control devices, temporary pavement striping and marking of streets and sidewalks affected by construction
8. Temporary commercial and industrial loading and unloading zones.
9. Construction vehicle reroutes, travel times, staging locations, and number and size of vehicles involved.

D. Obtain and submit prior to erection, or otherwise impacting traffic, all required permits from all authorities having jurisdiction, including Orange County Public Works, if applicable.

## **PART 2 - PRODUCTS**

### **2.01 MATERIALS AND EQUIPMENT**

A. The Contractor shall furnish, erect, and maintain all necessary traffic control devices, including flag person, in accordance with the Manual of Uniform Traffic Control Devices for Streets and Highways published by the U.S. Department of Transportation, Federal Highway Administration.

#### **1. FLAG PERSONS**

- a. All flag persons used on this Project will adhere to the following requirements:
- b. Any person acting as a flag person on this Project will have attended a training session taught by a Contractor's qualified trainer before the start date of this Contract.
- c. The Contractor's qualified trainer will have completed a "Flag person Train the Trainer Session" in the 5-years previous or before the start date of this Contract and will be on file as a qualified flag person trainer.
- d. The flag person trainer's name and Qualification Number will be furnished by the Contractor at the Pre-Construction meeting. The Contractor will provide all flag persons with the Flag Person Handbook and will observe the rules and regulations contained therein. This handbook will be in the possession of all flag person while flagging on the Project.
- e. Flag persons will not be assigned other duties while working as authorized flag persons.
- f. Any person replacing flag person for break shall have the same training.

## **PART 3 - EXECUTION**

### **3.01 NOTIFICATIONS**

A. The Contractor will notify individual owners, owner's agents, and tenants of buildings affected by the construction, with copies to the county, 72-hours in advance of any construction activities.

B. The Contractor shall notify residents and pedestrians via variable message boards no later than 10 days prior to the closure of any road, lane or pedestrian thoroughfare.

- C. The Contractor shall notify Emergency Management Services agencies, Lynx and OCPS no less than 7 days prior to such closures or whenever roads are impassable.
- D. Implement closing of vehicle or pedestrian thoroughfare in accordance with the construction drawings and the approved Traffic Control Plan.
- E. The Contractor will immediately notify the County of any vehicular or pedestrian safety or efficiency problems incurred as a result of the construction of the Project.

### 3.02 GENERAL TRAFFIC CONTROL

- A. The Contractor will sequence and plan construction operations and will generally conduct Work in such a manner as not to unduly or unnecessarily restrict or impede normal traffic.
- B. Unless otherwise provided, all roads within the limits of the Work will be kept open to all traffic by the Contractor. The Contractor will keep the portion of the project being used by public traffic, whether it is through or local traffic, in such condition that traffic will be adequately accommodated.
- C. The Contractor will be responsible for installation and maintenance of all traffic control devices and requirements for the duration of the construction period. Necessary precautions for traffic control will include, but not be limited to, warning signs, signals, lighting devices, markings, barricades, canalizations, and hand signaling devices.
- D. The Contractor will provide and maintain in a safe condition temporary approaches or crossings and intersections with trails, roads, streets, businesses, parking lots, residences, garages and farms.
- E. The Contractor will provide emergency access to all residences and businesses at all times. Residential and business access will be restored and maintained at all times outside of the Contractor's normal working hours.
- F. Traffic is to be maintained on one section of existing pavement, proposed pavement, or a combination thereof. Alternating one-way traffic may be utilized and limited to a maximum length of 500-feet during construction hours. Lane width for alternating one-way traffic will be kept to a minimum width of 10-feet, or as directed by the County.
- G. Travel lanes and pedestrian access will be kept reasonably smooth, dry, and in a suitable condition at all times.
- H. The Contractor will make provisions at all "open cut" street crossings to allow for free passage of vehicles and pedestrians, either by bridging or other temporary crossing structures. Such structures will be of adequate strength and proper construction and will be maintained by the Contractor in such a manner as not to constitute an undue traffic hazard.



- I. The Contractor will keep all signs in proper position, clean, and legible at all times. Care will be taken so that weeds, shrubbery, construction materials, equipment, and soil are not allowed to obscure any sign, light, or barricade. Signs that do not apply to construction conditions should be removed or adjusted so that the legend is not visible to approaching traffic.
- J. The County may determine the need for, and extent of, additional striping removal and restriping.
- K. Excavated material, spoil banks, construction materials, equipment and supplies will not be located in such a manner as to obstruct traffic, as practicable. The Contractor will immediately remove from the site all demolition material, exercising such precaution as may be directed by the County. All material excavated shall be disposed of so as to minimize traffic and pedestrian inconvenience and to prevent damage to adjacent property.
- L. During any suspension, the Contractor will make passable and open to traffic such portions of the Project and/or temporally roadways as directed by the County for accommodation of traffic during the anticipated period of suspension. Passable conditions will be maintained until issuance of an order for the resumption of construction operations. When Work is resumed, the Contractor will replace or renew any Work or materials lost or damaged because of such temporary use in every respect as though its prosecution had been continuous and without interferences.

### 3.03 TEMPORARY SHORING

- A. Use shoring to maintain traffic when it is necessary to provide lateral support to the side of an excavation or embankment parallel to an open travel-way. Provide shoring when a theoretical 2:1 or steeper slope from the bottom of the excavation or embankment intersects the existing ground line closer than 5-feet (1.5 m) from the edge of pavement of the open travel-way.
- B. The Contractor will furnish, install, and remove sheeting, shoring, and bracing necessary to maintain traffic at locations shown on the Traffic Control Plan and other locations determined during construction.

END OF SECTION

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**SECTION 01580**  
**PROJECT IDENTIFICATION AND SIGNS**

**PART 1 - GENERAL**

**1.01 REQUIREMENTS INCLUDED**

- A. The Contractor shall furnish, install, and maintain all sign materials including sign posts, weighted stands, brackets, any required mounting hardware, and miscellaneous materials required for temporary signs for the purpose of:
  - 1. Project Identification.
  - 2. Informational signs to direct traffic
  - 3. On-site safety signs as appropriate for the Work
- B. Remove temporary signs on completion of Construction prior to obtaining Certificate of Occupancy and Substantial Completion.
- C. Allow no other signs to be displayed without written approval of the County.

**1.02 SUBMITTALS**

- A. Submit complete Shop Drawings identifying locations, material, layout, sign content, font type and size, and sample colors. Make sign and lettering to scale, clearly indicating condensed lettering if used. The sign details will be submitted to the County for approval prior to fabrication.
- B. Submit method of erection to include materials, fasteners, and other items to assure compliance with the requirements for wind pressures as required by the authorities having jurisdiction.
- C. Submit signs in accordance with any details provided in the Drawings.
- D. Prior to erection obtain and submit all required permits from the authorities having jurisdiction.

**1.03 PROJECT IDENTIFICATION SIGN**

- A. Provide 1 painted sign at the site, or at each end of the Work if a linear project, or at each of the separate sites of Work, if applicable. The sign will be not less than 32-square feet area, with a minimum dimension of 4-feet and painted graphics with content to include:
  - 1. Title of Project
  - 2. Orange County Government name and logo
  - 3. Names and titles of the Board of County Commissioners, County Administrator, Director of Orange County Utilities Department, the Consulting Engineer, and the Contractor

- B. Erect on the site at a lighted location of high public visibility, adjacent to main entrance to site, as approved by the County. The sign must be located 5-feet from all rights-of-way and 20-feet from all property lines.

#### 1.04 INFORMATIONAL SIGNS

- A. All signs and other traffic control devices shall conform to the requirements for shape, color, size, and location as specified in the latest Manual on Uniform Traffic Control and Safe Streets and Highways and the Florida Manual of Traffic Control and Safe Practices for Street and Highway Construction, Maintenance and Utility Operations. Information as to the above may be obtained from FDOT Division engineers.

### **PART 2 - PRODUCTS**

#### 2.01 SIGN MATERIALS

- A. Structure and Framing: New construction grade lumber, structurally adequate and suitable for exterior application and specified finish.
- B. Sign Panels: New A-B Grade, exterior type, APA DF plywood with inset hardwood edges and mitered corners, standard large sizes to minimize joints.
  - 1. Thickness: As required by standards to span framing members, to provide even, smooth surface without waves or buckles, minimum 3/4-inch.
- C. Rough Hardware: Galvanized steel, of sizes and types to enable sign assemblies to resist wind pressures as required by the authorities having jurisdiction but not less than a wind velocity of 50-mph.
  - 1. Use minimum 1/2-inch diameter button head carriage bolts to fasten sign panels to supporting structures. Bolt heads to be painted to match sign face.
- D. Paint: Exterior quality, as specified in Division 9 or as a minimum as specified herein.
  - 1. Primer and finish coat: exterior, semi-gloss, alkyd enamel.
  - 2. Colors for structure, framing, sign surfaces, and graphics: As shown on the Drawings or as selected by the County.
- E. Safety Sign Number Tags
  - 1. Removable aluminum or galvanized steel, with 4-inch high, blue numerals and steel tag hooks.

### **PART 3 - EXECUTION**

#### 3.01 PROJECT IDENTIFICATION SIGN

- A. Install project identification signs within 10-days of the Notice to Proceed date. Failure to erect the signs may be reason to delay approval of the initial Application for Payment.

- B. Paint exposed surfaces of supports, framing, and surface material; one (1) coat of primer and two (2) coats of finish paint.
- C. Set signs plumb and level and solidly brace as required to prevent displacement during the Construction period. If mounted on posts, sink posts 3-feet to 4-feet below grade, leaving a minimum of 8-feet of each post above grade for mounting the sign.
- D. Install informational signs at a height for optimum visibility, on ground mounted poles or attached to temporary structural surfaces.

### 3.02 MAINTENANCE

- A. Maintain signs and supports in a neat, clean condition; repair damages to structure, framing, or sign.
- B. Relocate informational signs as required by the progress of the Work.
- C. Poorly maintained, defaced, damaged, or dirty signs shall be replaced, repaired, or cleaned without delay.
- D. Special care must be taken to ensure that construction materials and dust are not allowed to obscure the face of a sign.
- E. Signs not in effect shall be covered or removed.

### 3.03 REMOVAL

- A. Remove signs, framing, supports, and foundations at Substantial Completion of the Work.
- B. Leave areas clean and patch as required to remove any traces of temporary signs.

END OF SECTION



**SECTION 01610**  
**DELIVERY, STORAGE AND HANDLING**

**PART 1 - GENERAL**

1.01 DESCRIPTION

- A. This Section specifies the general requirements for the delivery, handling, storage and protection for all items required in the construction of the Work.
- B. Deliver, handle and store products in accordance with manufacturer's recommendations and by methods and means that will prevent damage, deterioration, and loss including theft and protect against damage from climatic conditions. Control delivery schedules to minimize long-term storage of products at the site and overcrowding of construction spaces. In particular, provide delivery/installation coordination to ensure minimum holding or storage times for products recognized to be flammable, hazardous, easily damaged, or sensitive to deterioration, theft and other sources of loss. Damaged or defective items, in the opinion of the County, will be replaced at no cost to the County.

1.02 REQUIREMENTS

- A. The Contractor is responsible for all material, equipment and supplies sold and delivered to the County under this Contract until final inspection of the Work and acceptance thereof by the County.
- B. All materials and equipment to be incorporated in the Work will be handled and stored by the Contractor before, during and after shipment in a manner to prevent warping, twisting, bending, breaking, chipping, rusting, and any injury, theft or damage of any kind whatsoever to the material or equipment.
- C. All materials and equipment, which in the opinion of the County, have become so damaged as to be unfit for the use intended or specified, will be promptly removed from the site of the Work, and the Contractor will receive no compensation for the damaged materials or equipment or for its removal.
- D. In the event any such material, equipment and supplies are lost, stolen, damaged or destroyed prior to final inspection and acceptance, the Contractor will replace same without additional cost to the County.

1.03 DELIVERY

- A. Transport and handle items in accordance with manufacturer's instructions.

- B. The County and the Contractor's project superintendent must be on-site to accept all deliveries shipped directly to the job site. If the project superintendent is not present for a delivery, that delivery may be rejected by the County. If any delivery is rejected due to non-availability of the Contractor's project superintendent, delivery shall be rescheduled at no additional cost to the County.
- C. Schedule delivery to reduce long-term on-site storage prior to installation and/or operation. Under no circumstances will materials or equipment be delivered to the site more than 1-month prior to installation without written authorization from the County.
- D. Coordinate deliveries in order to avoid delay in, or impediment of, the progress of the Work.
- E. Schedule deliveries to the site not more than 1-month prior to scheduled installation without written authorization from the County.
- F. Coordinate delivery with installation to ensure minimum holding time for items that are hazardous, flammable, easily damaged or sensitive to deterioration.
- G. All items delivered to the site will be unloaded and placed in a manner that will not hamper the Contractor's normal construction operation or those of Subcontractors and other Contractors and will not interfere with the flow of necessary traffic.
- H. Deliver products in undamaged condition, in manufacturer's original containers or packaging, with identifying labels intact and legible. Maintain packaged materials with seals unbroken and labels intact until time of use.
- I. Immediately on delivery, inspect shipments with the County to ensure compliance with requirements of Contract Documents and accepted submittals, and that products are properly protected and undamaged. If the Contractor does not notify the County regarding the delivery and the County rejects any part of the delivery, there will be no additional cost to the County for the material to be returned. For items furnished by others (i.e. County), perform inspection in the presence of the County. Provide written notification to the County of any problems.
- J. Promptly remove damaged material and unsuitable items from the job site, and promptly replace with material meeting the specified requirements, at no additional cost to the County.

#### 1.04 STORAGE AND HANDLING

- A. Provide equipment and personnel to handle products by methods recommended by the manufacturer to prevent soiling or damage to products or packaging, with seals and labels intact and legible.
- B. The Contractor is responsible for securing a location for on-site storage of all material and equipment necessary for completion of the Work. The location and storage layout will be submitted to the County at the Pre-Construction conference.



- C. Manufacturer's storage instructions will be carefully studied by the Contractor and reviewed with the County. These instructions will be carefully followed and a written record of this kept by the Contractor.
- D. All material delivered to the job site will be protected from dirt, dust, dampness, water, and any other condition detrimental to the life of the material from the date of delivery to the time of installation of the material and acceptance by the County.
- E. When required or recommended by the manufacturer, the Contractor will furnish a covered, weather protected storage structure providing a clean, dry, non-corrosive environment for all mechanical equipment valves, architectural items, electrical and instrumentation equipment, and special equipment to be incorporated into this Project.
- F. Arrange storage in a manner to provide easy access for inspection. Make periodic inspections of stored products to assure that products are maintained under specified conditions and free from damage or deterioration.
- G. Should the Contractor fail to take proper action on storage and handling of equipment supplied under this Contract within 7-days after written notice to do so has been given, the County retains the right to correct all deficiencies noted in previously transmitted written notice and deduct the cost associated with these corrections from the Contract Amount. These costs may be comprised of expenditures for labor, equipment usage, administrative, clerical, engineering, and any other costs associated with making the necessary corrections.

#### 1.05 SPECIFIC STORAGE AND HANDLING

(Additional specific storage and handling requirements may be found in the specification sections addressing the material requirements.)

- A. All mechanical and electrical equipment and instruments subject to corrosive damage by the atmosphere if stored outdoors (even though covered by canvas) will be stored in a weather tight building to prevent damage. The building may be a temporary structure on the site or elsewhere, but it must be satisfactory to the County. The building will be provided with adequate ventilation to prevent condensation. Maintain temperature and humidity within range required by manufacturer.
  - 1. All equipment will be stored fully lubricated with oil, grease and other lubricants unless otherwise instructed by the manufacturer. Mechanical equipment to be used in the Work, if stored for longer than 90-days, will have the bearings cleaned, flushed and lubricated prior to testing and startup, at no extra cost to the County.
  - 2. Moving parts will be rotated a minimum of once weekly to ensure proper lubrication and to avoid metal-to-metal "welding." Upon installation of the equipment, the Contractor will start the equipment, at least half load, once weekly for an adequate period of time to ensure that the equipment does not deteriorate from lack of use.

3. Lubricants will be changed upon completion of installation and as frequently as required thereafter during the period between installation and acceptance. New lubricants will be put into the equipment at the time of acceptance. Prior to acceptance of the equipment, the Contractor will have the manufacturer inspect the equipment and certify that its condition has not been detrimentally affected by the long storage period. Such certifications by the manufacturer will be deemed to mean that the equipment is judged by the manufacturer to be in a condition equal to that of equipment that has been shipped, installed, tested and accepted in a minimum time period. As such, the manufacturer will guaranty the equipment equally in both instances. If such a certification is not given, the equipment will be judged to be defective. It will be removed and replaced at the Contractor's expense.
  4. Electric motors provided with heaters will be temporarily wired for continuous heating during storage. Upon installation of the equipment, the Contractor will start the equipment, at least half load, and once weekly for an adequate period of time to insure that the equipment does not deteriorate from lack of use.
- B. Store loose granular materials on solid flat surfaces in a well-drained area. Prevent mixing with foreign matter.
  - C. Cement and lime will be stored under a roof and off the ground and will be kept completely dry at all times.
  - D. Brick, block and similar masonry products will be handled and stored in a manner to minimize breakage, chipping, cracking and spilling to a minimum.
  - E. Precast Concrete will be handled and stored in a manner to prevent accumulations of dirt, standing water, staining, chipping or cracking.
  - F. All structural and miscellaneous steel and reinforcing steel will be stored off the ground or otherwise to prevent accumulations of dirt or grease, and in a position to prevent accumulations of standing water and to minimize rusting. Beams will be stored with the webs vertical.
  - G. Metals will be stored dry, all under cover and vented to prevent build-up of humidity, all off ground to provide air circulation.
  - H. Lumber will be stacked to provide air circulation. Store materials for which maximum moisture content is specified in an area where moisture content can be maintained.
  - I. Gypsum wallboard systems will be stored to protect all metal studs, furring, insulation boards, batts, accessories and gypsum board to prevent any type of damage to these materials. Rusted material components, damp or wet insulation or gypsum boards will not be accepted.

- J. Acoustical materials will be delivered to the job site in unbroken containers labeled and clearly marked. Materials will not be removed from containers until ready to install, but will be stored in dry area with cartons neatly stacked. Before installation, acoustical board will be stored for not less than 24-hours in the Work area at the same temperature and relative humidity.
- K. Linear items will be stored in dry area with spacers to provide ventilation. Stack linear items to prevent warping, complying with manufacturer's instructions.
- L. Paints and other volatile materials will be stored within approved safety containers. No glass jugs will be permitted. Storage areas will be equipped with not less than 2 fire extinguishers (CO2 type) sufficient to discharge a distance of 25-feet when fully charged and have current tags. No other building materials will be stored in this area. Used rags will be removed daily. Clean rags will be stored in metal closed containers.

**PART 2 - PRODUCTS (NOT USED)**

**PART 3 - EXECUTION (NOT USED)**

END OF SECTION



**SECTION 01700**  
**PROJECT CLOSEOUT**

**PART 1 - GENERAL**

**1.01 DESCRIPTION**

The term "Project Closeout" is defined to include requirements near the end of the Contract Time, in preparation for Substantial Completion acceptance, occupancy by the County, release of retainage, final acceptance, final payment, and similar actions evidencing completion of the Work. Time of closeout is directly related to "Substantial Completion"; therefore, the time of closeout may be either a single period for the entire Work or a series of time periods for individual elements of Work that has been certified as substantially complete at different dates. This time variation, if any, will be applicable to the other provisions of this section.

**1.02 SCOPE OF WORK**

- A. This Section specifies administrative and procedural requirements for project closeout, including but not limited to:
  - 1. Final Cleaning
  - 2. Substantial Completion
  - 3. Final Acceptance

**1.03 RELATED WORK**

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and other Division 1 Specification Sections, apply to this Section.
- B. Closeout requirements for specific construction activities are included in the appropriate Sections in Divisions 2 through 16.
- C. Section 01720 "Project Record Documents"
- D. Section 01740 "Warranties and Bonds"

**1.04 PREREQUISITES FOR SUBSTANTIAL COMPLETION.**

When the Contractor considers the Work as substantially complete, submit to the County a written notice stating so and requesting an inspection to determine the status of completion. The Contractor will attach to the notice a list of items known to be incomplete or yet to be corrected. Complete the following before requesting the County's inspection for certification of substantial completion.

- A. In the progress payment request that coincides with or is the first request following, the date substantial completion is claimed, show 100% completion or list incomplete items, the value of incomplete Work, and reasons for the Work being incomplete. Inspection procedures include supporting documentation for completion as indicated in these Contract Documents.
- B. Submit a statement showing an accounting of changes to the Contract Sum.
- C. Submit specific warranties, workmanship/maintenance bonds, maintenance agreements, final certifications and similar documents in accordance with Section 01740 "Warranties and Bonds."
- D. Obtain and submit lien releases enabling the County's full, unrestricted use of the Work and access to services and utilities.
- E. Consult with County before submitting Record Documents in accordance with Section 01720 "Project Record Documents."
- F. Submit Operation and Maintenance Manuals.
- G. Make final changeover of permanent locks. Submit keys and keying schedule.
- H. Deliver tools, spare parts, extra stock, and similar items.
- I. Complete final cleaning requirements necessary for Substantial Completion.

#### 1.05 FINAL CLEANING.

Complete the following cleaning operations prior to Substantial Completion or Owner occupancy.

- A. Remove from job site all tools, surplus materials, construction equipment, storage sheds, debris, waste and temporary services.
- B. Clean the site, including landscape development areas, of rubbish, litter and other foreign substances. Sweep paved areas broom clean; remove stains, spills and other foreign deposits. Rake grounds that are neither paved nor planted, to a smooth even-textured surface.
- C. Structures:
  - 1. Visually inspect exterior surfaces and remove all traces of soil, waste materials, smudges and other foreign matter.
  - 2. Remove all traces of splashed materials from adjacent surfaces.
  - 3. Ensure exterior surfaces have a uniform degree of cleanliness.
  - 4. Visually inspect interior surfaces and remove all traces of soil, waste materials, smudges and other foreign matter.
  - 5. Remove paint droppings, spots, stains and dirt from finished surfaces.
  - 6. Remove labels that are not permanent labels.
  - 7. Clean transparent materials, including mirrors and glass in doors and windows. Remove glazing compound and other substances that are noticeable vision-obscuring materials. Replace chipped or broken glass and other damaged transparent materials.

8. Clean exposed exterior and interior hard-surfaced finishes to a dust-free condition, free of stains, films and similar foreign substances. Leave concrete floors broom clean.
9. Wipe surface of mechanical and electrical equipment. Remove excess lubrication and other substances. Clean light fixtures and lamps.
10. Clean permanent filters of ventilating systems and replace disposable filters if units were operated during construction. Clean ducts, blowers and coils if units were operated without filters during construction.

#### 1.06 OPERATION AND MAINTENANCE MANUALS

- A. The Contractor will submit the proposed format, content and tab structure for all Operating and Maintenance Manuals for the County's review and approval. The tab structure for Operating and Maintenance Manuals will follow specification division format as accepted by the Construction Specification Institute. After the County approves the proposed format, content, and tab structure for the Operating and Maintenance Manuals, the Contractor will create and deliver 5 complete sets.
- B. Operation and Maintenance documentation is required for each piece of mechanical, electrical, communications, instrumentation and controls, pneumatic, hydraulic, conveyance, and special construction. If required by the technical specifications, provide Operation and Maintenance documentation for any other product not listed in the foregoing.
- C. The requirements of this Section are separate, distinct and in addition to product submittal requirements that may be established by other Sections of the Specifications. Owner's manuals, manufacturer's printed instructions, parts lists, test data and other submittals required by other Sections of the Specifications may be included in the Operating and Maintenance Manuals provided that they are approved and are formatted in a manner consistent with the requirements of this Section.
- D. Deliver Operation and Maintenance Manuals directly to the County.
- E. Operating and Maintenance Manual documents must include, but are not limited to, table of contents, approved submittals, manufacturer's operating and maintenance instructions, brochures, Shop Drawings, performance curves and data sheets annotated to indicate equipment actually furnished (e.g. identifying impeller size, model, horsepower, etc), procedures, wiring and control diagrams, records of factory and field tests and device/controller settings and calibration, program lists or data compact discs, maintenance and warranty terms and contact information, spare parts listings, inspection procedures, emergency instructions, and other Operating and Maintenance documentation that may be useful to the County. The material and equipment data required by this Section must include all data necessary for the proper installation, removal, normal operation, emergency operation, startup, shutdown, maintenance, cleaning, adjustment, calibration, lubrication, assembly, disassembly, repair, inspection, trouble-shooting, and warranty service of the equipment or materials.

- F. The Contractor must bind the Operating and Maintenance Manual documents in heavy-duty, 3-ring vinyl-covered binders including pocket folders for folded sheet information. Mark binder identification on both the front and spine of each binder. Binder information must list the project title, identify separate structures or locations as applicable, identify the general subject matter covered in the manual and must include the words "OPERATING AND MAINTENANCE INSTRUCTIONS".
  - 1. The Contractor must submit the Operating and Maintenance documents on three-hole punched, 8-1/2-inch x 11-inch sheets or on three-hole punched sheets that are foldable in multiples of 8-1/2-inch x 11-inch. The three-hole punched edge will be the left 11-inch edge.
  - 2. The Contractor may request waivers to the size requirement for specific instances. The Contractor's waiver request must be in writing to the County. The Contractor's waiver request must include a justification for seeking the waiver.
  
- G. The Contractor must provide an electronic version of the complete and final Operating and Maintenance Manuals in original electronic file format on compact disc or DVD. The Contractor must also provide one (1) electronic pdf file of each bound Operating and Maintenance Manual that represents each Manual's content. The electronic pdf file must match the Operating and Maintenance Manual content and organizational structure.

#### 1.07 SUBSTANTIAL COMPLETION INSPECTION PROCEDURES

- A. Upon receipt of the Contractor's request for inspection, the County will either proceed with inspection or advise the Contractor of incomplete prerequisites.
  
- B. Following the initial inspection, the County will either prepare the certificate of Substantial Completion, or advise the Contractor of Work which must be performed before the certificate will be issued. The County will repeat the inspection when requested in writing and when assured that the Work has been substantially completed.
  
- C. Results of the completed inspection will form the initial "punch list" for final acceptance.

#### 1.08 PREREQUISITES FOR FINAL ACCEPTANCE.

Complete the following before requesting the County's final inspection for certification of final acceptance, and final payment. List known exceptions, if any, in the request.

- A. Submit the final payment request with final releases and supporting documentation not previously submitted and accepted. Include certificates for insurance for products and completed operations where required.
  
- B. Submit written certification that:
  - 1. The County's final punch list of itemized Work to be completed or corrected, stating that each item has been completed or otherwise resolved for acceptance.
  - 2. The Contract Documents have been reviewed and Work has been completed in accordance with Contract Documents.



3. Equipment and systems have been tested in the presence of the County and are operational.
4. Work is completed and ready for final inspection.

C. Submit consent of surety.

D. Submit evidence of final, continuing insurance coverage complying with insurance requirements.

#### 1.09 FINAL ACCEPTANCE INSPECTION PROCEDURES

A. The County will re-inspect the Work upon receipt of the Contractor's written notice that the Work, including punch list items resulting from earlier inspections, has been completed, except for those items for which completion has been delayed because of circumstances that are acceptable to the County.

B. Upon completion of re-inspection, the County will either prepare a certificate of final acceptance or advise the Contractor of Work that is incomplete or of obligations that have not been fulfilled, which are required for final acceptance.

C. If necessary, the re-inspection procedure will be repeated.

#### **PART 2 - PRODUCTS (NOT USED)**

#### **PART 3 - EXECUTION (NOT USED)**

END OF SECTION



**SECTION 01720**  
**PROJECT RECORD DOCUMENTS**

**PART 1 - GENERAL**

1.01 DESCRIPTION

- A. The purpose of the Project Record Documents is to provide the County with factual information regarding all aspects of the Work, both concealed and visible.
- B. To insure the Work was constructed in conformance with the Contract Drawings, the following survey documents are required to be prepared and certified by a Surveyor as per Spec Section 01050 Surveying and Field Engineering:
  - 1. Asset Attribute Data Form
  - 2. Pipe Deflection Table
  - 3. Gravity Main Data
  - 4. Boundary Survey and Survey Map Report for pump stations and easements with constructed improvements

The Asset Attribute Data and Pipe Deflection Table forms can be found on the County's web site:

<http://www.orangecountyfl.net/WaterGarbageRecycling/UtilitiesCapitalImprovementProgram.aspx>

1.02 DEFINITIONS

- A. Boundary Survey: Boundary survey, map and report certified by a Surveyor shall be provided that meets the requirements of Chapter 5J-17 'Minimum Technical Standards', FAC.
- B. Surveyor: Contractor's Surveyor that is licensed by the State of Florida as a Professional Surveyor and Mapper pursuant to Chapter 472, F.S.

1.03 QUALITY ASSURANCE

- A. Delegate the responsibility for maintenance of the Record Documents to one person on the Contractor's staff as approved by the County.
- B. Thoroughly coordinate changes within the Record Documents, making adequate and proper entries on each page of specifications and each sheet of Drawings and other documents where such entry is required to show progress and changes properly.
- C. Make entries within 24-hours after receipt of information has occurred.

## 1.04 RECORD DOCUMENTS AT SITE

- A. Maintain at the site and always available for County's use one (1) record copy of:
  - 1. Construction Contract, Drawings, Specifications, General Conditions, Supplemental Conditions, Bid Proposal, Instruction to Bidders, Addenda, and all other Contract Documents
  - 2. Change Orders, Verbal Orders, and other modifications to Contract
  - 3. Written instructions by the County as well as correspondence related to Requests for Information (RFIs)
  - 4. Accepted Shop Drawings, Samples, product data, substitution and "or-equal" requests
  - 5. Field test records, inspection certificates, manufacturer certificates and construction photographs
  - 6. Paper copies of the Progressive As-Built Drawings
  - 7. Current Surveyor's tables for the Assets Attribute Data, Pipe Deflection Data, and Gravity Main Data
- B. Maintain the documents in an organized, clean, dry, legible condition and protected from deterioration, loss and damage until completion of the Work, transfer of all record data to the final As-built Drawings for submittal to the County.
- C. Store As-Built Documents and samples in Contractor's office apart from documents used for construction. Do not use As-Built document for construction purposes. Label each document "AS-BUILT" in neat large printed letters. File documents and samples in accordance with CSI/CSC format.
- D. Record information concurrently with construction progress. Do not conceal any Work until required information is recorded.

## PART 2 - PRODUCTS

### 2.01 AS-BUILT SURVEY DRAWINGS

- A. Maintain the electronic As-Built Drawings to accurately record progress of Work and change orders throughout the duration of the Contract.
- B. Date all entries. Enter RFI No., Change Order No., etc. when applicable.
- C. Call attention to the entry by highlighting with a "cloud" drawn around the area affected or other means. In the event of overlapping changes, use different colors for entries of the overlapping changes.
- D. Design call-outs shall have a thin strike line through the design call-out and all As-Built information must be labeled (or abbreviated "AB") and be shown in a bolder text that is completely legible.
- E. Entries shall consist of graphical representations, plan view and profiles, written comments, dimensions, State Plane Coordinates, details and any other information as required to document field and other changes of the actual Work completed. As a

minimum, make entries to also record:

1. Depths of various elements of foundation in relation to finish floor datum and State Plane Coordinates and elevations.
2. As-Built Asset Attribute Data tables shall be completed in the Drawings.
3. When electrical boxes, or underground conduits and plumbing are involved as part of the Work, record true elevations and locations, dimensions between boxes.
4. Actually installed pipe or other work materials, class, pressure-rating, diameter, size, specifications, etc. Similar information for other encountered underground utilities, not installed by Contractor, their owner and actual location if different than shown in the Contract Documents.
5. Details, not on original Contract Drawings, as needed to show the actual location of the Work completed in a manner that allows the County to find it in the future.
6. The Contractor shall mark all arrangements of conduits, circuits, piping, ducts and similar items shown schematically on the construction documents and show on the As-Built Drawings the actual horizontal and vertical alignments and locations.
7. Major architectural and structural changes including relocation of doors, windows, etc. Architectural schedule changes according to Contractor's records and Shop Drawings.

## 2.02 RECORD DOCUMENTS

- A. Three (3) paper copy sets and three (3) digital media sets of the following final Record Documents below.
  1. The following documents shall be signed and sealed by the Surveyor:
    - a. As-built survey drawings as previously described in paragraph 2.01.
    - b. As-built Asset Attribute Data (see Specification Section 01050 "Surveying and Field Engineering," Table 01050-2 for an example)
    - c. Boundary Survey on a 8 1/2"x11" format of fee simple and/or permanent easement sites for pump stations, treatment facilities, etc.. As a minimum the Boundary Survey shall show all above ground and underground structures or equipment, pipe, and conduit. All property or easement corners and the center of wetwell shall be shown with GPS coordinates. The Boundary Survey field work shall be dated after the Work has been completed.
    - d. Boundary Survey on a 8 1/2"x11" format for Work related to constructed pipes within any permanent easements. As a minimum the Boundary Survey shall show the location of the pipe centerline and property corners with GPS coordinates. The Boundary Survey field work shall be dated after the Work has been completed within the easements.
    - e. Gravity Main Table (see Specification Section 01050 "Surveying and Field Engineering", Table 01050-4 for an example)
    - f. Pipe Deflection Table (see Specification Section 01050 "Surveying and Field Engineering" Table 01050-3 for an example). An electronic blank table will be supplied by the County.
  2. Provide an encompassing digital AutoCAD file in the Engineer's current version of AutoCAD and the file shall be saved under in the format dwg. The file includes all the information of the As-Built Survey and any other graphical information in the As-Built Drawings. It shall include the overall Work, utility system layout and

associated parcel boundaries and easements. Feature point, line and polygon information for new or altered Work and all accompanying geodetic control and survey data shall be included. The Surveyor's certified As-Built Asset Attribute Data shall be added to the As-Built Drawings.

3. Provide Scanned "As-Built" Drawing sets complete and include the title sheet, plan/profile sheets, cross-sections, and details. Each individual sheet contained in the printed set of the As-Built Drawings shall be included in the electronic drawings, with each sheet being converted into an individual tif (tagged image file). The plan sheets shall be scanned in tif format Group 4 at minimum of 400 dpi resolution to maintain legibility of each drawing. Then, the tif images shall be embedded into a single pdf (Adobe Acrobat) file representing the complete plan set.
4. Provide Scanned Record Documents reflecting changes from the Contract Documents.

### **PART 3 - EXECUTION**

#### **3.01 FINAL RECORD DOCUMENTS SUBMITTAL**

- A. Submit the Final Record Documents within 20-days after Substantial Completion.
  1. Participate in review meetings as required and make required changes and promptly deliver the Final Record Documents to the County.

END OF SECTION

**SECTION 01740**  
**WARRANTIES AND BONDS**

**PART 1 - GENERAL**

1.01 SCOPE OF WORK

- A. This Section specifies general administrative and procedural requirements for warranties and bonds required by the Contract Documents, including manufacturer's standard warranties on products and special warranties.

1.02 RELATED WORK

- A. Refer to Conditions of Contract for the general requirements relating to warranties and bonds.
- B. General closeout requirements are included in Section 01700 "Project Closeout."
- C. Specific requirements for warranties for the Work and products and installations that are specified to be warranted are included in the individual Sections of Division 2 through 16.

1.03 DEFINITIONS

- A. Standard Product Warranties are preprinted written warranties published by individual manufacturers for particular products and are specifically endorsed by the manufacturer to the County.
- B. Special Warranties are written warranties required by or incorporated in the Contract Documents, either to extend time limits provided by standard warranties or to provide greater rights for the County.

1.04 SUBMITTALS

- A. Submit written warranties to the County prior to requesting a Substantial Completion Inspection as outlined in Section 01700 "Project Closeout." If the Certificate of Substantial Completion designates a commencement date for warranties other than the date of Substantial Completion for the Work, or a designated portion of the Work, submit written warranties upon request of the County.
- B. When a designated portion of the Work is completed and occupied or used by the County, by separate agreement with the Contractor during the construction period, submit properly executed warranties to the County within 15-days of completion of that designated portion of the Work.

- C. When a special warranty is required to be executed by the Contractor, or the Contractor and a Subcontractor, supplier or manufacturer, prepare a written document that contains appropriate terms and identification, ready for execution by the required parties. Submit a draft to the County for approval prior to final execution.
- D. Refer to individual Sections of Divisions 2 through 16 for specific content requirements, and particular requirements for submittal of special warranties.
- E. Prior to Substantial Completion Inspection, submit to the County two (2) copies of each required warranty and bond properly executed by the Contractor, or by the Contractor, Subcontractor, supplier, or manufacturer. Organize the warranty documents into an orderly sequence based on the table of contents of the Project Manual.
  - 1. Bind warranties and bonds in heavy-duty, commercial quality, durable 3-ring vinyl covered loose-leaf binders, thickness as necessary to accommodate contents and sized to receive 8-1/2-inch by 11-inch three-hole punched paper.
  - 2. Table of Contents will be neatly typed, in the sequence of the Table of Contents of the Project Manual, with each item identified with the number and title of the specification Section in which specified and the name of the product or work item.
  - 3. Provide heavy paper dividers with celluloid covered tabs for each separate warranty. Mark the tab to identify the product or installation. Provide a typed description of the product or installation, including the name of the product and the name, address and telephone number of the installer, supplier and manufacturer.
  - 4. Identify each binder on the front and the spine with the typed or printed title "WARRANTIES AND BONDS", the project title or name and the name, address and telephone number of the Contractor.
  - 5. When operating and maintenance manuals are required for warranted construction, provide additional copies of each required warranty, as necessary, for inclusion in each required manual.

#### 1.05 WARRANTY REQUIREMENT

- A. The Contractor will warrant all equipment in the Contractor's one-year warranty period even though certificates of warranty may not be required. For all major pieces of equipment, the Contractor shall submit a warranty from the equipment manufacturer. "Major" equipment is defined as a device having a 5 HP or larger motor or which lists for more than \$1,000.00.
- B. In the event that an equipment manufacturer or supplier is unwilling to provide a one-year warranty commencing at Substantial Completion, the Contractor will obtain from the manufacturer a warranty of sufficient length commencing at the time of equipment delivery to the job site, such that the warranty will extend to at least 1-year past substantial completion.
- C. If an individual specification section requires a particular warranty more stringent than that required by this Section or the General Conditions, the more stringent requirements will govern for the applicable portion of the Work.



- D. Related Damages and Losses: When correcting warranted Work that has failed, remove and replace other Work that has been damaged as a result of such failure or that must be removed and replaced to provide access for correction of warranted Work.
- E. Reinstatement of Warranty: When Work covered by a warranty has failed and been corrected by replacement or rebuilding, reinstate the warranty by written endorsement. The reinstated warranty will be equal to the original warranty with an equitable adjustment for depreciation.
- F. Replacement Cost: Upon determination that Work covered by a warranty has failed, replace or rebuild the Work to an acceptable condition complying with requirements of Contract Documents. The Contractor is responsible for the cost of replacing or rebuilding defective Work regardless of whether the County has benefited from use of the Work through a portion of its anticipated useful service life.
- G. County's Recourse: Written warranties made to the County are in addition to implied warranties, and will not limit the duties, obligations, rights and remedies otherwise available under the law, nor will warranty periods be interpreted as limitations on time in which the County can enforce such other duties, obligations, rights, or remedies.
- H. Rejection of Warranties: The County reserves the right to reject warranties and to limit selections to products with warranties not in conflict with requirements of the Contract Documents.
- I. The County reserves the right to refuse to accept Work for the project where a special warranty, certification, or similar commitment is required on such work or part of the Work, until evidence is presented that entities required to counter-sign such commitments are willing to do so.
- J. Disclaimers and Limitations: Manufacturer's disclaimers and limitations on product warranties do not relieve the Contractor of the warranty on the Work that incorporates the products, nor does it relieve suppliers, manufacturers, and Subcontractors required to countersign special warranties with the Contractor.

## **PART 2 - PRODUCTS (NOT USED)**

## **PART 3 - EXECUTION**

### **3.01 DELIVERABLES**

- A. Assemble warranties, bonds and service and maintenance contracts, executed by each of the respective manufacturers, suppliers, and Subcontractors, and bind into a commercial quality standard 3-ring binder; submit 5 copies of the warranties and bonds to the County for review.
  - 1. The warranties and bonds shall include:
    - a. Equipment or product description
    - b. Manufacturer's name, principal, address and telephone number

- c. Contractor, name of responsible principal, address and telephone number
- d. Local supplier's or representatives name and address
- e. Scope of warranty or bond
- f. Proper procedure in case of failure
- g. Instances which might affect the validity of warranty or bond
- h. Date of beginning of warranty, bond or service and maintenance contract
- i. Duration of warranty, bond or service maintenance contract

B. Warranties

1. Furnish an extended warranty for sanitary sewer main liner certified by the manufacturer for specified material properties for a particular job. The manufacturer warrants the liner to be free from defects in raw materials for 1-year from the date of acceptance. During the warranty period, any defects which affect the integrity or strength of the pipe shall be repaired at the Contractor's expense in a manner acceptable to the County.
2. Furnish an extended warranty for sanitary lateral liner certified by the manufacturer for specified material properties for a particular job. The manufacturer warrants the liner to be free from defects in raw materials for 1-year from the date of acceptance. During the warranty period, any defects which affect the integrity or strength of the pipe shall be repaired at the Contractor's expense in a manner acceptable to the County.

END OF SECTION

## SECTION 02080

### ABANDONMENT, REMOVAL, AND SALVAGE OR DISPOSAL OF EXISTING PIPE

#### PART 1 - GENERAL

##### 1.01 DESCRIPTION

- A. Scope of Work: This section specifies the furnishing of all labor, materials, equipment, and incidentals required to abandon, remove, salvage, and/or dispose of existing pipelines and appurtenances as shown on the Drawings and as specified herein.

##### 1.02 QUALITY ASSURANCE

- A. Permits and Licenses: Contractor shall obtain and pay respective fees for all necessary permits and licenses for performing the Work and shall furnish a copy of same to the County prior to commencing the Work. The Contractor shall comply with the requirements of the permits. All removal or abandonment of asbestos pipe material shall be performed by a licensed asbestos abatement Contractor or Subcontractor registered in the State of Florida.
- B. Notices: Contractor shall issue written notices of planned Work to companies or local authorities owning utility conduit, wires, or pipes running to or through the project site. Copies of said notices shall be submitted to the County.
- C. Standards:
  - 1. Florida Administrative Code, Chapter 62-204.800
  - 2. National Emission Standards Hazardous Air Pollution (NESHAP), 40 CFR Part 61, Subpart M, latest revision
  - 3. Occupational Safety and Health Act, 29 CFR
  - 4. The Environmental Protection Agency (EPA) Asbestos Abatement Worker Protection Rule
  - 5. Florida Statute 455.300
  - 6. Asbestos pipe handling best management practices provided at the end of this section
- D. Quality Control
  - 1. It shall be the responsibility of the Contractor to provide supervision and inspections to ensure that the existing piping is removed and disposed, salvaged, or abandoned as designated in the Drawings and as specified herein.
  - 2. Asbestos Pipe
    - a. All removal or abandonment of pipe material containing asbestos shall be performed by a licensed asbestos abatement Contractor or Subcontractor.

- b. The asbestos abatement Contractor or Subcontractor shall contact the Orange County Environmental Protection Division (407-836-1400) prior to removal or abandonment of any asbestos material and shall obtain all required permits and licenses and issue all required notices as required by the Orange County Environmental Protection Division. The Contractor shall be responsible for all fees associated with permits, licenses, and notices to the governing regulatory agencies.
- c. The asbestos abatement Contractor shall perform Work in accordance with all applicable standards referenced in paragraph 1.02.C of this section.
- d. The asbestos abatement Contractor shall have experience performing asbestos removal similar to this Project.

### 1.03 SHOP DRAWINGS AND SUBMITTALS

#### A. Shop Drawings

1. Submittals shall be submitted to the County for review and acceptance prior to construction in accordance with the General Conditions and specifications Section 01300 "Submittals."
2. Shop Drawings shall be submitted to the County for review and acceptance prior to construction in accordance with these specifications for the following:
  - a. Grout
  - b. Caps and plugs
  - c. Credentials of licensed asbestos abatement Contractor including current certification.

### **PART 2 - PRODUCTS (NOT USED)**

### **PART 3 - EXECUTION**

#### 3.01 REMOVAL, ABANDONMENT, SALVAGE, AND DISPOSAL

- A. General: Existing piping designated on the Drawings to be removed shall be exposed and removed by the Contractor.
- B. Removal and Disposal
  1. Pipe designated to be removed shall be completely drained and the contents properly disposed. The piping system including fittings and valves shall then be completely removed from the site.
  2. Existing services and/or connections not shown on the Drawings shall be removed in accordance with this section at no additional cost. Existing live services encountered shall be maintained.
  3. Asbestos: Pipe material containing asbestos shall be removed and disposed by a licensed asbestos abatement Contractor or Subcontractor.

4. Structures shall be removed in accordance with Section 02050 "Demolition of Existing Structures."

C. Removal of material to be salvaged

1. Pipe designated on the Drawings to be removed and salvaged shall be completely drained and the contents properly disposed. The pipe shall then be thoroughly pressure washed, palletized on wooden skids to a dimension not exceeding the recommendation of the manufacturer, and conveyed to the County at the location designated by the County.
2. Items to be salvaged:
  - a. Air release valves
  - b. Sanitary manhole rings and covers
  - c. Isolation valves
  - d. Valve boxes
  - e. Fire hydrant and valve assemblies

D. Abandonment

1. Pipe designated on the Drawings to be abandoned (or retired in place) shall be left in place, drained, and its contents properly disposed. Pipe requires end caps or plugs. All air release valves and vaults, valve boxes, fire hydrants, manholes, and manhole rings and covers shall be removed and disposed of or salvaged as specified above.
2. All pipe 4-inches or larger to be abandoned in place shall be completely filled with grout and each end of the pipe shall be plugged in a manner acceptable to the County.
3. Grout: Where designated on the Drawings, pipe to be abandoned shall be filled with grout in accordance with Section 03600 "Grouting."
4. Plugs: Pipe to be abandoned shall be capped or plugged with a mechanical joint fitting that will prevent soil or other deposits from entering the pipe.

E. Asbestos Pipe Handling Best Management Practices

1. Projects will require worker documentation before entering the regulated Work area. A copy of: their current training certificate (workers and their supervisor); current medical condition showing the doctor approved their working with asbestos and wearing a respirator; signed acknowledgment forms; and current record (6-months) of each workers respirator fit test will be required from all workers.
2. Projects also require air monitoring. OSHA will accept historic data on air monitoring within 12-months of the Project, provided the data is from a project of like material and conditions with a crew of the same experience, supervision, and training. Otherwise, monitoring is required throughout the Project. OSHA requires two (2) types of personnel air monitoring, full shift and 30-minute excursion level (when highest levels are anticipated).
3. Some provisions should be made for worker showering or otherwise washing following work before removing respirators, etc. Even if direct exposure is not anticipated, and at a minimum, a source of water to rinse the respirators, wash workers faces and hands, and (in the event of unanticipated direct exposure) some place to shower is required. The workers will also need a change room and some place to keep their street clothes and personal possessions.

4. Proposals to remove asbestos pipe sections by cutting must address how the cutting debris will be captured and kept from becoming airborne. Soil that could be considered contaminated may also have to be removed.
5. Licensed asbestos abatement Contractors or Subcontractors should have a pollution endorsement in their liability insurance in case of asbestos fiber release. A contingency plan, in case the project does not run as smoothly as expected, should be developed and include emergency phone numbers kept on site during the Project.
6. Daily logs of the asbestos removal work should be kept, and should include sign in sheets for the workers and whatever air monitoring was done. Accident reports and other reports or correspondence if something unusual happened should also be included.
7. Waste receipts must be kept through all stages of transport from the site to, and including, the acceptance at the dumpsite where the material will be abandoned. Amount of material removed must be equal to the amount of material to be turned into to the dump.
8. The primary Contractor will give "approval for tear down" at project completion, indicating that all asbestos removal operations are complete and whether there is a need for any air monitoring. Air monitoring, if not required by any governing agency or approved permit as discussed previously, may also be required by the County if documentation to the general public pertaining to contamination is deemed necessary. This air monitoring is normally done by collecting area samples downwind of the project at the barrier tape or just inside it. It requires a source of electricity to run the pumps, which is often provided by a generator.

END OF SECTION

## **SECTION 02100**

### **TEMPORARY EROSION AND SEDIMENTATION CONTROL**

#### **PART 1 - GENERAL**

##### **1.01 DESCRIPTION**

###### **A. Scope of Work**

1. The Work specified in this Section consists of designing, providing, maintaining and removing temporary erosion, sedimentation and turbidity controls as necessary.
2. Temporary erosion controls include, but are not limited to, grassing, mulching, setting, watering and reseeding on-site surfaces and soil and borrow area surfaces and providing interceptor ditches at ends of berms and at those locations which will ensure that erosion during construction will be either eliminated or maintained within acceptable limits as established by federal, state and local requirements and by the County.
3. Temporary sedimentation controls include, but are not limited to; silt fence, silt dams, traps, barriers, and appurtenances at the foot of sloped surfaces which will ensure that sedimentation pollution will be either eliminated or maintained within acceptable limits as established by federal, state and local requirements and by the County.
4. Temporary turbidity controls include, but are not limited to, floating or staked turbidity barriers which will ensure that turbidity pollution will be either eliminated or maintained within acceptable limits as established by Federal, state, and local requirements and by the County.
5. Contractor is responsible for providing effective temporary erosion, sediment, and turbidity control measures during construction or until permanent controls become effective.

- B. Related Work Described Elsewhere:** South Florida Building Code and Standard Building Code, FDOT Standard Specifications for road and bridge construction and FDOT Design Standards.

#### **PART 2 - PRODUCTS**

##### **2.01 EROSION CONTROL**

- A. Netting Fence: fabricated of material acceptable to the County.
- B. Sod is specified in Section 02578, "Solid Sodding."

##### **2.02 SEDIMENTATION CONTROL**

- A. Bales: clean, seed-free cereal hay type.
- B. Netting: fabricated of material acceptable to the County.
- C. Filter stone: crushed stone conforming to Florida Department of Transportation specifications.

- D. Concrete block: hollow, non-load bearing type.
- E. Concrete: exterior grade not less than 1-inch thick.
- F. Rock Bags: conforming to FDOT Specifications.

### 2.03 TURBIDITY CONTROL

- A. Conforming to FDOT Design Standards Index 103 - Turbidity Barriers.

## **PART 3 - EXECUTION**

### 3.01 EROSION CONTROL

- A. Minimum Procedures for Grassing Are:
  1. Scarify slopes to a depth of not less than 6-inches and remove large clods, rock, stumps and roots larger than 1/2-inch in diameter and debris.
  2. Sow seed within 24-hours after the ground is scarified with either mechanical seed drills or rotary hand seeders.
  3. Apply mulch loosely and to a thickness of between 3/4-inch and 1-1/2-inches.
  4. Apply netting over mulched areas on sloped surfaces.
  5. Roll and water seeded areas in a manner which will encourage sprouting of seeds and growing of grass. Reseed areas which exhibit unsatisfactory growth. Backfill and seed eroded areas.

### 3.02 SEDIMENTATION CONTROL

- A. Install and maintain silt fence, silt dams, traps, barriers and appurtenances as shown on the approved descriptions and working Drawings. Hay bales which deteriorate and filter stone which is dislodged shall be replaced.

### 3.03 TURBIDITY CONTROL

- A. Install and maintain turbidity barriers daily and as described in FDOT Index #103.

### 3.04 PERFORMANCE

- A. Should any of the temporary erosion and sediment control measures employed by the Contractor fail to produce results which comply with the requirements of the State of Florida, the Contractor shall immediately take whatever steps are necessary to correct the deficiency at his own expense.

END OF SECTION



## **SECTION 02140**

### **DEWATERING**

#### **PART 1 - GENERAL**

##### **1.01 DESCRIPTION**

- A. Scope of Work: This Section specifies the furnishing of equipment; labor and materials necessary to remove storm or subsurface waters from excavation areas in accordance with the requirements set forth, as shown on the Drawings, and/or geotechnical report.

##### **1.02 QUALITY ASSURANCE**

- A. Qualifications: The Contractor shall engage a Geotechnical Engineer registered in the State of Florida, to design the temporary dewatering system. The Contractor shall submit conceptual plan for the dewatering system prior to commencing work. The dewatering system installed shall be in conformity with the overall construction plan and certification of this shall be provided by the Geotechnical Engineer. The dewatering system shall be designed by a firm who regularly engages in the design of dewatering systems and who is fully experienced, reputable and qualified in the design of such dewatering systems.
- B. The dewatering of any excavation areas and the disposal of the water shall be in strict accordance with the latest revision of all local and state government rules and regulations.
- C. Permits: The Contractor shall obtain and pay respective fees for all local, state, and federal permits (including the Orange County, St. Johns River Water Management District, and/or South Florida Management District discharge permits) required for the withdrawal, treatment and disposal/discharge of water from the dewatering operation, prior to start of work.
- D. Comply with Florida Administrative Code, Chapter 62-621.300 (2).

##### **1.03 SHOP DRAWINGS AND SUBMITTALS**

- A. Submittals shall be submitted to the County for review and acceptance prior to construction in accordance with the General Conditions and specifications Section 01300 "Submittals."
- B. In accordance with FAC 62-621.300(2), submit analytical test results from a certified laboratory for the parameters listed in the FDEP "Generic Permit for the Discharge of Produced Ground Water from Any Non-Contaminated Site Activity" to the FDEP and the County. The submitted information shall show the location of the work, where the water will be going to, as well as an estimate for the amount, rate and duration of discharge being proposed.

- C. Provide notification to all jurisdictional permitting agencies in accordance with the requirements of the respective agency.
- D. Provide a detailed plan and operation schedule for dewatering of excavations.
  - 1. Provide descriptive literature of the dewatering system.
  - 2. Provide a plan for erosion and sedimentation control during dewatering.
  - 3. Provide copies of all permits/approvals for disposal/discharge of water during dewatering.

## **PART 2 - PRODUCTS (NOT USED)**

## **PART 3 - EXECUTION**

### **3.01 GENERAL**

- A. The Contractor shall have on-site and available the analytical test results performed in accordance with the FDEP "Generic Permit for the Discharge of Produced Ground Water from Any Non-Contaminated Site Activity" (FAC 62-621.300(2)).
- B. The Contractor shall provide adequate equipment for the removal of storm or subsurface waters which may accumulate within the excavation.
- C. The Contractor's attention is directed to the water surface elevations discussed in the report(s) on subsurface investigations. Water levels will normally vary from season to season.
- D. The Contractor shall be required to monitor the performance of the dewatering system during the progress of the Work and make such modifications as may be required to assure that the systems will perform satisfactorily. The dewatering system shall be designed in such a manner as to preserve the undisturbed bearing capacity of the sub-grade soils at the bottom of the trench or excavation.
- E. Prior to excavation, the Contractor shall submit his proposed method of dewatering and maintaining dry conditions to the County. Approval of the dewatering plan shall not relieve the Contractor of the responsibility for the satisfactory performance of the system. The Contractor shall be responsible for correcting any disturbance of natural bearing soils or damage to structures caused by an inadequate dewatering system or by interruption of the continuous operation of the system as specified.
- F. If subsurface water is encountered, the Contractor shall utilize suitable equipment to adequately dewater the excavation. A wellpoint system or other County acceptable dewatering method shall be utilized if necessary to maintain the excavation in a dry condition for preparation of the trench bottom and for pipe laying. Within and adjacent to residential areas and other areas as required by the County, engines driving dewatering pumps shall be equipped with residential type mufflers and the noise shall not exceed 55 decibels within 50-feet.

### 3.02 DEWATERING AND DISPOSAL

- A. The Contractor shall construct and place all pipelines, structures, concrete work, structural fill, backfill and bedding material in-the-dry. In addition, the Contractor shall make the final 24-inches of excavation in-the-dry and not until the water level is a minimum of 2-foot below proposed bottom of excavation. For purposes of this Contract, in-the-dry is defined as  $\pm 2\%$  of the optimum moisture content of the soil.
- B. The Contractor shall, at all times during construction, provide and maintain proper equipment and facilities to remove promptly and dispose of all water entering excavations. Contractor shall keep excavations dry so as to obtain a satisfactory undisturbed subgrade foundation condition until the fill, structure, or pipes have been completed to such extent that they will not be floated or otherwise damaged by allowing water levels to return to natural elevations.
- C. Dewatering shall at all times be conducted in such a manner as to preserve the natural undisturbed bearing capacity of the subgrade soils at proposed bottom of excavation.
- D. It is expected that dewatering will be required for pre-drainage of the soils prior to final excavation for most of the in-ground structures or piping and for maintaining the lowered groundwater level until construction has been completed so that the structure, pipeline or fill will not be floated or otherwise damaged.
- E. If wellpoints are used, Contractor shall adequately space wellpoints to maintain the necessary dewatering. Provide suitable filter sand and/or other means to prevent pumping of fine sands and silts. A continual check shall be maintained by the Contractor to ensure that the subsurface soil is not being removed by the dewatering operations. Pumping from wellpoints shall be continuous and standby pumps shall be provided.
- F. The Contractor's proposed method of dewatering shall include groundwater observation wells to determine the water level during construction. Observation wells shall be installed along pipelines as required to verify depth to water level and at locations approved by the County.
- G. At all times, site grading shall promote drainage. Surface runoff shall be diverted from excavations. Water entering the excavation from the surface shall be collected in shallow ditches around the perimeter of the excavation, drained to sumps, and pumped or drained by gravity to maintain an excavation bottom free from standing water.
- H. Flotation shall be prevented by the Contractor by maintaining a positive and continuous removal of water. The Contractor shall be fully responsible for all damages which may result from failure to adequately keep excavations dewatered.
- I. The Contractor shall dispose of water from the Work in a suitable manner without damage to adjacent properties or facilities. No water shall be discharged without appropriate treatment for adverse contaminants. No water shall be drained in work built or under construction without prior consent from the County. Water shall be filtered to remove sand and fine soil particles before disposal into any drainage system.

- J. Dewatering of excavations shall be considered incidental to the construction of the Work and all costs shall be included in the various Contract prices in the Bid Form, unless a separate bid item has been established for dewatering.

### 3.03 GROUNDWATER TREATMENT (IF REQUIRED)

- A. If concentrations of tested groundwater quality parameters exceed those allowable in the FDEP Generic Permit for the Discharge of Produced Groundwater from any Non-Contaminated Site Activity (62-621.300(2), F.A.C.), the Contractor shall treat the effluent.
- B. The Contractor shall immediately notify the County and discuss the parameters that exceed allowable limits.
- C. The Contractor shall meet with the FDEP to determine alternatives that are acceptable to the FDEP.
- D. The Contractor shall apply for and obtain any and all permits and/or treatment approvals that FDEP requires including but not limited to:
  - 1. Generic Permit for Discharges from Petroleum Contaminated Sites (62-621.300(1)). Allows discharges from sites with automotive gasoline, aviation gasoline, jet fuel, or diesel fuel contamination; or
  - 2. Permit for all Other Contaminated Sites (62-04; 62-302; 62-620 & 62-660). The coverage is available only through the individual NPDES permit issued by FDEP, allows discharges from sites with general contaminant issues i.e. ground water and/or soil contamination other than petroleum fuel contamination; or
  - 3. Generic Permit for the Discharge of Produced Ground Water from Any Non-Contaminated Site Activity (62-621.300(2), F.A.C.); or
  - 4. Generic Permit for Stormwater Discharge from Large or Small Construction Activities (62-621.300(4)(a), F.A.C.); or
  - 5. An Individual Wastewater Permit (62-604.300(8) (a))
- E. The Contractor shall implement the appropriate treatment that is acceptable to FDEP and County to attain compliance for all excess limits encountered during dewatering activities. Treatment may include, but is not limited to: Chemical, Biological, Electrolysis or any combination of the three.
- F. The Contractor shall make every effort to minimize the spread of contamination into uncontaminated areas. Provide for the health and safety of all workers at the job site and make provisions necessary for the health and safety of the public that may be exposed to any potentially hazardous conditions. Ensure provision adhere to all applicable laws, rules or regulations covering hazardous conditions and will be in a manner commensurate with the level of severity of the conditions.
- G. If necessary, provide contamination assessment and remediation personnel to handle site assessment, determine the course of action necessary for site security and perform the necessary steps under applicable laws, rules and regulations for additional assessment and/or remediation work to resolve the contaminations issue.

- H. Delineate the contamination area(s) and any staging or holding area required and develop a work plan that will provide the schedule of projected completion dates for the final resolution of the contamination issue.
- I. Maintain jurisdiction over activities inside any delineated contamination areas and any associated staging or holding areas. Be responsible for the health and safety of workers within the delineated areas. Provide continuous access to representatives of regulatory or enforcement agencies having jurisdiction.

#### 3.04 REMOVAL

Immediately upon completion of the dewatering system, the Contractor shall remove all of his equipment, materials, and supplies from the site of the Work, remove all surplus materials and debris, fill in all holes or excavations, and grade the site to elevations of the surface levels which existed before work started. The site shall be thoroughly cleaned and approved by the County.

END OF SECTION



**SECTION 02215**  
**FINISH GRADING**

**PART 1 - GENERAL**

1.01 DESCRIPTION

- A. Scope of Work: Provide finish grading to all areas within the limits of construction.
- B. Grade sub-soil. Cut out areas to receive stabilizing base course materials for paving and sidewalks. Place, finish grade, and compact topsoil.

1.02 PROTECTION

- A. Prevent damage to existing fencing, trees, landscaping, natural features, benchmarks, pavement, and utility lines. Correct damage at no cost to the County.

1.03 SHOP DRAWINGS AND SUBMITTALS

- A. Submittals shall be submitted to the County for review and acceptance prior to construction in accordance with the General Conditions and specifications Section 01300 "Submittals."

**PART 2 - PRODUCTS**

2.01 MATERIALS

- A. All material supplied shall be one of the products specified in Appendix D "List of Approved Products" appended to these technical specifications.
- B. Topsoil: Friable loam free from subsoil, roots, grass, excessive amount of weeds, stones, and foreign matter; acidity range (pH) of 5.5 to 7.5; containing a minimum of 4% and a maximum of 25% organic matter. The topsoil shall be suitable for the proposed plant growth shown on the Drawings and specified. Use topsoil stockpiles on site if conforming to these requirements. If there is not sufficient topsoil available at the project site, the Contractor shall furnish additional topsoil as required to complete the Work at no additional cost to the County.

**PART 3 - EXECUTION**

3.01 SUB SOIL PREPARATION

- A. Rough grade sub-soil systematically to allow for a maximum amount of natural settlement and compaction. Eliminate uneven areas and low spots. Remove debris, roots, branches, stones, etc. Remove sub-soil that has been contaminated with petroleum products.

- B. Cut out areas to subgrade elevation which are to receive stabilizing base for paving and sidewalks.
- C. Bring sub soil to required levels, profiles, and contours. Make changes in grade gradual. Blend slopes into level areas.
- D. Slope grade away from building a minimum of 2-inches in 10-feet unless indicated otherwise on the Drawings.
- E. Cultivate subgrade to a depth of 3-inches where topsoil is to be placed. Repeat cultivation in areas where equipment used for hauling and spreading topsoil has compacted sub-soil.

### 3.02 PLACING TOPSOIL

- A. Place topsoil in areas where seeding, sodding, and planting is to be performed. Place to the following minimum depths, up to finished grade elevations.
  - 1. 6-inches for seeded areas
  - 2. 4-1/2-inches for sodded areas
  - 3. 24-inches for shrub beds
  - 4. 18-inches for flower beds
- B. Use topsoil in relatively dry state. Place during dry weather.
- C. Fine grade topsoil eliminating rough and low areas to ensure positive drainage. Maintain levels, profiles, and contours of subgrades.
- D. Remove stones, roots, grass, weeds, debris, and other foreign material while spreading.
- E. Manually spread topsoil around trees, plants, and buildings to prevent damage which may be caused by grading equipment.
- F. Lightly compact placed topsoil.

### 3.03 SURPLUS MATERIAL

- A. Remove surplus sub soil and topsoil from site.
- B. Leave stockpile areas and entire job site clean and raked, ready to receive landscaping.

END OF SECTION



**SECTION 02220**  
**EXCAVATING, BACKFILLING, AND COMPACTING**

**PART 1 - GENERAL**

1.01 DESCRIPTION

- A. Scope of Work: Excavate, backfill, and compact as required for the construction of the utility system consisting of piping and appurtenances, and structural construction as shown on the Drawings and specified herein. The Contractor shall furnish all labor, materials, equipment, and incidentals necessary to perform all excavation, backfill, compaction, grading, and slope protection to complete the Work. The Contractor shall be responsible for having determined to his satisfaction, prior to the submission of his bid, all under ground utilities locations and appurtenances shown on the construction Drawings.
- B. Definitions:
1. Maximum Density: Maximum weight in pounds per cubic foot of a specific material as determined by AASHTO T-180 (ASTM D155).
  2. Optimum Moisture: Percentage of water in a specific material at maximum density.
  3. Rock Excavation: Excavation of any hard natural substance which requires the use of explosives and/or special impact tools such as jack hammers, sledges, chisels, or similar devices specifically designed for use in cutting or breaking rock, but exclusive of trench excavating machinery.
  4. Suitable: Suitable materials for fills shall be non-cohesive, non-plastic granular local sand and shall be free from vegetation, organic material, marl, silt, or muck. The Contractor shall furnish all additional fill material required.
  5. Unsuitable: Unsuitable materials are highly organic soil (peat or muck) classified as A-8 in accordance with AASHTO Designation M 145.
- C. Plan For Earthwork: The Contractor shall be responsible for having determined to his satisfaction, prior to the submission of his bid, the conformation of the ground, the character and quality of the substrata, the types and quantities of materials to be encountered, the nature of the groundwater conditions, the prosecution of the Work, the general and local conditions, and all other matters which can in any way affect the Work under this Contract. Prior to commencing the excavation, the Contractor shall submit a plan of his proposed operations, including maintenance of traffic, to the County for review. The Contractor shall consider, and his plan for excavation shall reflect, the equipment and methods to be employed in the excavation. The prices established in the Proposal for the Work to be done will reflect all costs pertaining to the Work.

## 1.02 QUALITY ASSURANCE

- A. Testing laboratory employed by the County will make such tests as are deemed advisable. The Contractor shall schedule his work to permit a reasonable time for testing before placing succeeding lifts and shall keep the laboratory informed of his progress. Costs for initial testing shall be paid by the County; however, tests which have to be repeated because of the failure of the tested material to meet specification shall be paid for by the Contractor and the cost of re-testing shall be deducted from payments due the Contractor.
- B. Standards
  - 1. AASHTO: American Association of State Highway and Transportation Officials
  - 2. ANSI: American National Standards Institute
  - 3. ASCE: American Society of Civil Engineers
  - 4. ASTM: American Society for Testing and Materials
  - 5. AWWA: American Water Works Association
  - 6. OSHA 29 CFR Subpart P – Excavations and Trenches a) 1926.650, 1926.651, 1926.652
  - 7. OSHA 29 CFR Subpart J - a) 1910.146 for Confined Space Entry

## 1.03 JOB CONDITIONS

- A. Existing Utilities
  - 1. The Contractor is responsible for subsurface verification of existing utilities prior to construction. Locate existing utilities in the area of work in accordance with Sunshine State One Call regulations, Chapter 556, "Underground Facility Damage Prevention and Safety Act", FS.
  - 2. Should uncharted or incorrectly charted piping or other utility be encountered during excavation, notify the County. Keep all facilities in operation and repair damaged utilities to the satisfaction of the County.
  - 3. Damage and repair costs to such piping or utilities are the Contractor's responsibility.
  - 4. If utilities are to remain in place, the Contractor shall provide adequate means of protection.
- B. Test borings and the sub-surface exploration data if previously done on the site will be made available upon request and are for the Contractor's information only.

## 1.04 PROTECTION

- A. Sheeting and Bracing
  - 1. Requirements of the Trench Safety Act shall be adhered to at all times.

2. Furnish, put in place, and maintain such sheeting and bracing as may be required to support the sides of excavations, to prevent any movement which could in any way diminish the width of the excavation below that necessary for proper construction, to protect adjacent structures and power poles from undermining, and to protect workers from hazardous conditions or other damage. Such support shall consist of braced steel sheet piling, braced wood lagging and soldier beams or other acceptable methods. If the County is of the opinion that at any point sufficient or proper supports have not been provided, the County may order additional supports put in at the expense of the Contractor, and compliance with such order shall not relieve or release the Contractor from his responsibility for the sufficiency of such supports. Care shall be taken to prevent voids outside of the sheeting, but if voids are formed, they shall be immediately filled and compacted. Where soil cannot be properly compacted to fill a void, lean concrete shall be used as backfill at no additional expense to the County.
3. The Contractor shall construct the sheeting outside the neat lines of the foundation unless indicated otherwise for the method of operation. Sheeting shall be plumb and securely braced and tied in position. Sheeting and bracing shall be adequate to withstand all pressure to which the structure or trench will be subjected. Any movement or bulging which may occur shall be corrected by the Contractor at their own expense so as to provide the necessary clearances and dimensions.
4. Where sheeting and bracing is required to support the sides of excavations for structures, the Contractor shall engage a Professional Geotechnical Engineer, registered in the State of Florida, to design the sheeting and bracing. The sheeting and bracing installed shall be in conformity with the design, and the Professional Engineer shall provide certification of this.
5. The installation of sheeting, particularly by driving or vibrating, may cause distress to existing structures. The Contractor shall evaluate the potential for such distress and, if necessary, take all precautions to prevent distress of existing structures because of sheeting installation.
6. The Contractor shall leave in place to be embedded in the backfill all sheeting and bracing not shown on the Drawings but which the County may direct him in writing to leave in place at any time during the progress of the Work for the purpose of preventing damage to structures, utilities, or property, whether public or private. The County may direct that timber used for sheeting and bracing be cut off at any specified elevation.
7. All sheeting and bracing not left in place shall be carefully removed in such manner as not to endanger the construction or other structures, utilities, or property. All voids left or caused by withdrawal of sheeting shall be immediately refilled with sand by ramming with tools especially adapted to that purpose, or otherwise as may be directed by the County.
8. The right of the County to order sheeting and bracing left in place shall not be construed as creating any obligation on the County's part to issue such orders, and their failure to exercise this right shall not relieve the Contractor from liability for damages to persons or property occurring from or upon the Work occasioned by negligence or otherwise, growing out of a failure on the part of the Contractor to leave in place sufficient sheeting and bracing to prevent any caving or moving of the ground.

9. No wood sheeting is to be withdrawn if driven below mid-diameter of any pipe, and under no circumstances shall any wood sheeting be cut off at a level lower than 1-foot above the top of any pipe.

B. Pumping and Drainage:

1. The Contractor shall at all times during construction provide and maintain proper equipment and facilities to remove all water entering excavations, and shall keep such excavations dry so as to obtain a satisfactory undisturbed subgrade foundation condition until the fills, structures, or pipes to be built thereon have been completed to such extent that they will not be floated or otherwise damaged by allowing the water level to return to the natural level as stipulated in Section 02140 "Dewatering." The Contractor shall engage a Professional Geotechnical Engineer registered in the State of Florida to design the dewatering systems. The Contractor shall submit to the County for a plan for dewatering systems prior to commencing work. The dewatering system installed shall be in conformity with the overall construction plan, and the Professional Engineer shall provide certification of this. The Professional Engineer shall be required to monitor the performance of the dewatering systems during the progress of the Work and require such modifications as may be required to assure that the systems are performing satisfactorily.
2. Dewatering shall at all times be conducted in such a manner as to preserve the undisturbed bearing capacity of the subgrade soils at the proposed bottom of excavation and to preserve the integrity of adjacent structures. Dewatering by trench pumping will not be permitted if migration of fine grained natural material from bottom, sidewalls, or bedding material will occur.
3. Water entering the excavation from surface runoff shall be collected in shallow ditches around the perimeter of the excavation, drained to sumps, and pumped from the excavation to maintain a bottom free from standing water.
4. The Contractor shall take all additional precautions to prevent uplift of any structure during construction.
5. Permission to use any storm sewers or drains for water disposal purposes shall be obtained from the authority having jurisdiction. Any requirements and costs for such use shall be the responsibility of the Contractor. However, the Contractor shall not cause flooding by overloading or blocking up the flow in the drainage facilities, and he shall leave the facilities unrestricted and as clean as originally found. Any damage to facilities shall be repaired or restored as directed by the County or the authority having jurisdiction, at no cost to the County.
6. The Contractor shall prevent flotation by maintaining a positive and continuous operation of the dewatering system. The Contractor shall be fully responsible and liable for all damages which may result from failure of this system.
7. Removal of dewatering equipment shall be accomplished after compaction/density testing has been completed and the system is no longer required. The Contractor shall remove the material and equipment constituting the system.
8. The Contractor shall take all necessary precautions to preclude the accidental discharge of fuel, oil, or other contaminants in order to prevent adverse effects on groundwater quality.

## 1.05 TESTING AND INSPECTION SERVICE

- A. The County will provide a geotechnical testing and inspection service. The services include testing soil materials and quality control testing during filling and backfilling operations. Samples of soil materials shall be furnished to the testing service by the Contractor. The County shall pay costs of initial geotechnical testing. The Contractor shall pay for any subsequent testing required due to failure and laboratory stand-by charges incurred.
- B. The Contractor shall provide monthly density testing reports to the County during backfilling activities. Density testing reports not submitted in a timely manner shall result in rejection of the pipe installed and rejection of the density testing reports until such time that density re-testing is coordinated and repeated at the Contractors expense.
- C. Density testing scheduled subsequent to backfilling activities shall be coordinated with, and witnessed by the County. Failure by the Contractor to coordinate or have the County present shall result in rejection of the submitted density testing reports and re-testing at the Contractor's expense.
- D. Dewatering systems shall not be removed until compaction/density testing has been completed.

## PART 2 - PRODUCTS

### 2.01 MATERIALS

- A. General:
  - 1. All fill material shall be subject to the review and acceptance of the County.
  - 2. All fill material shall be free of organic material, trash, or other objectionable material. The Contractor shall remove excess or unsuitable material from the job site.
- B. Common Fill Material: Common fill shall consist of mineral soil, substantially free of clay, organic material, muck, loam, wood, trash, and other objectionable material which may be compressible or which cannot be compacted properly. Common fill shall not contain stones larger than 3-1/2-inches in any dimension in the top 12-inches or 6-inches in any dimension in the balance of fill area. Common fill shall not contain asphalt, broken concrete, masonry, rubble or other similar materials. It shall have physical properties that allow it to be easily spread and compacted during filling. Additional common fill shall be no more than 12 % by weight finer than the No. 200 mesh sieve, unless finer material is approved for use in a specific location by the County. Select Common Fill shall be as specified as above from common fill, except that the material shall contain no stones larger than 1/2-inches in largest dimension, and shall be no more than 5 % by weight finer than the No. 200 mesh sieve.

C. Structural Fill: Structural fill shall be reasonably well graded sand to gravelly sand having the following gradation:

US Sieve Size	Percent Passing By Weight
No. 1	100
No. 4	75 - 100
No. 40	15 - 80
No. 100	0 - 30
No. 200	0 - 12

D. Class 1 Soils\*: Manufactured angular, granular material, 1/4 to 1-1/2-inches (6 to 4 mm) size, including materials having significance such as crushed stone or rock, broken coral, crushed slag, cinders, or crushed shells. Sieve analysis for crushed stone is given below separately.

Crushed Stone: Crushed stone shall consist of clean mineral aggregate free from clay, loam or organic matter, conforming to ASTM C33 stone size No. 89 and with particle size limits as follows:

U.S. Sieve Size	% Passing By Weight
1/2	100
3/8	100
No. 4	20 - 25
No. 8	5 - 30
No. 16	0 - 10
No. 50	0 - 2

E. Class II Soils\*\*:

1. GW: Well graded gravels and gravel-sand mixtures, little or no fines. Fifty percent or more retained on No. 4 sieve. More than 95 % retained on No. 200 sieve. Clean.
2. GP: Poorly graded gravels and gravel-sand mixtures, little or no fines. Fifty percent or more retained on No. 4 sieve. More than 95 % retained on No. 200 sieve. Clean.
3. SW: Well graded sands and gravelly sands, little or no fines. More than passes No. 4 sieve. More than 95 % retained on No. 200 sieve. Clean.
4. SP: Poorly graded sands and gravelly sands, little or no fines. More than 50 % passes No. 4 sieve. More than 95 % retained on No. 200 sieve. Clean.

\*Soils defined as Class I materials are not defined in ASTM D2487.

\*\*In accordance with ASTM D2487, less than 5 % pass No. 200 sieve.

- F. Coarse Sand: Sand shall consist of clean mineral aggregate with particle size limits as follows:

U.S. Sieve Size	Percent Passing By Weight
3/8	100
No. 10	85 – 100
No. 40	20 – 40
No. 200	0 - 12

- G. Other Material: All other material, not specifically described, but required for proper completion of the Work shall be selected by the Contractor and acceptable by the County.

### **PART 3 - EXECUTION**

#### **3.01 PREPARATION**

- A. Clearing:
1. The construction areas shall be cleared of all obstructions and vegetation including large roots and undergrowth within 10-feet of the lines of the excavation.
  2. Strip and stockpile topsoil on the site at the location to be determined by the County.

#### **3.02 EXCAVATION**

- A. General: Excavations for roadways, structures, and utilities must be carefully executed in order to avoid interruption of utility service.
- B. Excavating for Roadways/Structures/Utilities:
1. Excavation shall be made to such dimensions as will give suitable room for building the foundations and the structures, for bracing and supporting, for pumping and draining, and for all other work required.
    - a. Excavation for precast or prefabricated structures shall be carried to an elevation 2-feet lower than the proposed outside bottom of the structure to provide space for the select backfill material. Prior to placing the select backfill, the excavation shall be measured by the County to verify that the excavation has been carried to the proper depth and is reasonably uniform over the area to be occupied by the structure.
    - b. Excavation for structures constructed or cast in place in dewatered excavations shall be carried down to the bottom of the structure where dewatering methods are such that a dry excavation bottom is exposed and the naturally occurring material at this elevation leveled and left ready to receive construction. Material disturbed below the founding elevation in dewatered excavations shall be replaced with Class B concrete.
    - c. Footings: Cast-in-place concrete footing sides shall be formed immediately after excavation.
  2. Immediately document the location, elevation, size, material type and function of all new subsurface installations, and utilities encountered during the course of construction.

3. Excavation equipment operators and other concerned parties shall be familiar with subsurface obstructions as shown on the Drawings and should anticipate the encounter of unknown obstructions during the course of the Work.
4. Encounters with subsurface obstructions shall be hand excavated.
5. Excavation and dewatering shall be accomplished by methods that preserve the undisturbed state of subgrade soils. Subgrade soils which become soft, loose, "quick" or otherwise unsatisfactory for support of structures as a result of inadequate dewatering or other construction methods shall be removed and replaced by crushed stone as required by the County at the Contractor's expense.
6. The bottom of excavations shall be rendered firm and dry before placing any piping or structure.
7. All pavements shall be cut with saws or approved power tools prior to removal.
8. Excavated material shall be stockpiled in such a manner as to prevent nuisance conditions. Surface drainage shall not be hindered. Excavated material not suitable for backfill shall be removed from the site and disposed of by the Contractor.

### 3.03 DRAINAGE

- A. The Contractor shall at all times during construction provide and maintain proper equipment and facilities to remove promptly and dispose of properly all water entering excavations, and keep such excavations dry so as to obtain a satisfactory undisturbed subgrade foundation condition. The dewatering method used shall prevent disturbance of earth below grade.
- B. All water pumped or drained from the Work shall be disposed of in a suitable manner without undue interference with other work, without damage to surrounding property, and in accordance with pertinent rules and regulations.
- C. No construction, including pipe laying, shall be allowed in water. No water shall be allowed to contact masonry or concrete within 24-hours after being placed. The Contractor shall constantly guard against damage due to water and take full responsibility for all damage resulting from his failure to do so.
- D. The Contractor will be required at his expense to excavate below grade and refill with crushed stone (gradation 57 or 89) or other acceptable fill material if the County determines that adequate dewatering has not been provided.

### 3.04 UNDERCUT

- A. If the bottom of any excavation is below that shown on the Drawings or specified because of Contractor error, convenience, or unsuitable subgrade due the Contractor's excavation methods, he shall refill to normal grade with fill at his own cost. Fill material and compaction method shall be approved by the County.



### 3.05 FILL AND COMPACTION

- A. Compact and backfill excavations and construct embankment according to the following schedule. (Modified Proctor standard shall be ASTM D-1557):

#### STRUCTURES AND ROADWORK

Area	Material	Compaction
Beneath Structures	Structural Fill	12-inch lifts, compacted to 98% maximum density as determined by AASHTO T-180. Fill Should not be placed over any in-place soils until those deposits have been compacted to 98% Modified Proctor.
Around Structures	Structural Fill	12-inch lifts, 95% of maximum density as determined by AASHTO T-180. Rubber Tire or vibratory plate compactors shall be used
Beneath Paved Surfaces	Common Fill	12-inch lifts, 98% by maximum density as determined by AASHTO T-180 or as required by the FDOT Standards.
Open Areas	Common Fill	12-inch lifts, 95% by maximum density as determined by AASHTO T-180.

- B. Pipe shall be laid in open trenches unless otherwise indicated on the Drawings or elsewhere in the Contract Documents.
- C. Excavations shall be backfilled to the original grade or as indicated on the Drawings. Deviation from this grade because of settling shall be corrected. The backfill operation shall be performed to comply with all rules and regulations and in such a manner that it does not create a nuisance or safety hazard.
- D. Embankments shall be constructed true to lines, grades, and cross sections shown on the plans or ordered by the County. Embankments shall be placed in successive layers of not more than 8-inches in thickness, loose measure, for the full width of the embankment. As far as practicable, traffic over the Work during the construction phase shall be distributed so as to cover the maximum surface area of each layer.
- E. If the Contractor requests approval to backfill material utilizing lifts and/or methods other than those specified herein, such request shall be in writing to the County. Acceptance will be considered only after the Contractor has performed tests, at the Contractor's expense, to identify the material used and density achieved throughout the backfill area utilizing the method of backfill requested. The County's acceptance shall be in writing.
- F. One compaction test location shall be required for each 300 linear feet of pipe and for every 100 square feet of backfill around structures as a minimum. The County may determine that more compaction tests are required to certify the installation depending on field conditions. The locations of the compaction tests within the trench shall be in conformance with the following schedule:
1. At least one test at the spring line of the pipe.

2. At least one test for each 12-inch layer of backfill within the pipe bedding zone for pipes 24-inches and larger.
3. One test at an elevation of 1-foot above the top of pipe.
4. One test for each 2-feet of backfill placed from 1-foot above the top of the pipe to finished grade elevation.
5. Density testing is required for sanitary sewer manholes. Tests shall be staggered around the manhole within 3-feet of the structure's outside diameter.
  - a. First test shall be 1-foot above the structure base.
  - b. Second test shall be 2-feet above the first test and subsequent tests every 2-feet up the finished grade.
6. The Contractor shall provide additional compaction and testing prior to commencing further construction if the County's testing reports and inspection indicate that the fill has been placed below specified density.
7. The Contractor shall coordinate testing with the County approved testing laboratory and shall provide monthly test results to the County in a timely manner during construction activities. Density testing scheduled subsequent to backfilling activities shall be coordinated with the County and witnessed by the County representative. Failure by the Contractor to coordinate or have the County representative present shall result in rejection of the submitted density testing reports and re-testing at the Contractor's expense. Density testing reports not submitted in a timely manner shall result in rejection of the pipe installed and rejection of the density testing reports until such time that density re-testing is coordinated and repeated at the Contractor's expense as deemed necessary by the County's representative.
8. Dewatering systems shall not be removed until compaction/density testing has been completed.

END OF SECTION

**SECTION 02360**  
**SHEET STEEL PILING**

**PART 1 - GENERAL**

**1.01 DESCRIPTION**

- A. **Scope of Work:** The Work covered in this Section consists of furnishing all labor, equipment, appliances, and materials and performing all operations in connection with the installation of a steel sheet piling wall in strict accordance with this Section of the specification, Appendix F "Structural Engineering Report (Sheet Piling)", and the applicable Drawings, and subject to the terms and condition of the Contract.
- B. **Work Included:** The Work to be performed under this Section of the specifications includes, but is not limited to the following:
  - 1. Furnishing and driving of all steel piling required, including special piling required for closures and corners.
  - 2. Excavation, removal, and disposal of all materials and obstructions of whatever nature encountered that interfere with the driving of the sheet piling.

**1.02 SHOP DRAWINGS AND SUBMITTALS**

- A. Submittals shall be submitted to the County for review and acceptance prior to construction in accordance with the General Conditions and specifications Section 01300 "Submittals."
- B. **Shop Drawings:**
  - 1. The Contractor shall prepare as soon as possible after award of the contract, complete and accurate Shop Drawings of all Work of this Section. The Drawings shall include the size and spacing of all steel members. All members shall be numbered for identification in erection. Shop Drawings shall give complete information necessary for fabrication of component parts of the structure, including location, type, and size of all bolts and welds. Shop and field welds shall be clearly distinguished. Welding symbols used on Shop Drawings shall be American Welding Society symbols. The types of steel used for component parts shown shall be noted on each Shop Drawing. Drawings shall show complete dimensioned layout of all steel sheet piling.
  - 2. No steel shall be ordered until such drawings have been approved by the County.
  - 3. Approval by the County covers general design of details only, and if any change is made, which would cause members not to fit, or would not give sufficient strength, the Contractor shall call the County's attention to the fact at once, in writing, so that corrections may be made. If the Contractor fails to do this, the sole responsibility shall rest upon the Contractor.
  - 4. Any error or omission on the Contractor's Drawings, even though approved, shall not relieve the Contractor from the responsibility of performing the Work in accordance

- with the specifications.
5. Any details not sufficiently shown on the plans shall be furnished to the Contractor by the County upon request.

## **PART 2 - PRODUCTS**

### **2.01 GENERAL**

- A. All material supplied shall be one of the products specified in Appendix D "List of Approved Products" appended to these technical specifications.

### **2.02 MATERIALS**

- A. Steel Sheet Piling: Steel Sheet Piling shall be domestic steel or equivalent, conforming to the requirements of ASTM A-328 or approved equal and shall be given a protective coating as specified in the Contract.
  1. The Contractor shall be required to furnish the County with three (3) certified copies of the records of chemical and physical tests of the steel sheet piling. One bending test will be required upon at least 1-piece taken at random from every 30-tons of sheet piling. The testing agency shall be approved by the County. All costs in connection with testing shall be paid by the Contractor.
- B. Protective Coating
  1. General: All bulkhead steel sheet piling shall be given a protective coating as hereinafter specified. Each sheet shall be coated, within the limits shown of the Drawings, with 1 coat of primer and 1 coat of coal tar epoxy.
    - a. Surface Preparation: The surfaces to be coated shall be dry grit-blasted. All Work blasted in 1-day must be coated on that day and before the dew point has been reached. Any blasted area, not coated, which is exposed overnight, shall be at least whip-blasted again before primer application. All areas of the surface to be blasted which show any trace of oil or grease shall be degreased using V.M. and P. Naphtha, or Xylol, prior to grit blasting. All surfaces to be coated shall be completely dry, free of soil, dust, oil, paint, scale, and grit at the time of application of the primer.
    - b. Application: Both the primer and the coal tar epoxy shall be prepared and applied in strict conformance with the manufacturer's instructions and recommendations, except as herein modified. Dry film thickness of the primer shall be 3-mils minimum. Dry film thickness of the coal tar epoxy shall be 10-mils minimum. The Contractor shall submit certification that the minimum film thickness requirements have been met. The primer shall be allowed to cure a minimum of 24-hours before application of the coal tar epoxy.

## PART 3 - EXECUTION

### 3.01 INSTALLATION

- A. The Contractor shall ascertain the location of any utilities or drain lines that pass through the area in which the sheet piling is to be driven, and shall protect same during installation of sheet piling.
- B. Piles shall be carefully located as shown on the Drawings, in accordance with approved Shop Drawings and driven in a plumb position, each pile interlocked with adjoining piles for its entire length. The Contractor shall drive all piles true to line and shall provide suitable temporary wales or guide structures to insure that the piles are driven in correct alignment. All piles shall be driven to depths shown on the Drawings and shall extend to the elevations indicated for the tops of the piles.
- C. Driving: Piles shall be driven by approved methods in such a manner as not to subject the piles to serious injury and to insure proper interlocking throughout the length of the piles. Pile hammers shall be of approved sizes and types and shall be maintained in proper alignment during driving operations by use of suitable leads or by guides attached to the hammer. A protecting cap of approved design shall be employed in driving, when required, to prevent damage to the tops of piles. Vibratory drivers/Extractors are also acceptable. All piles shall be driven without the aid of a water jet, unless otherwise authorized. If at any time the forward or leading edge or the piling wall is found to be out of plumb in the plane of the wall, the piles already assembled and partly driven shall be driven to full depth and the Contractor shall provide and drive tapered piles or take other corrective measures to insure succeeding piles are plumb. The maximum permissible taper for any tapered pile will be 1/8- inch per foot of length. Each run of piling shall be driven to grade progressively from the start and no pile shall be driven to a lower grade than those behind it in the same run except when the piles behind it cannot be driven deeper. If the pile next to the one being driven tends to follow below final grade, it may be pinned to the next adjacent pile. Piles driven out of interlock with adjacent piles or otherwise injured shall be removed and replaced by new piles at the Contractor's expense. Piles shall not be driven within 100-feet of concrete less than 7-days old.
- D. Sheet piling shall be installed plumb and true with the following tolerances:
  - 1. Deviation from vertical, not more than 1/8-inch per foot.
  - 2. Alignment, in any given 30-foot length of bulkhead: no point at the top of the bulkhead, before capping, shall deviate more than 2-inches from a straight line.
  - 3. After capping there shall be no deviation of more than 1-inch in any 30-feet for the cap.

- E. Cutting and Splicing Piles: Accepted piles driven to refusal and extending above cut-off elevation shall be cut off to required grade. Piles driven below grade and piles which, because of damaged heads have been cut off to permit further driving and are then too short to reach final grade shall be extended to the required grade by welding an additional length, when directed, without cost to the County. The Contractor shall trim the tops of piles exclusively battered during driving, when directed to do so, at no cost to the County. Cut-offs shall become the property of the Contractor and shall be removed from the site. The Contractor shall cut holes in the piles for bolts, rods, drains, or utilities at locations and of sizes shown on the Drawings or as directed.
  
- F. Welding: Where welding is specified or permitted by the County it shall conform to the AWS Specifications and shall be performed in the presence of a representative of and approved inspection agency.

END OF SECTION

**SECTION 02570**  
**STABILIZED SUBGRADE**

**PART 1 - GENERAL**

1.01 DESCRIPTION

- A. Scope of Work: All labor, materials, and equipment required to install stabilized subgrade.

1.02 REFERENCES

- A. American Association of State Highway and Transportation Officials (AASHTO) latest edition:
  - 1. AASHTO T-180 – Moisture-Density Relations of Soils Using a 10-lb Rammer and 18-in Drop
- B. Florida Department of Transportation Standard Specifications for Road and Bridge Construction, latest edition:
  - 1. Section 914 – Stabilization Materials

1.03 QUALITY ASSURANCE

- A. Field compaction density, stability, and thickness testing frequencies of the subgrade shall be tested once every 300 linear feet of paving per 24-foot wide strip, staggered left, center, and right of centerline. Where less than 300 linear feet of asphalt is placed in 1-day, provide minimum of 1 test for each per day's construction at a location designated by the County.

1.04 SHOP DRAWINGS AND SUBMITTALS

- A. Submittals shall be submitted to the County for review and acceptance prior to construction in accordance with the General Conditions and specifications Section 01300 "Submittals."
  - 1. Materials certificates signed by material producer and Contractor, certifying that each material item complies with specified requirements.

1.05 SYSTEM DESCRIPTION

- A. Stabilize the roadbed below the proposed base to provide a firm and unyielding subgrade.
- B. Provide a finished roadbed section that meets the bearing value requirements regardless of the quantity of stabilizing materials necessary to be added.

## **PART 2 - PRODUCTS**

### **2.01 GENERAL**

- A. All material supplied shall be one of the products specified in Appendix D "List of Approved Products" appended to these technical specifications.
- B. The Contractor may choose the type of stabilizing material.
- C. Materials may be lime rock, shell rock, cemented coquina, or shell-base sources approved by the FDOT.
- D. At least 97% by weight of the total material shall pass a 3-1/2-inch (90-mm) sieve. Material having a plasticity index greater than 10 or a liquid limit greater than 40 shall not be used as a stabilizer.

### **2.02 LIMEROCK**

- A. For limerock, carbonates of calcium and magnesium shall be at least 70%.

### **2.03 CRUSHED SHELL**

- A. Crushed shell for this use shall be mollusk shell (i.e., oysters, mussels, clams, cemented coquina). Steamed shell will not be permitted.
- B. At least 50% by weight of the total material shall be retained on the No. 4 (4.75  $\mu$ m) sieve.
- C. Not more than 20% by weight of the total material shall pass the No. 200 (75  $\mu$ m) sieve. The determination of the percentage passing the No. 200 (75  $\mu$ m) sieve shall be by washing only.

### **2.04 LOCAL MATERIALS**

- A. Local materials used for this stabilizing may be soils or recyclable materials such as crushed concrete, roof tiles, asphalt coated base, or reclaimed pavement. However, no materials that deteriorate over time, cause excessive deformations, contain hazardous substances, contaminates, or do not improve the bearing capacity of the stabilized material may be used.

## **PART 3 - EXECUTION**

### **3.01 GENERAL**

- A. Prior to the beginning of stabilizing operations, construct the area to be stabilized to an elevation such that, upon completion of stabilizing operations, the completed stabilized subgrade will conform to the lines, grades, and cross-section shown in the plans. Prior to spreading any additive stabilizing material, bring the surface of the roadbed to a plane approximately parallel to the plane of the proposed finished surface.



- B. Process the subgrade to be stabilized in 1 course, unless the equipment and methods being used do not provide the required uniformity, particle size limitation, compaction, and other desired results, in which case, the County will direct that the processing be done in more than 1 course.

### 3.02 APPLICATION OF STABILIZING MATERIAL

- A. When additive stabilizing materials are required, spread the designated quantity uniformly over the area to be stabilized.
- B. When materials from an existing base are to be used in the stabilizing at a particular location, place and spread all of such materials prior to the addition of other stabilizing additives.
- C. Spread commercial stabilizing material by the use of mechanical material spreaders, except that where use of such equipment is not practicable, use other means of spreading, but only upon written approval of the proposed alternate method.

### 3.03 MIXING

- A. Perform mixing using rotary tillers or other equipment meeting the approval of the County. The Contractor may mix the materials in a plant of an approved type suitable for this Work. Thoroughly mix the area to be stabilized throughout the entire depth and width of the stabilizing limits.
- B. Perform the mixing operations as specified (either in place or in a plant) regardless of whether the existing soil, or any select soils placed within the limits of the stabilized sections, have the required bearing value without the addition of stabilizing materials.

### 3.04 MAXIMUM PARTICLE SIZE OF MIXED MATERIALS

- A. At the completion of the mixing, ensure that the gradation of the material within the limits of the area being stabilized is such that 97% will pass a 3-1/2-inch sieve and that the material does not have a plasticity index greater than 8 or liquid limit greater than 30. Note that clay balls or lumps of clay size particles (2 microns or less) cannot be considered as individual particle sizes. Remove any materials not meeting the plasticity requirements from the stabilized area. The Contractor may break down or remove from the stabilized area materials not meeting the gradation requirements.

### 3.05 COMPACTION

- A. Compact the materials at a moisture content permitting the specified compaction. If the moisture content of the material is improper for attaining the specified density, either add water or allow the material to dry until reaching the proper moisture content for the specified compaction.

### 3.06 FINISH GRADING

- A. Shape the completed stabilized subgrade to conform to the finished lines, grades, and cross-section indicated in the Drawings. Check the subgrade using elevation stakes or other means approved by the County.

### 3.07 CONDITION OF COMPLETED SUBGRADE

- A. After completing the stabilizing and compacting operations, ensure that the subgrade is firm and substantially unyielding to the extent that it will support construction equipment and will have the bearing value required by the Drawings.
- B. Remove all soft and yielding material, and any other portions of the subgrade that will not compact readily. Replace yielding material with suitable material so that the whole subgrade is brought to line and grade with proper allowance for subsequent compaction.

### 3.08 MAINTENANCE OF COMPLETED SUBGRADE

- A. After completing the subgrade, maintain it free from ruts, depressions, and any damage resulting from the hauling or handling of materials, equipment, and tools. The Contractor is responsible for maintaining the required density until the subsequent base or pavement is in place including any repairs or replacement of curb and gutter or sidewalk which might become necessary in order to recompact the subgrade in the event of underwash or other damage occurring to the previously compacted subgrade. Perform any such recompaction at no expense to the County. Construct and maintain ditches and drains along the completed subgrade section.

### 3.09 FIELD QUALITY CONTROL

- A. When proper moisture conditions are attained, compact the material to not less than 98% of maximum density determined by AASHTO T-180, and a minimum LBR of 40.

END OF SECTION

## SECTION 02573

### ASPHALT PAVEMENT REMOVAL AND REPLACEMENT

#### PART 1 - GENERAL

##### 1.01 DESCRIPTION

- A. Scope of Work: Mill or remove existing asphalt pavement and base materials and install asphalt paving on a prepared base or as an overlay to existing asphalt pavement sections. Provide Maintenance of Traffic and coordinate and install temporary and permanent replacement of traffic signalization and pavement striping and markings.

##### 1.02 REFERENCES

- A. Florida Department of Transportation (FDOT) Standard Specifications for Road and Bridge Construction, 2000 and 2004 editions.
  - 1. Section 300 – Prime and Tack Coats for Base Courses (2000 and 2004 Editions)
  - 2. Section 320 – Hot Bituminous Mixtures – Plant, Methods, and Equipment (2000 and 2004 Editions)
  - 3. Section 327 – Milling of Existing Asphalt Pavement (2000 and 2004 Editions)
  - 4. Section 330 – Hot Bituminous Mixtures – General Construction Requirements (2000 and 2004 Editions)
  - 5. Section 331 – Type S Asphalt Concrete (2000 Edition)
  - 6. Section 334 – Superpave Asphalt Concrete (2004 Edition)
  - 7. Section 901 – Coarse Aggregate (2000 and 2004 Editions)
  - 8. Section 902 – Fine Aggregate (2000 and 2004 Editions)
  - 9. Section 916 – Bituminous Materials (2000 and 2004 Editions)
  - 10. Section 917 – Mineral Filler (2000 and 2004 Editions)
- B. Florida Department of Transportation (FDOT) Design Standards, 2000 and 2004 editions.

##### 1.03 QUALITY ASSURANCE

- A. Asphalt pavements shall be plant-mixed hot bituminous mixtures. Plant operations shall not begin unless all weather conditions are suitable for laying operations. A prime and tack coat shall be first applied to newly constructed bases. A tack coat shall be applied on existing pavements that are to be overlaid with an asphalt mix and between successive layers of asphalt mix. Apply prime and tack coats when ambient or base surface temperature is above 40°F, and when temperature has been above 35°F for 12-hours immediately prior to application. Construct asphaltic concrete paving when ambient temperature is above 45°F. Do not apply when base is wet, contains excess moisture, or during rain. Establish and maintain required lines and elevations.

- B. Do not spread the mixture when the wind is blowing to such an extent that proper and adequate compaction cannot be maintained or when sand, dust, etc., are being deposited on the surface being paved to the extent that the bond between layers will be diminished.
- C. Field compaction density and thickness testing frequencies of the asphalt shall be tested once every 300-linear feet of paving per 24-foot wide strip, staggered left, center, and right of centerline. Where less than 300-linear feet of asphalt is placed in 1-day, provide minimum of 1 test for each per day's construction at a location designated by the County.
- D. Asphalt extraction gradation shall be tested from grab samples collected once every 1,800-square yards of asphalt delivered to the site, or a minimum of once per day. Obtain the results in a timely manner (no later than the end of the day) so that adjustments can be made if necessary.
- E. On initial use of a Type S mix design at a particular plant, as a minimum, run an additional extraction gradation analysis if more than 500-tons [450-metric tons] of mixture are produced on the first day of production.
- F. Tolerances for Quality Control Tests (Extraction Gradation Analysis) shall be in accordance with FDOT Specification Section 331.

#### 1.04 SHOP DRAWINGS AND SUBMITTALS

- A. Submittals shall be submitted to the County for review and acceptance prior to construction in accordance with the General Conditions and specifications Section 01300 "Submittals."
  - 1. Submit for each proposed design mix the Gradation analysis; Grade of asphalt cement used; and Marshall Stability in pounds flow.
  - 2. Provide a single percentage of asphalt by weight of total mix intended to be incorporated in the completed mixture, shown to the nearest 0.1%. For structural mixes (S-1, S-3) establish the optimum asphalt content at a level corresponding to a minimum of 4.5% air voids. Provide the laboratory density of the asphalt mixture for all mixes except Open-Graded Friction Courses.
  - 3. Identify source and description of the materials to be used.
  - 4. Provide certification that the mix design conforms to specification requirements.
  - 5. Field compaction density and thickness testing.
  - 6. Field asphalt extraction gradation.

## **PART 2 - PRODUCTS**

### 2.01 GENERAL

- A. All material supplied shall be one of the products specified in Appendix D "List of Approved Products" appended to these technical specifications.

- B. Type S Asphalt Concrete (Type S-1 or S-3) is required. The equivalent fine Type SP (Superpave) Asphalt Concrete mixture (Traffic Level C) meeting the requirements of FDOT Specification Section 334 may be selected as an alternate at no additional cost to the County. The equivalent mixes are as follows:
  1. Type S-1: Type SP-12.5
  2. Type S-3: Type SP-9.5
- C. Asphalt plant and equipment shall meet the requirements in FDOT Specification Section 320.

2.02 AGGREGATE

- A. Coarse Aggregate, Stone, Slag, or Crushed Gravel shall meet the requirements in FDOT Specification Section 901.
- B. Fine Aggregate shall meet the requirements in FDOT Specification Section 902.
- C. Aggregate gradation shall meet the following:

**Table 02573-1  
Bituminous Concrete Mixtures  
(Gradation Design Range)**

Type	Total Aggregate Passing Sieves <sup>1</sup>							
	3/4-inch [19.0 mm]	1/2-inch [12.5 mm]	3/8-inch [9.5 mm]	No. 4 [4.75 mm]	No. 10 [2.0 mm]	No. 40 [425 μm]	No. 80 [180 μm]	No. 200 [75 μm]
S-1 <sup>4</sup>	100	88-98	75-93	47-75	31-53	19-35	7-21	2-6
S-3 <sup>4</sup>		100	88-98	60-90	40-70	20-45	10-30	2-6
ABC-1		100						0-12
ABC-2		100			55-90			0-12
ABC-3 <sup>2</sup>	70-100			30-70	20-60	10-40		2-10
FC-2 <sup>3</sup>		100	85-100	10-40	4-12			
FC-3 <sup>4</sup>		100	88-98	60-90	40-70	20-45	10-30	2-6
1. In inches [mm] or sieves [μm]. 2. 100% passing 1-1/2-inch [37.5 mm] sieve. 3. The County may increase the design range for the No. 10 [200 mm] sieve for lightweight aggregates. 4. The County may retain up to 1% on the maximum sieve size.								

- D. Use clean aggregate containing no deleterious substances. Do not use coarse or fine aggregate which contains more than 0.5% of phosphate.
- E. In laboratory tests, and for the purpose of proportioning the paving mixture, consider all material passing the No. 10 [2.00-mm] sieve and retained on the No. 200 [75 μm] sieve as fine aggregate, and the material passing the No. 200 [75 μm] sieve as mineral filler.

- F. Do not use any screenings in the combination of aggregates containing more than 15% of material passing the No. 200 [75 µm] sieve. When two screenings are blended to produce the screening component of the aggregate, one of such screenings may contain up to 18% of material passing the No. 200 [75 µm] sieve, as long as the combination of the two does not contain over 15% material passing the No. 200 [75 µm] sieve. Screenings may be washed to meet these requirements.

## 2.03 ASPHALT CEMENT

- A. Superpave PG Asphalt Binder or Recycling Agent shall meet the requirements in FDOT Specification Section 916.
- B. Mineral Filler shall meet the requirements in FDOT Specification Section 917.
- C. Marshall design mix shall be in accordance with the following:

**Table 02573-2  
Marshall Design Properties For Bituminous Concrete Mixes**

Mix Type	Minimum Marshall Stability (lbs.)	Flow* (0.01 in)	Minimum VMA (%)	Air Voids (%)	Minimum Effective Asphalt Content (%)	VFA Voids Filled with Asphalt (%)
S-1	1,500	8-13	14.5	4-5	**	65-75
S-3	1,500	8-13	15.5	4-6	**	65-75
ABC-1	500	7-15	15	5-16	6.0	-
ABC-2	750	7-15	15	5-14	5.5	-
ABC-3	1,000	8-13	14	4-7	**	65-78
FC-2	-	-	-	-	-	-
FC-3	1,500	8-13	15.5	4-6	**	65-75

\* The maximum Flow value during production shall not exceed one point more than shown in the Table.

\*\* The ratio of the percentage by weight of total aggregate passing the No. 200 sieve to the effective asphalt content expressed as a percentage by weight of total mix shall be in the range of 0.6 to 1.2.

## 2.04 BITUMINOUS MIXTURE

- A. Use a bituminous mixture composed of a combination of aggregate (coarse, fine or mixtures thereof), mineral filler, if required, and bituminous material. Ensure that no more than 20% by weight of the total aggregate used is silica sand or local materials as defined in FDOT Specification Section 902. Size, grade, and combine the several aggregate fractions in such proportions that the resulting mixture meets the grading and physical properties of the verified mix design.

## **PART 3 - EXECUTION**

### **3.01 GENERAL**

- A. Set up, install and maintain temporary traffic control devices and detours as necessary in accordance with Specification Section 1570 "Maintenance of Traffic."
- B. Asphalt pavements, including all surface courses and base courses, where shown to be open cut and removed on the Drawings or specified in the Project Manual, shall be removed to a line back from each edge of the trench, other excavation, or to the limits indicated on the Drawings. Pavements shall be cut straight, clean and square with a power saw or other tools and equipment suitable for the Work.
- C. Asphalt pavements, where shown to be milled on the Drawings or specified in the Project Manual, shall be milled according to FDOT Specification Section 327.
- D. Asphalt mixtures shall meet the general construction requirements specified in FDOT Specification Section 330.
- E. Spread the mixture only when the surface upon which it is to be laid has been previously prepared, is intact, firm, and properly cured, and is dry. Do not spread mixture that cannot be finished and compacted during daylight hours.
- F. Deliver the asphalt cement from the asphalt plant at a temperature not to exceed 350°F and equip the transport tanks with sampling and temperature sensing devices meeting the requirements of FDOT. Maintain the asphalt cement in storage within a range of 230°F to 350°F in advance of mixing operations. Maintain constant heating within these limits, and do not allow wide fluctuations of temperature during a day's production.
- G. Produce a homogeneous mixture, free from moisture and with no segregated materials, that meets all specification requirements for the mixture, including compliance with the Marshall Properties. Also apply these requirements to all mixes produced by the drum mixer process and all mixes processed through a hot storage or surge bin, both before and after storage.

### **3.02 PREPARATION OF APPLICATION SURFACES**

- A. Prior to the laying of the mixture, clean the surface of the base or pavement to be covered of all loose and deleterious material by the use of power brooms or blowers, supplemented by hand brooming where necessary.
- B. Where an asphalt mix is to be placed on an existing pavement or old base that is irregular, and wherever the plans indicate, bring the existing surface to proper grade and cross-section by the application of patching or leveling courses.
- C. Where an asphalt mix is to be placed over a newly constructed surface treatment, sweep and dispose of all loose material from the paving area.

- D. Paint all structures which will be in actual contact with the asphalt mixture, with the exception of the vertical faces of existing pavements and curbs or curb and gutter, with a uniform coating of asphalt cement to provide a closely bonded, watertight joint.
- E. Apply a prime and tack coat on newly constructed bases and apply a tack coat, as specified in FDOT Specification Section 300, on existing pavement structures that are to be overlaid with an asphalt mix and between successive layers of all asphalt mixes.

### 3.03 PLACING MIXTURE

- A. Lay all asphaltic concrete mixtures, including leveling courses, other than adjacent to curb and gutter or other true edges, by the string line method to obtain an accurate, uniform alignment of the pavement edge.
- B. For each paving machine operated, use a separate crew, each crew operating as a full unit. The Contractor's Certified Paving Technician in charge of the paving operations may be responsible for more than one crew but must be physically accessible to the County at all times when placing mix.
- C. Check the depth of each layer at frequent intervals, and make adjustments when the thickness exceeds the allowable tolerance. When making an adjustment, allow the paving machine to travel a minimum distance of 32-feet to stabilize before the second check is made to determine the effects of the adjustment.
- D. In limited areas where the use of the spreader is impossible or impracticable, the Contractor may spread and finish the mixture by hand.
- E. Straightedge and back-patch after obtaining initial compaction and while the material is still hot.
- F. Upon arrival, dump the mixture in the approved mechanical spreader, and immediately spread and strike-off the mixture to the full width required, and to such loose depth for each course that, when the Work is completed, the required weight of mixture per square yard [square meter], or the specified thickness, is secured. Carry an excess amount of mixture ahead of the screed at all times. Hand-rake behind the machine as required.
- G. Construct each course in layers of the thickness as shown on FDOT Design Standards Index No. 513.
- H. Before starting any rolling, check the surface; correct any irregularities; remove all drippings, fat sandy accumulations from the screed, and fat spots from any source; and replace them with satisfactory material. Do not skin patch. When correcting a depression while the mixture is hot, scarify the surface and add fresh mixture.



### 3.04 APPLICATION OF LEVELING COURSES

- A. Before spreading any leveling course, fill all depressions in the existing surface more than 1-inch deep by spot patching with leveling course mixture, and then compact them thoroughly.
- B. Place all courses of leveling by the use of two (2) motor graders; equip one with a spreader box. Use other types of leveling devices after they have been approved by the County.
- C. When the total asphalt mix provided for leveling exceeds 50-lb/yds<sup>2</sup> [27-kg/m<sup>2</sup>], place the mix in two or more layers, with the average spread of any layer not to exceed 50-lb/yd<sup>2</sup> [27-kg/m<sup>2</sup>]. When using Type S-3 Asphaltic Concrete for leveling, do not allow the average spread of a layer to be less than 50-lb/yd<sup>2</sup> [27-kg/m<sup>2</sup>] or more than 75-lb/yd<sup>2</sup> [40-kg/m<sup>2</sup>]. The Contractor may vary the rate of application throughout the Project as directed by the County. When leveling in connection with base widening, the County may require placing all the leveling mix prior to the widening operation.

### 3.05 COMPACTING MIXTURE

- A. The coverage is the number of times the roller passes over a given area of pavement. Regardless of the rolling procedure used, complete the final rolling before the surface temperature of the pavement drops below 160°F.
- B. Seal Rolling: Provide two (2) coverages with a tandem steel-wheeled roller (either vibratory or static), weighing 5 to 12-tons, following as close behind the spreader as possible without pick-up, undue displacement, or blistering of the material. Use vibratory rollers in the static mode for layers of 1-inch or less in thickness.
- C. Intermediate Rolling: Provide five (5) coverages with a self-propelled pneumatic-tired roller, following as close behind the seal rolling operation as the mix will permit.
- D. Final Rolling: Provide one (1) coverage with a tandem steel-wheeled roller (static mode only), weighing 5 to 12-tons, after completing the seal rolling and intermediate rolling, but before the surface pavement temperature drops below 160°F.
- E. Operate the self-propelled, pneumatic-tired roller at a speed of 6 to 10-mph. For each roller, do not exceed an area of coverage of 4,000 yd<sup>2</sup>/hour; if rolling Type S Asphaltic Concrete, do not exceed an area of coverage of 3,000 yd<sup>2</sup>/hour.
- F. Use a sufficient number of self-propelled pneumatic-tired rollers to ensure that the rolling of the surface for the required number of passes does not delay any other phase of the laying operation and does not result in excessive cooling of the mixture before completing the rolling. In the event that the rolling falls behind, discontinue the laying operation until the rolling operations are sufficiently caught up.

- G. Use hand tamps or other satisfactory means to compact areas which are inaccessible to a roller, such as areas adjacent to curbs, headers, gutters, manholes, etc.
- H. Use self-propelled pneumatic-tired rollers to roll all patching and leveling courses. Where placing the initial leveling course over broken concrete pavement, use a pneumatic-tired roller that weighs at least 15-tons. For Type S-3 Asphaltic Concrete leveling courses, use a steel-wheeled roller to supplement the traffic rollers. On other leveling courses, use a steel-wheeled roller to supplement the traffic rollers on all passes after the first pass.
- I. Do not allow the rollers to deposit gasoline, oil, or grease onto the pavement. Remove and replace any areas damaged by such deposits as directed by the County. While rolling is in progress, test the surface continuously, and correct all discrepancies to comply with the surface requirements. Remove and replace all drippings, fat or lean areas, and defective construction of any description. Remedy depressions that develop before completing the rolling by loosening the mixture and adding new mixture to bring the depressions to a true surface. Should any depression remain after obtaining the final compaction, remove the full depth of the mixture, and replace it with sufficient new mixture to form a true and even surface. Correct all high spots, high joints, and honeycombing as directed by the County. Remove and replace any mixture remaining unbonded after rolling. Correct all defects prior to laying the subsequent course.
- J. Use a self-propelled pneumatic-tired roller on the first structural layer placed on a milled surface. Compact with a minimum of three passes.

### 3.06 JOINTS

- A. Place the mixture as continuously as possible. Do not pass the roller over the unprotected end of the freshly laid mixture except when discontinuing the laying operation long enough to permit the mixture to become chilled. When thus interrupting the laying operation, construct a transverse joint by cutting back on the previous run to expose the full depth of the mat.
- B. For all layers of pavement except the leveling course, place each layer so that longitudinal construction joints are offset 6-inches to 12-inches laterally between successive layers.
- C. When laying fresh mixture against the exposed edges of joints (trimmed or formed as provided above), place it in close contact with the exposed edge to produce an even, well-compacted joint after rolling.

### 3.07 SURFACE REQUIREMENTS

- A. Obtain a smooth surface on all pavement courses placed, and then straightedge all intermediate and final courses with a 15-foot rolling straightedge. Furnish a 15-foot [4.572-m] manual straightedge, and make it available at the job site at all times during the paving operation for checking joints and surface irregularities.

- B. Produce a finished surface of uniform texture and compaction with no pulled, torn, or loosened portions and free of segregation, sand streaks, sand spots, or ripples.

### 3.08 ACCEPTANCE REQUIREMENTS

- A. Upon completion of the final surface or friction course, the County will test the finished surface with a 15-foot rolling straightedge. Correct all deficiencies in excess of 3/16-inch.
- B. If correction is made by removing and replacing the pavement, remove the full depth of the course and extend at least 50-feet on either side of the defective area for the full width of the paving lane.
- C. If correction is made by overlaying, cover the length of the defective area and taper uniformly to a featheredge thickness at a minimum distance of 50-feet on either side of the defective area. Extend the overlay the full width of the roadway. Maintain the specified cross slope. The County may adjust, as necessary, the mix used for the overlay for this purpose.
- D. The maximum deficiency from the specified thickness as follows:
  - 1. For pavement of a specified thickness of 2-1/2-inches or more: 1/2-inch
  - 2. For pavement of a specified thickness less than 2-1/2-inches: 1/4-inch
- E. Where the deficiency in thickness is: (1) in excess of 3/8-inch for pavement of less than 2-1/2-inches in specified thickness, or (2) in excess of 3/4-inch for pavement of specified thickness of 2-1/2-inches or more, correct the deficiency either by replacing the full thickness for a length extending at least 50-feet from each end of the deficient area.
- F. For any case of excess deficiency of the pavement, if approved by the County for each particular location, correct the deficient thickness by adding new surface material, and compact it to the same density as the adjacent surface. The County will determine the area to be corrected and the thickness of new material added.

### 3.09 REPAIR AND RESTORATION

- A. Replace asphalt pavement or roadway surfaces cut or damaged to equal or better condition than the original, including stabilization, base course, surface course, curb and gutter, and other appurtenances.

### 3.10 SIGNALIZATION, PAVEMENT STRIPING AND MARKING

- A. The Contractor shall be responsible for coordinating, repairing or replacing all traffic signalization devices and traffic loops damaged during the pavement milling, removal and replacement process.

- B. The Contractor shall be responsible for coordinating, inventorying, and replacing all temporary and permanent pavement striping and markings damaged during the asphalt pavement milling, removal, and replacement process.
- C. Temporary pavement striping and markings shall be paint or reinforced retro-reflective removal tape. Foil back tape is not acceptable. Permanent pavement striping and markings shall be alkyd thermoplastic tape and raised reflective pavement markers.

END OF SECTION

**SECTION 02576**  
**CONCRETE SIDEWALKS AND DRIVEWAYS**

**PART 1 - GENERAL**

1.01 DESCRIPTION

- A. Scope of Work: Constructing new concrete sidewalks, driveways, and curb and gutters as shown on the Drawings.

1.02 QUALITY ASSURANCE

- A. Codes and Standards: Comply with applicable sections of F.D.O.T. Specifications and local governing regulations.
- B. The mixture, placement, and curing of all concrete work shall be in accordance with F.D.O.T. Specifications.

1.03 SHOP DRAWINGS AND SUBMITTALS

- A. Submittals shall be submitted to the County for review and acceptance prior to construction in accordance with the General Conditions and specifications Section 01300 "Submittals."
- B. Furnish manufacturer's product data, design mixes, test reports, and materials certifications.

1.04 JOB CONDITIONS

- A. Traffic Control: Maintain access for vehicular and pedestrian traffic as required for other construction activities, as specified under Section 01570 "Maintenance of Traffic."
- B. Utilize flagman, barricades, warning signs, and warning lights as required.

1.05 GUARANTEE

- A. All restored areas within the public right-of-way shall be guaranteed for 1-year after final acceptance. In the event of cracked or broken concrete surfaces, the Contractor shall make the necessary repairs to restore the concrete within 10-calendar days after notification by the County. The cost of such repairs shall be paid by the Contractor.

## **PART 2 - PRODUCTS**

### **2.01 GENERAL**

- A. All material supplied shall be one of the products specified in Appendix D "List of Approved Products" appended to these technical specifications.

### **2.02 CONCRETE MATERIALS**

- A. Forms: Steel or wood for each type of use of size and strength to resist movement during concrete placement and to retain horizontal and vertical alignment until removal. Use straight forms, free of distortion and defects.
  - 1. Use flexible spring steel forms or laminated boards to form radius bends as required.
  - 2. Coat forms with a non-staining form release agent that will not discolor or deface the surface of the concrete.
- B. Fibermesh Reinforcement: Fibermesh reinforcement fibers shall be 2-inches to 3-inches collated polypropylene fibers. Fibers shall be in strict accordance with the manufacturer recommendations and within the time as specified in ASTM C94, Type III 4.13 and applicable building codes.
- C. Concrete Materials: Comply with requirements of F.D.O.T. Section 347 for concrete materials, admixtures, bonding materials, curing materials, and others as required.
- D. Epoxy Resin Grout: Type N as specified in F.D.O.T. Section 926.
- E. Aggregate, brick, or other material required to match existing driveway or walk shall be as approved by the County.

### **2.03 CONCRETE MIX, DESIGN, AND TESTING**

- A. Comply with requirements of applicable F.D.O.T. Section 347 for concrete mix design, sampling and testing, and quality control, and as herein specified.
- B. Design the mix to produce standard weight concrete consisting of Portland cement, aggregate, air entraining admixture, and water to produce the following properties.
  - 1. Compressive Strength: Class B, 3,000 psi for walks and curbs.
  - 2. Compressive Strength: Class A, 4,000 psi for driveways.
  - 3. Air Content: 3% to 6% .
- C. Concrete slump shall not exceed plus or minus 1-inch from approved design slump.

## PART 3 - EXECUTION

### 3.01 CONCRETE SIDEWALK, DRIVEWAY, AND CURB AND GUTTER

#### A. Surface Preparation:

1. Remove loose material from the compacted sub base surface immediately before placing concrete.
2. Proof-roll prepared sub base surface to check for unstable areas and the need for additional compaction. Do not begin paving work until such conditions have been corrected and are ready to receive paving.

#### B. Form Construction:

1. Set forms to the required grades and lines, rigidly braced and secured. Install sufficient quantity of forms to allow continuous progress of the Work and so that forms can remain in place at least 24-hours after concrete placement.
2. Check completed form work for grade alignment to the following tolerances:
  - a. Top of forms not more than 1/8-inch in 10-feet.
  - b. Vertical face on longitudinal axis, not more than 1/4-inch in 10-feet.
3. Clean forms for reuse immediately after use, and coat with form release agent as often as required to ensure separation from concrete without damage.

#### C. Concrete Placement:

1. Do not place concrete until sub base and forms have been checked for line and grade. Moisten if required to provide a uniform dampened condition at the time concrete is placed. Do not place concrete around manholes or other structures until they are completed to required finish elevation and alignment. Use special colors or aggregate as required to match existing material.
2. Place concrete using methods which prevent segregation of the mix. Consolidate concrete along the face of forms and adjacent to transverse joints with an internal vibrator. Keep vibrator away from joint assemblies, reinforcement, or side forms. Use only square-faced shovels for hand spreading and consolidation. Consolidate with care to prevent dislocation of reinforcing, dowels, and joint devices. Do not use vibrators to push or move concrete in forms or chute.
3. Deposit and spread concrete in a continuous operation between transverse joints, as far as possible. If interrupted for more than 1/2-hour, place a construction joint.
4. An automatic machine may be used for sidewalk or curb and gutter placement at Contractor's option. If machine placement is to be used, submit revised mix design and laboratory test results which meet or exceed the minimum herein specified. Machine placement must produce sidewalks and/or curbs and gutters to the required cross-section, lines, grades, finish, and jointing as specified for formed concrete. If results are not acceptable, remove and replace with formed concrete as specified.

5. Joints: Construct expansion, weakened-plane (contraction), and construction joints true-to-line with face perpendicular to surface of the concrete, unless otherwise indicated. Construct transverse joints at right angles to the centerline, unless otherwise indicated. When joining existing structures place transverse joints to align with previously placed joints, unless otherwise indicated.
  - a. Weakened-Plane Joints: Provide weakened-plane (contraction) joints sectioning concrete into areas as shown on the Drawings. Construct weakened plane joints for a depth equal to at least 1/4 concrete thickness, by sawing within 24-hours of placement or formed during finishing operations. Place joints at intervals not to exceed 10-feet if not otherwise indicated.
  - b. Construction Joints: Place construction joints at the end of all pours and at locations where placement operations are stopped for a period of more than 1/2-hour, except where such pours terminate at expansion joints. Construction joints shall be as shown or, if not shown, use standard metal keyway-section form of appropriate height.
  - c. Expansion Joints:
    - (1) Provide premolded joint filler for expansion joints abutting concrete curbs, catch basin, manholes, inlets, structures, walks, and other fixed objects, unless otherwise indicated.
    - (2) Locate expansion joints at 12-feet on center for concrete walks unless otherwise indicated.
    - (3) Extend joint fillers full-width and depth of joint, and not less than 1/2-inch below finished surface where joint sealer is indicated. If no joint sealer, place top of joint filler flush with finished concrete surface.
    - (4) Furnish joint fillers in one-piece lengths for the full width being placed, wherever possible. Where more than one length is required, lace or clip joint filler sections together. Pieces shorter than 4-inches shall not be used unless specifically shown as such.
    - (5) Protect the top edge of the joint filler during concrete placement with a metal cap or other temporary material. Remove protection after concrete has been placed on both sides of joint.
    - (6) Fillers and Sealants: Comply with the requirements of these specifications for preparation of joints, materials installation, and performance, and as herein specified.

D. Concrete Finishing:

1. After striking-off and consolidating concrete, smooth the surface by screening and floating. Use hand methods only where mechanical floating is not possible. Adjust the floating to compact the surface and produce a uniform texture.
2. After floating, test surface for trueness with a 20-foot straightedge. Variations exceeding 1/3-inch for any two points within 10-feet shall not be acceptable. Distribute concrete as required to remove surface irregularities, and refloat repaired areas to provide a continuous smooth finish.
3. Work edges of slabs, gutters, back top edge of curb, and formed joints with an edging tool, and round 10-1/2-inch radius, unless otherwise indicated. Eliminate any tool marks on concrete surface.



4. After completion of floating and when excess moisture or surface sheen has disappeared, broom finish sidewalks by drawing a fine-hair broom across concrete surface, perpendicular to a line of pedestrian traffic. If the existing material has another finish, match existing finish.
5. Do not remove forms for 24-hours after concrete has been placed. After form removal, clean ends of joints and point up any minor honeycombed areas.

E. Curing:

Protect and cure finished concrete paving and walks, complying with applicable requirements of F.D.O.T. Section 350. Use moist-curing methods for initial curing of approved concrete curing compounds whenever possible.

F. Repairs and Protections:

1. Repair or replace broken or defective concrete, as directed by the County.
2. Drill test cores where directed by the County, when necessary to determine magnitude of cracks or defective areas. Fill drilled core holes in satisfactory pavement areas with Portland cement concrete bonded to pavement with epoxy resin grout.
3. Protect concrete from damage until acceptance of work. When construction traffic is permitted, maintain pavement as clean as possible by removing surface stains and spillage of materials as they occur.
4. Sweep concrete pavement and wash free of stains and discolorations, dirt, and other foreign material just prior to final inspection.

### 3.02 FIELD QUALITY CONTROL

- A. General: Repair or remove and replace unacceptable concrete sidewalk, driveways, or curb and gutter as directed by the County.
- B. Surface Elevation: Actual surface elevations shall be within  $\pm 0.05$  feet of specified or indicated elevations at any given point. Surface elevations between any 2 given points shall be interpolated from a direct line between the 2 points. Surfaces exceeding actual elevation tolerances of more than  $\pm 0.05$  feet at any 2 points within a distance of 15-feet will not be acceptable.

END OF SECTION



## **SECTION 02578**

### **SOLID SODDING**

#### **PART 1 - GENERAL**

##### **1.01 DESCRIPTION**

- A. Scope of Work: Establishing a stand of grass by furnishing and placing grass sod. Included are fertilizing, watering, and maintenance as required to assure a healthy stand of grass. Solid sodding shall be placed on all slopes greater than 4:1, within 10-feet of all proposed structures, and in all areas where existing grass or sod (regardless of it's condition) is removed or disturbed by Contractor's operation unless otherwise specified or shown on the Drawings.

##### **1.02 SHOP DRAWINGS AND SUBMITTALS**

- A. Submittals shall be submitted to the County for review and acceptance prior to construction in accordance with the General Conditions and specifications Section 01300 "Submittals."
  - 1. A certification of sod quality by the producer shall be delivered to the County ten days prior to use.

#### **PART 2 - PRODUCTS**

##### **2.01 GENERAL**

- A. All material supplied shall be one of the products specified in Appendix D "List of Approved Products" appended to these technical specifications.

##### **2.02 GRASS SOD**

- A. Grass sod for the road rights-of-way shall be of variety to match the existing adjacent area and shall be well matted with grass roots. The sod shall be taken up in rectangles, preferably 12-inch by 24-inch, shall be a minimum of 2-inches in thickness, and shall be live, fresh, and uninjured at the time of planting.
- B. Grass sod for restoration of new construction sites and/or areas disturbed by construction on existing sites shall be St. Augustine well matted with grass roots. The sod shall be taken up in rectangles, preferably 12-inch by 24-inch, shall be a minimum of 2-inches in thickness, and shall be live, fresh, and uninjured at the time of planting.

- C. It shall be reasonably free of weeds and other grasses and shall have a soil mat of sufficient thickness adhering firmly to the roots to withstand all necessary handling. The sod shall be planted as soon as possible after being dug and shall be shaded and kept moist until it is planted.

## 2.03 FERTILIZER

- A. Commercial fertilizers shall comply with the state fertilizer laws.
- B. The numerical designations for fertilizer indicate the minimum percentages (respectively) of (1) total nitrogen, (2) available phosphoric acid, and (3) water-soluble potash contained in the fertilizer.
- C. The chemical designation of the fertilizer shall be 6-6-6. At least 50% of the nitrogen shall be derived from organic sources. At least 50 % of the phosphoric acid shall be from normal super phosphate or an equivalent source, which will provide a minimum of two units of sulfur. The amount of sulfur shall be indicated on the quantitative analysis card attached to each bag or other container.

## 2.04 WATER FOR GRASSING

- A. The water used in the sodding operations shall be by the Contractor as approved by the County.

## **PART 3 - EXECUTION**

### 3.01 PREPARATION OF GROUND

- A. The area over which the sod is to be placed shall be scarified or loosened to a depth and then raked smooth and free from debris. Where the soil is sufficiently loose and clean, the County, at its discretion, may authorize the elimination of ground preparation.

### 3.02 APPLICATION OF FERTILIZER

- A. Before applying fertilizer, the soil pH shall be brought to a range of 6.0 - 7.0.
- B. The fertilizer shall be spread uniformly over the area to be sodded at the rate of 700-pounds per acre, or 16-pounds per 1,000 square feet, by a spreading device capable of uniformly distributing the material at the specified rate. Immediately after spreading, the fertilizer shall be mixed with the soil to a depth of approximately 4-inches.
- C. On steep slopes, where the use of a machine for spreading or mixing is not practicable, the fertilizer shall be spread by hand and raked in and thoroughly mixed with the soil to a depth of approximately 2-inches.

### 3.03 PLACING SOD

- A. The sod shall be placed on the prepared surface, with edges in close contact and shall be firmly and smoothly embedded by light tamping with appropriate tools.
- B. Where sodding is used in drainage ditches, or on slopes of 4:1 or greater, the setting of the pieces shall be staggered to avoid a continuous seam along the line of flow. Along the edges of such staggered areas, the offsets of individual strips shall not exceed 6-inches. In order to prevent erosion caused by vertical edges at the outer limits, the outer pieces of sod shall be tamped so as to produce a featheredge effect.
- C. On slopes greater than 2:1, the Contractor shall, if necessary, prevent the sod from sliding by means of wooden pegs driven through the sod blocks into firm earth at suitable intervals.
- D. Sod which has been cut for more than 72-hours shall not be used unless specifically authorized by the County after the inspection thereof. Sod which is not planted within 24-hours after cutting shall be stacked in an approved manner, maintained, and properly moistened. Any pieces of sod that, after placing, show an appearance of extreme dryness shall be removed and replaced by fresh, uninjured pieces.
- E. Sodding shall not be performed when weather and soil conditions are, in the County's opinion, unsuitable for proper results.

### 3.04 WATERING

- A. The areas on which the sod is to be placed shall contain sufficient moisture, as determined by the County, for optimum results. After being placed, the sod shall be kept in a moist condition to the full depth of the rooting zone for at least 2-weeks. Thereafter, the Contractor shall apply water as needed until the sod roots and starts to grow for a minimum of 60-days (or until final acceptance, whichever is latest).

### 3.05 MAINTENANCE

- A. The Contractor shall maintain, at his expense, the sodded areas in a satisfactory condition until final acceptance of the Project. Such maintenance shall include repairing of any damaged areas and replacing areas in which the establishment of the grass stand does not appear to be developing satisfactorily.
- B. Replanting or repair necessary due to the Contractor's negligence, carelessness, or failure to provide routine maintenance shall be at the Contractor's expense.

END OF SECTION



**SECTION 02661**  
**WASTEWATER FORCE MAINS**

**PART 1 - GENERAL**

1.01 WORK INCLUDED

- A. The work under this Section includes providing a complete system for wastewater transmission pressure piping and appurtenant items.

1.02 QUALITY ASSURANCE

A. Design Requirements

1. Piping shall be laid with a minimum cover of 36-inches below finished grade, unless otherwise indicated.
2. Pipelines shall be constructed of the materials indicated on the Drawings.
3. All force mains shall be installed with a continuous insulated 10-gauge copper wire. Wire shall terminate at the top of each valve and be capable of extending 18-inches above the top of the box.
4. All PVC force mains shall be solid green. All lettering shall appear legibly on the pipe and shall run the entire length of the pipe. Lettering shall read as is acceptable for the intended use.
5. Flanged ductile iron used in valve vaults or above ground piping at pump stations shall be Protecto 401 lined and coated per specification Section 09901, "Coatings and Linings." Flanged DIP shall be epoxy coated from the factory and shall not be coated with bitumastic or asphaltic exterior coatings.

- B. Pipe Inspection: The Contractor shall obtain from the pipe manufacturers a certificate of inspection to the effect that the pipe and fittings supplied for this contract have been inspected at the plant and that they meet the requirements of these specifications. All pipe and fittings shall be subjected to visual inspection at time of delivery and just before they are lowered into the trench to be laid. Joints or fittings that do not conform to these specifications will be rejected and must be removed immediately by the Contractor. The entire product of any plant may be rejected when, in the opinion of the County, the methods of manufacture fail to secure uniform results, or where the materials used produce inferior pipe or fittings.

- C. Prevention of Electrolysis: Where shown on Drawings or deemed necessary, electrolytic action through the contact of dissimilar metals shall be prevented by either;

1. The separation of one material from the other by means of an insulating or dielectric coupling (polyethylene wrap), or
2. The use of alternative materials, as directed by the County

### 1.03 SHOP DRAWINGS AND SUBMITTALS

- A. Submittals shall be submitted to the County for review and acceptance prior to construction in accordance with the General Conditions and specifications Section 01300 "Submittals."
  - 1. Certified test reports on pipe
  - 2. Details of restrained and flexible joints
  - 3. Detailed laying schedule for pipe
  - 4. Valves and valve boxes
- B. Acceptance of Material: The County reserves the right to sample and test any pipe or fitting after delivery and to reject all pipe and fittings represented by any sample which fails to comply with the specified requirements.

### 1.04 JOB CONDITIONS

- A. Water in Excavation: Water shall not be allowed in the trenches while the pipes are being laid and/or tested. The Contractor shall not open more trenches than the available pumping facilities are able to dewater to the satisfaction of the County. The Contractor shall assume responsibility for disposing of all water so as not to injure or interfere with the normal drainage of the territory in which he is working. In no case shall the pipelines being installed be used as drains for such water, and the ends of the pipe shall be kept properly and adequately blocked during construction by the use of acceptable stoppers and not by improvised equipment. All necessary precautions shall be taken to prevent the entrance of mud, sand, or other obstructing matter into the pipelines. If on completion of the Work any such material has entered the pipelines, it must be cleaned as directed by the County so that the entire system will be left clean and unobstructed.

## **PART 2 - PRODUCTS**

### 2.01 GENERAL

- A. All material supplied shall be one of the products specified in Appendix D "List of Approved Products" appended to these technical specifications.

### 2.02 MATERIALS

- A. Pipe Fittings, Valves, and Ancillary Equipment shall be installed as shown on the Drawings and as specified in Division 15.
- B. Additional Work: Additional items of construction, necessary for the complete installation of the systems, shall conform to specific details shown on the Drawings and shall be constructed of first-class materials conforming to the applicable portions of these specifications.



## PART 3 - EXECUTION

### 3.01 PREPARATION

- A. Bedding: Upon satisfactory installation of the pipe bedding material as specified in Section 02220 "Excavating, Backfilling and Compacting", a continuous trough for the pipe barrel and recesses for the pipe bells or couplings shall be excavated by hand digging. The pipe shall be laid in the prepared trench, true to line and grade, the pipe barrel shall receive continuous, uniform support and no pressure will be exerted on the pipe joints from the trench bottom.
- B. Cleanliness: The interior of the pipes shall be thoroughly cleaned of all foreign matter before being gently lowered into the trench and shall be kept clean during laying operations by means of plugs or other methods acceptable by the County. During suspension of work for any reason at any time, a suitable stopper shall be placed in the end of the pipe last laid to prevent mud or other foreign material from entering the pipe.

### 3.02 INSTALLATION

- A. Pipe Identification/Location
  1. All PVC wastewater mains shall be solid green in color. All lettering shall appear legibly on the pipe and shall run the entire length of the pipe. Lettering shall read as is acceptable for the intended use.
  2. All HDPE wastewater mains shall be either a solid green or black with four co-extruded equally spaced green stripes of the same material as the pipe. Stripes painted on the pipe outside surface shall not be acceptable.
  3. If main is located over 30-feet from the edge of the pavement or in an easement, the Contractor shall install 4-inch diameter schedule 80 PVC utility pipe line markers over the pipe alignment at 1,000-foot intervals, at all valves, and at all locations where fittings deflect the pipe alignment in the horizontal plane. Utility pipeline markers shall include a decal and shall be colored purple for reclaimed water service.
  4. All mains (PVC and HDPE) shall be installed with a continuous, insulated 10-gauge copper wire installed directly above the pipe for location purposes. Locate wire shall terminate in a test station box and be capable of extending 12-inches above the top of the box. Directionally drilled pipe shall be installed with two insulated 10-gauge copper wires.
- B. Pipe:
  1. Gradient: Lines shall be laid straight, and depth of cover shall vary to provide uniform gradient or slope to pipe, whether grading is completed or proposed at time of pipe installation. When a grade or slope is shown on the Drawings, batter boards with string line paralleling design grade, or other previously approved means, shall be used by the Contractor to assure conformance to required grade.

2. Pipe Joint Deflection: No joint deflection or pipe bending is allowed in PVC pipe. The maximum allowable tolerance in the joint due to variances in installation is 0.75° (degrees), (3-inches per joint per 20-ft stick of pipe). No bending tolerance in the pipe barrel shall be acceptable. Alignment changes shall be made with sleeves and fittings as shown in Drawings. Deflection in fittings and sleeves shall not exceed 75% of the limits recommended by the fitting manufacturer.
3. Rejects: Any pipe found defective shall be immediately removed from the site and replaced with sound pipe at the Contractor's expense.
4. Joint Compounds: No sulfur base joint compound shall be used.
5. Thrust restraints shall be accomplished by the use of mechanical restraining devices unless specifically identified otherwise on the Drawings or herein. Restraining devices are specified in Section 15064 "Polyvinyl Chlorine Pipe and Fittings", respectfully.

#### C. Installing Valves and Boxes

1. Valves: Valves shall be carefully inspected, opened wide and then tightly closed and the various nuts and bolts shall be tested for tightness. Plug valves shall have the disc shaft installed horizontally with the plug rotating upward to the top of the valve. Any valve that does not operate correctly shall be removed and replaced.
2. Valve Boxes: Valve boxes and riser shall be centered over the operating nuts of the valves with a centering ring or disc so as to permit a valve key to be fitted easily to the operating nut. In unpaved areas, valve boxes shall be set to conform to the level of the finished surface and held in position by a concrete collar placed under the support flange as shown on the Drawings. The valve box shall not transmit surface loads to the pipe or valve. Extensions or risers for valve boxes shall be an integral part of the box. No cut sections of D.I. or PVC pipe shall be used in extending the box to its proper height. Care shall be taken to prevent earth and other material from entering the valve box. Any valve box which is out of alignment or whose top does not conform to the finished ground surface shall be dug out and reset. Before final acceptance of the Work all valve boxes shall be adjusted to finish grade.

#### D. Concrete Encasement

1. Concrete encasement shall be constructed in accordance with details shown on the Drawings and shall be constructed of Class C concrete. Encasement shall be constructed where
  - a. As indicated on the Drawings
  - b. As directed by the County
2. The points of beginning and ending of pipe encasement shall be not more than 6-inches from a pipe joint to protect the pipe from cracking due to uneven settlement of its foundation or the effects of superimposed live loads.
3. Concrete Collar: Each valve installed in an unimproved area (outside of pavement, driveways or sidewalks) shall require a 24-inch x 24-inch x 6-inch concrete pad or collar as shown in the Drawings.

- E. Flush Out Connections: Flush out connections shall be installed at the locations as determined by the County and be full pipe size to accommodate a full diameter flush for pipes 12-inches and smaller or a swab for pipes greater than 12-inches.

- F. Backfilling: Backfilling shall be in accordance with Section 02220 "Excavating, Backfilling and Compacting" of these specifications.

### 3.03 CLEANING

- A. General: At the conclusion of the Work the Contractor shall thoroughly clean the new pipe lines by flushing with water or other means to remove all dirt, stones or other material which may have entered the line during the construction period.
- B. Flushing 12-inch pipes and less: Flushing to remove all sand and other foreign matter from pipelines shall only be permitted for mains 12-inches and smaller. Flushing shall be accomplished through full pipe size connections at full pipe depth. The velocity of the flushing water shall be at least 4-feet per second. Flushing shall be terminated at the direction of the County. The Contractor shall dispose of the flushing water without causing a nuisance or property damage. The Contractor shall arrange and pay for the source of flushing water with the County or others.
- C. Swabbing in lieu of flushing: New mains may be hydraulically or pneumatically cleaned with a polypropylene swabbing device to remove dirt, sand and debris from main. If swabbing access and egress points are not provided in the design drawings, it will be the responsibility of the Contractor to provide temporary access and egress points for the cleaning, as required. Passage of cleaning poly swabs through the system shall be constantly monitored, controlled and all poly swabs entered into the system shall be individually marked and identified so that the exiting of the poly swabs from the system can be confirmed. Cleaning of the system shall be done in conjunction with the initial filling of the system for its hydrostatic test. After initial slow-fill, pipe shall sit full for 24 hours to facilitate cleaning and collection of debris from interior of pipe. The Contractor shall insert flexible polyurethane foam swabs (2-pounds per cubic foot density) complete with rear polyurethane drive seal, into the first section of pipe. The swabs shall remain there until the pipeline construction is completed. The line to be cleaned shall only be connected to the existing distribution system at a single connection point. Locate and open all new in-line valves beyond the point of connection on the pipeline to be cleaned during the swabbing operation. At the receiver or exit point for the poly swab, the Contractor is responsible for creating a safe environment for collection of debris, water and the swab. Considerations shall be made for protecting surrounding personnel and property and safe retrieval of the swab. Only County personnel shall operate the supply valve from the existing distribution system. Cleaning and flushing shall be accomplished by propelling the swab down the pipeline to the exit point with potable water. Flushing shall continue until the water is completely clear and swab is retrieved.

### 3.04 FIELD QUALITY CONTROL

- A. Correction of Non-Conforming Work: All non-conforming work shall be repaired or replaced by the Contractor at no additional expense to the County. Non-conforming work shall be defined as failure to adhere to any specific or implied directive of this Project Manual and/or the Drawings, including but not limited to pipe not laid true to the lines and grades as shown on the Drawings, damaged or unacceptable materials, misalignment or diameter ring deflection in pipe due to bedding or backfilling, visible or detectable leakage and failure to pass any specified test or inspection.
- B. Pressure and Leakage Tests of Pressure Piping
1. General: The Contractor shall perform hydrostatic pressure and leakage tests on all pressure piping. Tests shall be conducted on segments between valves and no more than 2,000 linear feet is to be tested at one time unless otherwise acceptable by the County.
  2. Standard: AWWA C600, Section 5 (DI pipe) and AWWA C605 Section 7 (PVC pipe) with the exceptions required herein and the exception that the Contractor shall furnish all gauges, meters, pressure pumps and other equipment needed to test the lines.
  3. Hydrostatic Pressure Test
    - a. Test Pressure: Test pressure will be 50% above the normal working pressure, but not less than 100-psi, unless otherwise noted on the Drawings.
    - b. Test Duration: Test shall be for a period of 2-hours. If during the test, the integrity of the tested line is in question, the County may require a 6-hour pressure test.
    - c. Air Release: Corporation cocks at least 3/4-inch in diameter, pipe riser and angle globe valves shall be provided at each dead-end to bleed air from the line.
  4. Hydrostatic Leakage Test
    - a. General: Following the pressure test, the Contractor shall perform the leakage test. The line shall be filled with water and all air removed for the test. The Contractor shall provide a pump to maintain the test pressure for the entire test period.
    - b. Test Pressure: Maximum operating pressure as determined by the County but not less than 100-psi unless otherwise noted.
    - c. Test duration: 2-hours.
    - d. Allowable leakage: 
$$L = \frac{SD(P)^{0.5}}{148,000}$$

L = Allowable leakage (gallons per hour)  
S = Length of pipe tested (feet)  
D = Nominal diameter of pipe (inches)  
P = Average test pressure maintained (psig)
    - e. Visible Leakage: All leaks evident at the surface shall be repaired and leakage eliminated regardless of the measured total leakage.
    - f. Leakage Measurement: The amount of water required to maintain the test pressure is the leakage.

END OF SECTION

**SECTION 02667**  
**JACKING AND BORING PIPE**

**PART 1 - GENERAL**

1.01 DESCRIPTION

- A. The Work of this section includes all labor, machinery, material, construction equipment and appurtenances required to perform in a good workman-like manner all jacking and boring of the pipeline casings at designated locations and the installation of the carrier pipe within the casing.

1.02 SHOP DRAWINGS AND SUBMITTALS

- A. Submittals shall be submitted to the County for review and acceptance prior to construction in accordance with the General Conditions and specifications Section 01300 "Submittals."
- B. Submit certificates of inspection from the pipe manufacturer certifying that steel casing pipe supplied meets the requirements of these specifications.
- C. Submit Shop Drawings of each steel casing and carrier pipe installation prior to fabrication of piping, casing, and appurtenances.
- D. Before starting excavation, the Contractor shall submit Drawings of jack pit bracing, casing (or conduit), and jacking head proposed to be used. In addition to submitting details for the jacking pit bracing and casing and jacking head, the Contractor shall submit to the County/Professional for review and record purposes 2 copies of the Drawings, design details, and calculations for support blocks, bracing to prevent pipe shifting or flotation, and pressure cement mortar mix design, placement method, and equipment.
- E. If welding of casing pipe is required, submit welder's certification.

1.03 REQUIREMENTS

- A. Unless otherwise specified, the methods and equipment used in jacking casing or conduit shall be optional with the Contractor, provided that the proposed method is approved by the County and meet all Florida Department of Transportation (FDOT) requirements. Such approval, however, shall in no way relieve the Contractor of the responsibility for making a satisfactory installation meeting the criteria set forth herein. Only workmen experienced in jacking operations shall be used in performing the Work.

- B. Only a certified welder shall perform welding operations on the casing pipe. Welder's certification shall be submitted to County/Professional.
- C. Prior to commencement of jack and bore operation, the Contractor must notify the County and Professional.

**PART 2 - PRODUCTS**

2.01 GENERAL

- A. All material supplied shall be one of the products specified in Appendix D "List of Approved Products" appended to these technical specifications.

2.02 PIPE CASING

- A. Steel casing shall be new and unused Grade B steel pipe, minimum yield strength 35,000-psi, conforming to FDOT standards, with allowance for corrosion; and shall conform to ASTM A 139 or AWWA C 200, latest editions, for fabricated pipe. Thickness shall be as shown in the table below. Joints shall be electric-fusion (arc) welded by operators qualified in accordance with American Welding Society Standard Procedure. Steel casing sizes shown are minimum required diameters. Casing sizes only pertain to installations involving a single carrier pipe.

1. Steel Casing Pipe

<u>Carrier Pipe Nominal Diameter</u>	<u>Casing Outside Diameter</u>	<u>Casing Wall Thickness</u>
4-inch	16-inch	0.250-inch
6-inch	16-inch	0.250-inch
8-inch	18-inch	0.250-inch
10-inch	20-inch	0.250-inch
12-inch	24-inch	0.250-inch
16-inch	30-inch	0.312-inch
20-inch	36-inch	0.375-inch
24-inch	42-inch	0.500-inch
30-inch	48-inch	0.500-inch
36-inch	54-inch	0.500-inch
42-inch	60-inch	0.500-inch

2.03 CARRIER PIPE

- A. Carrier pipes shall be in accordance with Section 15062 "Ductile Iron Pipe and Fittings." Restrained joints with a pressure-rating equivalent to that of the piping and a safety factor of 2 shall be used for the carrier pipe contained within casing pipes.

## 2.04 JOINTS

- A. The joints of sections of casing pipe to be jacked shall be welded with a continuous circumferential weld by a certified welder. It shall be the Contractor's responsibility to provide stress transfer across the joints which is capable of resisting the jacking forces involved. Welds shall be ground smooth on the side of the casing to provide smooth bore and shall not extend more than 3/4-inches beyond pipe outside diameter. Field welds shall be complete penetration, single-level groove type joint. Welds shall be airtight and continuous.

## 2.05 BRACING

- A. The pipe shall be braced to prevent shifting or flotation. The details of bracing and blocking of the pipe are subject to the approval of the County.

## 2.06 STAINLESS STEEL CASING SPACERS

- A. Carrier pipes, inside of steel casing pipe, shall be supported by casing spacers at no more than 6-1/2-feet between spacers with double spacers on each end of the casing and spacers at a maximum of 2-feet behind the bell. Each spacer shall be a minimum 8-inches wide for pipe 12-inch diameter or less or minimum 12-inches wide for pipe 16-inch or greater and manufactured of minimum 14-gauge Type 304 stainless steel. All nuts, bolts and washers shall be 304 stainless steel and compatible with the respective 304 stainless steel shell/band. Each spacer shall have a minimum of 4 runner supports manufactured of an ultra high molecular weight polyethylene or glass reinforced polymer. The runner supports shall be of adequate height to position the carrier pipe in the center of casing with a minimum top clearance of 1-1/2-inch. All casing spacers larger than 36-inch diameter (carrier pipe) shall be factory designed, taking in consideration the weight of the carrier pipe filled with water. All calculations and Drawings produced by the manufacturer shall be submitted to County/Professional for review.

## 2.07 CASING END SEALS

- A. Casing ends shall be sealed with brick and cement in the annular space and casing end seals shall be used to completely close both openings on either side of the casing. These end seals shall be pull on (seamless) or wrap around with stainless steel straps for securing to the carrier pipe and the casing. End seals shall be constructed of specially compounded synthetic rubber a minimum thickness of 1/8-inch.

## **PART 3 - EXECUTION**

### **3.01 GENERAL**

- A. The installation of pipeline casings under public highways shall be in accordance with all the requirements of encroachment permits issued by the governing agency.
- B. Once the jacking operation has commenced, it shall be continued uninterrupted around the clock until the conduit has been jacked between the specified limits.
- C. Steel casing pipe sizes shown on the Drawings are minimum sizes. Larger pipe may be provided to facilitate the installation, at no additional cost to the County. The thickness of steel casing pipe shall be of sufficient thickness and axial strength to withstand the forces to be encountered during the jacking process. Steel casing pipe shall be of the minimum length as shown on the Drawings.

### **3.02 EXCAVATION**

- A. Every effort shall be made to avoid any loss of earth outside the jacked casing by following:
  - 1. The rear of the cutting head from advancing in front of the leading edge of the casing by more than 1/3 times the casing diameter and in stable cohesive conditions not to exceed 8-inches.
  - 2. In unstable conditions, such as granular soil, loose or flowable materials, the cutting head is retracted into the casing a distance that permits a balance between pushing pressure, pipe advancement and soil conditions.
  - 3. Development of and maintaining a log of the volume of spoil material removal relative to the advancement of the casing.
- B. Excavated material shall be removed from the conduit as excavation progresses, and no accumulation of such material within the conduit will be permitted

### **3.03 GROUTING**

- A. In the event that ground loss does occur that produces voids outside of the casing, the voids shall be backfilled with cement grout by drilling holes in the casing at the locations of ground loss and elsewhere where voids are suspected and shall force cement grout in to fill voids to refusal at pressures determined by the County/Professional, but not to exceed 50-psi. The cement grout shall be 1 part Portland cement to 5 parts sand by volume.



### 3.04 LOSS OF GROUND

- A. Should appreciable loss of ground occur during the jacking operation, the voids shall be backpacked promptly to the extent practicable with soil cement consisting of a slightly moistened mixture of 1 part cement to 5 parts granular material. Where the soil is not suitable for this procedure, the Contractor shall import suitable material at his expense. The soil cement shall be thoroughly mixed and rammed into place as soon as possible after the loss of ground.

### 3.05 TOLERANCES

- A. Extreme care shall be exercised by the Contractor to maintain line and grade during jacking operations, and the Contractor may be required to modify the manner in which he is conducting his jacking operation to correct any deviation when deemed necessary by the County/Professional. A maximum tolerance of 0.12-foot per 100 linear feet of jacked casing is permitted.

### 3.06 RESPONSIBILITY

- A. The Contractor shall be fully responsible for the structural sufficiency of the casing and the placement thereof. The details shown on the Drawings are to be considered minimum only.

### 3.07 UNFORESEEN CONDITIONS

- A. Casing bores not completed and abandoned because of unforeseen subsurface conditions beyond the control of the Contractor shall be left in a safe condition including filling the casing or bore to restore the structural integrity of the area to a condition equal to that prior to construction. Casing or bore shall be filled completely with cement grout as previously specified.

### 3.08 INSTALLATION OF CARRIER PIPE

- A. Carrier pipes installed inside of steel casing pipe shall be supported at a minimum of every 10-foot by casing spacers or 2 spacers per pipe, whichever is less.
- B. Adjust the pipe grade as required by changing the thickness of the supports to compensate for any grade variations of the casing, and to maintain carrier pipelines, grades, and dimensions, as shown on the Drawings.
- C. If the alignment of the casing is such that the carrier pipe grade cannot be met, the grade of the casing shall, if required by the County/Professional, be adjusted. If realignment is not deemed feasible by the County/Professional, another casing meeting the required grade shall be installed. The abandoned casing shall be filled with sand and the ends plugged with 12-inch thick masonry plugs. Realignment or replacement Work shall in no way result in extra cost to the County.

- D. All carrier pipe installed in a casing must be restrained for the entire length of the casing. Piping shall, at a minimum, be restrained to 1 joint outside of casing. If a fitting is present at the joint, restraint requirements shall conform to table presented in Drawings.

END OF SECTION

## SECTION 02670

### PRESSURE MAIN SAMPLE COLLECTION

#### PART 1 - GENERAL

##### 1.01 DESCRIPTION

###### A. SCOPE:

Where an existing pressure main is being tapped, connected to a new constructed main, or being prepared for abandonment, a pipe sample shall be collected in order for the County to perform a condition assessment of the pipe. This section specifies the procedures for collecting pipe samples and does not address the work involved in the tapping, the repair, or the actual abandonment of the pipeline.

###### B. GENERAL SAMPLE REQUIREMENTS:

The pipe samples shall be taken from all existing pipe connections or abandoned pipe that is ductile iron pipe, cast iron pipe, asbestos cement pipe, and prestressed concrete cylinder pipe.

#### PART 2 - MATERIALS (Not Used)

#### PART 3 - EXECUTION

##### 3.01 PIPE SAMPLE COLLECTION

Contractor shall be responsible for obtaining coupons or sections from pressure mains being tapped, removed, or abandoned, digital photos, and completing the Pressure Main Sample Collection Submittal Form (see Appendix B). As indicated on the drawings, the Contractor shall collect coupons taken from line-stop operations, line taps, dry connection, or from any other operations such as where the pipe will be disconnected, removed or abandoned.

- A. The submittal requirements are not considered complete unless all of the requirements described below are complete for each sample of pipe.
  - 1. Complete the Pressure Main Sample Collection Submittal Form (see Appendix B)
  - 2. If applicable, note in the comments section of the form:
    - a. The condition of the DIP external polyethylene wrap.
    - b. Site observations relevant to work site of the sample (e.g. gas main in close proximity, AC pipe with areas of softness, etc.)
    - c. Visually inspect the exposed asbestos cement pipe and note if there are areas of softness
  - 3. Pipe sample unique identification number as shown on the drawings:
    - a. Shall be printed on a sturdy waxed tag affixed to each whole piece of pipe sample or legibly marked on the pipe sample with permanent marking pen.

- b. Wet-tap samples shall have a legibly written ID number on the exterior side and top of the sample.
  - c. An additional digit will be added at the end to indicate where multiple samples were taken from a pipe with the same ID number.
  - 4. Pipe sample requirements:
    - a. Wet-taps from a tapping sleeve - the complete tapping coupon
    - b. Dry connection – 12” length of pipe
    - c. Abandoned pipe – 12” length of pipe at the beginning and the end if applicable
    - d. Pipe repair – 12” length of pipe that was cut from the existing pipe representative of damage or typical conditions.
  - 5. GPS coordinates of where the sample was taken shall be noted on the Submittal Form
  - 6. Provide digital photographs for the following views:
    - a. Overall Work site
    - b. Exposed pipe before tap or abandonment
    - c. Sample exterior
    - d. Close-up of the edge (thickness of pipe)
    - e. All photos shall bear the unique sample ID number shown on the drawings, date, and time.
- B. Prior to submitting a monthly pay request that includes payment for taps, connections, replacement or abandonment of pipe, the Contractor’s requirements as specified herein shall be acceptable to the County.

**\*\*END OF SECTION\*\***

## SECTION 02771

### CURE-IN-PLACE PIPE FOR SANITARY SEWER RENEWAL

#### PART 1 - GENERAL

##### 1.01 REQUIREMENTS

- A. The Work within this Section consists of the installation and testing cured-in-place pipe (CIPP). The CIPP shall provide a structurally sound, joint-less and water-tight new pipe within a pipe. The Contractor is responsible for proper, accurate and complete installation of the CIPP using the system selected by the Contractor.
- B. The finished liner shall extend over the installation length in a continuous, tight fitting, watertight pipe-within-a-pipe and shall be fabricated from materials which, when installed, will be chemically resistant to withstand internal exposure to domestic sewage.
- C. Neither the CIPP system, nor its installation, shall cause adverse effects to any of the County's facilities or processes. The use of the product shall not result in the formation or production of any detrimental compounds or by-products at the treatment facilities. The Contractor shall test and monitor the levels of by-products produced as a result of the installation operations. The Contractor shall conduct installation operations and schedule cleanup in a manner to cause the least possible obstruction and inconvenience to traffic, pedestrians, businesses, and property owners or tenants.

##### 1.02 INSTALLER EXPERIENCE AND QUALIFICATIONS

- A. The Contractor's staff experience shall meet as a minimum the following requirements. The inability to document such experience may be grounds for rejecting the proposed installer's staff.
  - 1. The proposed **Superintendent** must have a minimum of three (3) years of CIPP lining supervisory field experience on projects totaling a minimum of 150,000 LF of 8-inch or greater CIPP liner installation using the methods and materials proposed for this Work, as documented by verifiable references. Superintendent's resume of projects. Each reference project shall include the pipe dimensions, length of installation, size/type of flow control required to perform the Work, description of the actual work performed including installation method, owner's name, telephone number and contact person, date of installation. It is required that the Superintendent(s) named are the Superintendent(s) assigned to this project and on site during construction. The Contractor is required to have at least 1 qualified Superintendent on site at all times during the construction activities. All referenced experience shall be for projects completed within the United States or Canada and shall have used the same installation method, CIPP liner and resin combination proposed for this project. References will be checked.

2. **Installation Crew:** At least 1 person other than the Superintendent from the CIPP installation crew shall have a minimum of 1-year of CIPP experience totaling at least 20,000 lineal feet of 8-inch or greater installed liner. The crewmember with listed qualifications must be on the project site during all installation activities.
3. **Boiler Technician:** Contractor shall provide the name and information for the boiler technician who will perform the actual Work. The boiler technician must have a minimum of 2 projects totaling at least 10,000 lineal feet of CIPP lining in which a similar position was held.
4. **Lateral Cutter Technician:** Contractor shall provide the name and information for the technician who will perform the actual Work. The lateral cutter technician must have a minimum of 2 projects totaling at least 10,000 lineal feet of CIPP lining in which a similar position was held.
5. **Lead CCTV inspector** shall be NASSCO PACP certified to report liner defects.
6. The final decision to accept or reject the product, manufacturer, and/or installer lies solely with the County. The named Manufacturer, Field Superintendent, CIPP Lead Installer, Boiler Technician, and Lateral Cutter must be employed to perform the Work, unless changes are specifically authorized by the County.

### 1.03 PERFORMANCE WORK STATEMENT

- A. The Contractor shall submit, before any lining WORK is performed, to the County a Performance Work Statement (PWS) which clearly defines the CIPP product delivery in conformance with the requirements of these contract documents. The PWS shall contain at a minimum the following:
  1. Contractor's certificate of compliance that clearly indicates that the CIPP will conform to the project requirements as outlined in Specification Section 01010 Summary of Work and as delineated in these specifications.
  2. A detailed installation plan describing:
    - a. All preparation work (cleaning operations, pre-CCTV inspections, by-pass pumping, and traffic control)
    - b. Installation procedure and method of curing
    - c. Service reconnection
    - d. Quality control and testing to be performed
    - e. Post-CCTV inspection
    - f. Warrantees
    - g. Description of the proposed CIPP lining technology.
  3. A detailed plan for identifying all active service connections during mainline installation.
  4. The qualifications of the Contractor.
    - a. Name, business address and telephone number
    - b. Personnel names, experience, and certifications for Field Superintendent, CIPP lead Installer, Lateral Cutter, Boiler Technician, and Lead CCTV NASSCO PACP Certificated Inspector to be directly involved with this project. The Contractor shall sign and date the information provided and "certify that to the extent of his knowledge, the information is true and accurate, and that the supervisory personnel will be directly involved with and used on this project". Substitutions of personnel and/or methods will not be allowed without written authorization of the County.

- c. Specialty technicians shall be certified by the equipment manufacturer and/or its authorized representative. Certifications shall be submitted to the County/Professional.
5. Proposed manufacturer's technology data shall be submitted for all CIPP products and all associated technologies to be furnished.
6. All tools and equipment required for a complete installation of the CIPP.
  - a. Clearly describe all equipment including proposed back-up equipment to be furnished for this project.
  - b. Identify redundant tools and equipment to be kept on the job site in the event of equipment breakdown.
  - c. The Contractor shall outline the mitigation procedure to be implemented in the event of key equipment failure during the installation process for the CIPP.
7. A detailed description of the Contractor's proposed procedures for the removal of any existing blockages in the pipeline that may be encountered during the cleaning process.
8. Detailed public notification plan for stage notification to residences affected by the CIPP installation.
9. An odor control plan that will ensure that project specific odors will be minimized at the project site and surrounding area.
10. Outline specific repair or replacement procedures for potential defects that may occur in the installed CIPP. Repair or replacement procedures shall be as recommended by the CIPP system manufacturer and shall be submitted prior to any Work.
  - a. Repairable defects that may occur in the installed CIPP shall be specifically defined by the Contractor based on the manufacturer's recommendations, including a detailed step-by-step repair procedure, resulting in a finished product meeting the requirements of the specifications.
  - b. Un-repairable defects that may occur to the CIPP shall be clearly defined by the Contractor based on the manufacturer's recommendations, including a recommended procedure for the removal and replacement of the CIPP.

#### 1.04 REFERENCES

##### A. Codes, Specifications, and Standards

1. Codes, specifications, and standards referred to by number or title shall form a part of this specification to the extent required by the references thereto. Latest revisions shall apply, unless otherwise shown or specified.
2. All American Society for Testing and Materials (ASTM) Standards noted below shall be to the latest revised version.
  - D543 – Standard and Practice for Evaluating the Resistance of Plastics to Chemical Reagents
  - D638 – Standard Test Method for Tensile Properties of Plastics
  - D790 – Standard Test Methods for Flexural Properties of Un-reinforced and Reinforced Plastics and Electrical Insulating Materials
  - D792 – Standard Test Methods for Density and Specific Gravity of Plastics by Displacement
  - D2122 – Standard Test Method for Determining Dimensions of Thermoplastic Pipe and Fittings

- D2837 – Obtaining Hydrostatic Design Basis for Thermoplastic Pipe Materials
- D2990 – Standard Test Methods for Tensile, Compressive, and Flexural Creep and Creep-Rupture of Plastics
- D3567 – Standard Practice for Determining Dimensions of Fiberglass (Glass-Fiber-Reinforced Thermosetting Resin) Pipe and Fittings
- D3681 – Standard Test Method for Chemical Resistance of “Fiberglass (Glass Fiber Reinforced Thermosetting Resin) Pipe and Fittings
- D5813 – Standard Specification for Cured-in Place Thermosetting Resin Sewer Pipe
- F1216 – Standard Practice for Rehabilitation of Existing Pipelines and Conduits by Inversion and Curing of a Resin-impregnated Tube
- F1743 – Standard Practice for Rehabilitation of existing pipelines and conduits by pulled-in-place installation of cured-in-place thermo setting resin pipe
- F2019 - Standard Practice for Rehabilitation of Existing Pipelines and Conduits by the Pulled in Place Installation of Glass Reinforced Plastic (GRP) Cured-in-Place Thermosetting Resin Pipe (CIPP)
- F2561 - Standard Practice for Rehabilitation of a Sewer Service lateral and Its Connection to the Main Using a One Piece Main and Lateral Cured-in-Place Liner

**1.05 PRE-TREATMENT OF REGULATED CHEMICALS TO DISCHARGE INTO SEWER**

- A. CIPP liner systems using resins containing styrene or other regulated chemicals that will be discharged into the wastewater system shall be required to reduce the concentration of Styrene in the cure water prior to discharge to the sanitary sewer. The discharge limits are as follows:

	Discharge Limits to South WRF Service Area		Discharge Limits to Northwest WRF Service Area		Discharge Limits to Eastern WRF Service Area	
	Maximum Styrene Concentration Limit for Discharge to South WRF (PPM)	Maximum Total Pounds per Day of Styrene to be Discharged to South WRF (Pounds/Day)	Maximum Styrene Concentration Limit for Discharge to Northwest WRF (PPM)	Maximum Total Pounds per Day of Styrene to be Discharged to Northwest WRF (Pounds/Day)	Maximum Styrene Concentration Limit for Discharge to Eastern WRF (PPM)	Maximum Total Pounds per Day of Styrene to be Discharged to Eastern WRF (Pounds/Day)
< 500,000	7	29	1	4	3.5	14
< 250,000	14	29	2	4	7.0	14
< 100,000	35	29	5	4	17.5	14

- 1. A single day’s or line segment water discharge in excess of 500,000 gallons per day shall require approval by the County’s Environmental Compliance Section for separate concentration limit evaluation and approval.”

- B. CIPP liner systems using resins containing styrene or other regulated chemicals that will be discharged into the wastewater system shall require a pre-treatment plan to remove the regulated chemicals to acceptable levels prior to discharge. The Contractor shall submit the pre-treatment plan to the County for approval prior to discharge. The information required shall include:



1. MSDS for all chemicals used in the process and that will be discharged into the wastewater system
  2. Representative analytical data that was performed in the past for the proposed process, as collected from the wastewater stream
  3. The addresses and mapped locations of the discharge
  4. The total duration of discharge request
  5. The anticipated discharge temperature. Discharges in excess of 140°F are not permitted
  6. The Contractor shall submit for approval a summary table of pre-treatment design calculations in Excel containing the following information:
    - a. Dates of discharge of each section
    - b. Lining section numbers using the OCUD numbering system
    - c. Length and diameter of each section
    - d. Volume (in gallons) of inversion water of each section
    - e. Volume (in gallons) of cool down water of each section
    - f. Total volume (in gallons) of inversion and cooling water of each section
    - g. Regulated chemical (in pounds) in discharge volume of each section
    - h. Reduction chemical (in pounds) to meet post-treatment concentration limit
    - i. Reaction time period (in hours) to achieve post-treatment concentration limit
    - j. Cool down time period (in hours)
    - k. Regulated chemical post-treatment concentration limit (in PPM)
  7. The Contractor shall provide pre-treatment and post-treatment sampling and laboratory analysis of the process wastewater and submit the results to the County for verification.
- C. After curing, the Contractor shall obtain a post-treatment cure water sample at each site and submit for laboratory analysis. ,
1. The following laboratory analysis is required:
    - a. One (1) sample to be collected from the treated water line segment and analyzed for “Styrene” using EPA Method 8260.
    - b. One (1) “Trip Blank” sample, analyzed for “Styrene” using EPA Method 8260.
  2. The Contractor shall submit the analytical report to the County for approval.
  3. The Contractor shall be responsible for all costs related to laboratory analytical testing of the water samples collected.
  4. Sampling shall continue for each successive lining segment until the laboratory results verify the Contractor’s competency in determining the amount of styrene reduction tablets/material required for a given water volume. Competency will be determined by meeting the stated discharge limits.
  5. Once the sample results demonstrate that the discharge limits have been met the Contractor shall follow similar styrene reduction procedures for subsequent lining segments, but sampling will not be required.
  6. Should samples from three locations not meet the discharge limits, the County may require the Contractor to hold cure water in place until laboratory results confirm the water is below the discharge limits.
  7. The County reserves the right to obtain samples at any site on any line segment to ensure compliance with the discharge limits.”

- D. The service areas for each of the proposed lining subareas are as follows:
1. (Subarea Name) (Subarea Number) is/are located in the Eastern WRF service area.
  2. (Subarea Name) (Subarea Number) is/are located in the South WRF service area
  3. (Subarea Name) (Subarea Number) is/are located in the Northwest WRF service area.

#### 1.06 RESPONSIBILITY FOR OVERFLOWS AND SPILLS

- A. It shall be the responsibility of the Contractor to schedule and perform his work so as to result in no overflows or spills of sewage or combined sewage from the system. If sewage flows are such that they interfere with the Contractor's ability to perform work, the Contractor shall be responsible for scheduling his work during low flow periods or provide bypass pumping. Bypass pumping shall be provided only with the specific written approval of the County.
- B. In the event of overflows caused by the Contractor's work activities, the Contractor shall immediately take appropriate action to contain and stop the overflow, clean up the spillage, disinfect the area affected by the spill, and notify the County in a timely manner.
- C. Contractor will indemnify and hold harmless the County for any fines or third-party claims for personal or property damage arising out of a spill or overflow that is fully or partially the responsibility of the Contractor. Should fines subsequently be imposed as a result of any overflow for which the Contractor is fully or partially responsible, the Contractor shall pay all such fines and all of the County's legal, engineering, and administrative costs in defending such fines and claims associated with the overflow.
- D. If the Contractor is required to hold cure water due to unacceptable styrene testing results, the Contractor shall be required to provide bypass pumping or other means to insure wastewater service is not disrupted during the hold period.

#### 1.07 SHOP DRAWINGS AND SUBMITTALS

- A. Submittals shall be submitted to the County for review and acceptance prior to construction in accordance with the General Conditions and specifications Section 01300 "Submittals." Submittals shall include the following:
1. Performance Work Statement shall be provided with a table of contents and tabbed sections.
  2. Product:
    - a. A list of projects from the Manufacturer that total a minimum of 500,000 linear feet of liner installed in the United States. An Excel spread sheet shall be included listing as a minimum the name of projects, linear footage of main, completion date, contract amount, name of owner, address, contact person, and phone number.
    - b. Fabric tube – manufacturer and description of product components
    - c. Flexible membrane (coating) material and recommended repair (patching) procedure if applicable
    - d. Raw resin data – manufacturer and description of product components

- e. Manufacturer's shipping, storage and handling recommendations for all components of the CIPP system
  - f. All MSDS sheets for all materials to be furnished
  - g. Tube wet-out and cure method including:
    - (1) A complete description of the proposed wet-out procedure for the proposed technology
    - (2) The manufacturer's recommended cure method for each diameter and thickness of CIPP liner to be installed including the curing medium and the method of application
3. Quality Control Plan
    - a. Defined responsibilities of the Contractor's personnel for assuring that all quality requirements are met. These will be assigned by the Contractor to specific personnel.
    - b. Proposed procedures for quality control, product sampling and testing shall be defined and submitted as part of the Plan.
    - c. Proposed methods for product performance controls, including the method of and frequency of product sampling and testing both in raw material form and cured product form.
    - d. Inspection forms and guidelines for quality control inspections shall be prepared in accordance with the standards specified within this specification.
    - e. The manufacturer shall furnish a check list containing key elements of the CIPP installation criteria that is important for the County to ensure that quality control and testing requirements are performed in accordance with these specifications.
  4. Engineering design calculations shall be submitted in a timely fashion prior to construction, in accordance with the Appendix of ASTM F-1216, for each length of liner to be installed including the thickness of each proposed CIPP. It will not be acceptable for the Contractor to submit a design for the most severe line condition and apply that design to all of the line sections. All calculations shall include data that conforms to the requirements of these specifications.
    - a. These calculations shall be performed and certified by a Professional Engineer registered in the State of Florida.
    - b. The manufacturer shall certify as to the compliance of its materials to the values used in the calculations.
  5. The liner manufacturer shall submit a tabulation of time versus temperature. This tabulation shall show the lengths of time that exposed portions of the liner will endure without self-initiated cure or other deterioration beginning. This tabulation shall be at 5°F (degrees Fahrenheit) increments ranging from 70°F to 100°F. The manufacturer shall also submit his analysis of the progressive effects of such "pre-cure" on the insertion and cured properties of the liner
  6. Certified copies of test reports of factory tests required by the applicable standards and this Section.
  7. Manufacturer's installation instructions and procedures.
  8. CIPP Installation Record (Shot Record) to include shot number and corresponding manhole to manhole pipe reaches for each scheduled installation, design thickness, actual thickness delivered to the site, pipe diameter, relength, total length of shot, and number of laterals.

9. Wastewater pre-treatment plan including data, measurements, assumptions, calculations and procedures for the pre-treatment of CIPP process wastewater containing regulated chemicals.
  10. Manufacturer's detailed procedures for repairing liners that have been installed incorrectly or that have failed during installation.
  11. Contractor's procedures and materials for service renewal including time and duration of sewer service unavailability and a complete description of the methods he intends to use to reconnect the existing laterals.
  12. Sampling procedures and locations for obtaining representative samples of the finished liner.
  13. Sampling tests for compliance by an independent laboratory shall be made according to the applicable ASTM specification and the manufacturer's quality control program.
- B. A final certificate of compliance with this specification shall be provided by the manufacturer for all lining material furnished.

#### 1.08 WARRANTY

- A. The materials used for the project shall be certified by the manufacturer for the specified purpose. The Contractor shall warrant the liner material and installation for a period of one (1) year. During the Contractor warranty period, any defect which may materially affect the integrity, strength, function and/or operation of the pipe, shall be repaired at the Contractor's expense in accordance with procedures in these specifications and as recommended by the manufacturer.
- B. On any work completed by the Contractor that is defective and/or has been repaired, the Contractor shall warrant this work for an additional one (1) year.

#### 1.09 DELIVERY, STORAGE, AND HANDLING

- A. The Contractor shall be responsible for the delivery, storage, and handling of products. No products shall be shipped to the job site without the approval of the County.
- B. Keep products safe from damage. Promptly remove damaged products from the job site. Replace damaged products with undamaged products.
- C. The wet-out facility shall write the Shot number, total wet-out length, thickness, pipe width, and resin type on each bag delivered to the project.

### **PART 2 - PRODUCTS**

#### 2.01 GENERAL

- A. The materials used shall be designed, manufactured, and intended for sanitary sewer pipe relining and the specific application in which they are used. The materials shall have a proven history of performance in sewer relining and rehabilitation.

- B. Pipe lining products pre-approved by the County include: Insituform Technologies (CIPP Liner), National Liner (CIPP Liner), LMK Enterprises (Performance Liner), Steven's Technologies (CIPP Liner 2 part 100% epoxy), Inner Cure Technologies (Reichold/Dion CIPP Liner), Lanzo Lining Services (Lanzo CIPP Lining System), and Premier Pipe (Premier Pipe CIPP Lining System), Layne Inliner (CIPP Liner), and Miller Pipeline (CIPP Liner). All products must meet the specification herein and will require approval prior to installation.
- C. All materials, shipped to the project site, shall be accompanied by test reports certifying that the material conforms to the ASTM listed herein. Materials shall be shipped, stored, and handled in a manner consistent with written recommendations of the CIPP system manufacturer to avoid damage. Damage includes, but is not limited to, gouging, abrasion, flattening, cutting, puncturing, or ultra-violet (UV) degradation. On site storage locations, shall be approved by the County. All damaged materials shall be promptly removed from the project site at the Contractor's expense and disposed of in accordance with all current applicable agency regulations.
- D. The finished pipe liner in place shall be fabricated from materials which when complete are chemically resistant to and will withstand internal exposure to domestic sewage having a pH range of 5 to 11 and temperatures up to 150°F.
- E. Take all necessary field measurements of the existing pipe (including diameter, ovality and length) prior to manufacturing liners.
- F. The minimum length shall be that deemed necessary by the Contractor to effectively span the distance from the inlet to the outlet of the respective manholes unless otherwise specified. The Contractor shall verify the lengths in the field before manufacturing.

## 2.02 STRUCTURAL REQUIREMENTS

- A. Each CIPP shall be designed to withstand internal and/or external loads as dictated by the site and pipe conditions. The CIPP design shall assume no bonding to the original pipe wall.
- B. The Contractor must have performed long-term testing for flexural creep of the CIPP pipe material installed by his company. Such testing results are to be used to determine the long-term, time dependent flexural modulus to be utilized in the product design. The long-term modulus shall not exceed 50 percent of the short-term value for the resin system and shall be verifiable through testing. The materials utilized for the contracted project shall be of a quality equal to or better than the materials used in the long-term test with respect to the initial flexural modulus used in the CIPP design.
- C. The Contractor shall submit, prior to installation of the lining materials, certification of the compliance with these specifications and/or the requirements of the CIPP system. Certified material test results shall be included that confirm that all materials conform to these specifications. Materials not complying with these requirements will be rejected.

- D. The design thickness of the CIPP shall be arrived at using standard engineering methodology as found in ASTM F1216 and the physical properties. In no case shall the finished thickness of the cured liner be less than 4.5 millimeters. The required cured structural CIPP wall thickness shall be based, as a minimum, on the physical properties described in TABLE 02771 - 1 Minimum Physical Properties and per the design of the Professional Engineer and in accordance with the design equations in ASTM F 1216 Appendix X1 and the following design parameters:

<b>Design Considerations</b>	<b>Criteria</b>
Tube Design	ASTM F 1216 Appendix X1
Hydrostatic Buckling	ASTM F 2561 Section 6.1 and 6.1.1
Design Safety Factor	2.0
Retention Factor for Long Term Flexural Modulus to be used in Design	50 % of the short-term value of the resin system
Ovality	2 %
Groundwater Depth*	100% depth from pipe invert to surface
Soil Depth*	As indicated on the plans
Lining enhancement factor (K)	7
Soil Modulus**	1,000 psi
Soil Density**	120 pcf
Live Load**	One (1) H20 passing truck
Design Condition	Fully deteriorated
Minimum Long-Term Life	50 years

\*Denotes multiple line segments may require a table of values

\*\*Denotes information required for fully deteriorated design conditions

TABLE 02771-1  
Minimum Physical Properties

<b>Property</b>	<b>Standard</b>	<b>Cured Composite per ASTM F1216 (PSI)</b>
Flexural Strength (short term)	ASTM D790	4,500
Flexural Modulus of Elasticity (short term)	ASTM D790	250,000

- E. When multiple layers are present, the layers of the finished CIPP shall be uniformly bonded. It shall not be possible to separate any two layers with a probe or point of a knife blade so that the layers separate cleanly or such that the knife blade moves freely between the layers. If separation of the layers occurs during testing of the field samples, new samples will be cut from the work. The composite of the materials will, upon installation inside the host pipe, exceed the minimum test standards specified by the American Society for Testing Methods. Any reoccurrence may be cause for rejection of the work.

## 2.03 CURED-IN-PLACE LINER

### A. Fabric

1. The Contractor shall determine the minimum tube length necessary to effectively span the designated run between manholes. The Contractor shall verify the lengths in the field prior to ordering and prior to impregnation of the tube with resin, to ensure that the tube will have sufficient length to extend the entire length of the run. The Contractor shall also measure the inside diameter of the existing pipelines in the field prior to ordering liner so that the liner can be installed in a tight-fitted condition.
2. The sewn tube shall consist of one or more layers of absorbent non-woven felt fabric and meet the requirements of ASTM F-1216, ASTM F1743, or ASTM D5813. The tube shall be constructed to withstand installation pressures, have sufficient strength to bridge missing pipe, and stretch to fit irregular pipe sections.
3. The wet out tube shall have a relatively uniform thickness that when compressed at installation pressures will equal or exceed the calculated minimum design CIPP wall thickness.
4. The flexible tube shall be fabricated to a size that when installed will neatly fit (minimum 99.75%) the internal circumference of the existing sanitary sewer lines (including services). Allowance shall be made for circumferential stretching during insertion so that the final cured product is snug against the wall of the host pipe.
5. The outside layer of the tube shall be coated with an impermeable, flexible membrane that will contain the resin and allow the resin impregnation (wet out) procedure to be monitored.
6. The tube shall contain no intermediate or encapsulated elastomeric layers. No material shall be included in the tube that may cause delamination in the cured CIPP. No dry or unsaturated layers shall be evident.
7. The wall color of the interior pipe surface of CIPP after installation shall be a relatively light reflective color so that a clear detailed examination with closed circuit television inspection equipment may be made.
8. Seams in the tube shall be stronger than the non-seamed felt material.
9. The tube shall be marked for a distance at regular intervals along its entire length, not to exceed five feet. Such markings shall include the Manufacturers name or identifying symbol.
10. Unless otherwise specified, the Contractor will use a polyester filter felt tube and a resin and catalyst system compatible with the inversion process and having the minimum physical properties for the cured pipe identified in Table 02771 - 1 Minimum Physical Properties.

### B. Resin

1. The resin system shall be a corrosion resistant polyester or vinyl ester resin and catalyst system or epoxy and hardener system that when properly cured within the tube composite, meets the minimum requirements of ASTM F1216, ASTM F1743 or F2019, the physical properties given herein these specifications Section 02771 and those, which are to be utilized in the design of the CIPP for this project.
2. The resin used shall not contain non-strength enhancing fillers.
3. The Contractor shall submit the resin characteristics, including filler identification, to the County for approval prior to lining activities.

4. The resin shall produce a CIPP that will comply with the structural and chemical resistance requirements of the specification.

## **PART 3 - EXECUTION**

### **3.01 PREPARATION**

- A. Prior to any lining of a pipe so designated.
  1. It shall be the responsibility of the Contractor to remove all internal debris and clean the existing sewer line and/or lateral in accordance with the recommendations of the liner manufacturer prior to installation of the liner and in accordance with Section 02761 "Cleaning Sanitary Sewer Systems." Both mainline and lateral line shall be cleaned.
    - a. Preparation of the interior surface shall be accomplished by a thorough high-pressure water-jet cleaning. The pipe shall be left free of all loose sand, rock, or other deleterious materials. Any roots in the pipe shall be either removed or cut off flush with the interior.
    - b. If conditions such as broken pipe and major blockages are found that will prevent proper cleaning or where additional damage would result if cleaning is attempted or continued, the Contractor shall notify the County immediately. The County will determine what course of action will be taken to complete the project.
    - c. Precautions shall be taken by the Contractor to ensure that no damage or flooding of public or private property is caused by the cleaning operation.
    - d. The County shall inspect the prepared pipe for cleanliness and smoothness before the Contractor is authorized to proceed with pipe lining operations.
  2. Certified PACP personnel trained in locating breaks, obstacles and service connections by closed circuit television shall perform inspection of existing sewer lines. The interior of the line shall be carefully inspected in accordance with Section 02762 "Televising Sanitary Sewer Systems" to determine the location of laterals in any condition that may prevent proper installation of the liner pipe into the lines. Such conditions shall be noted so they can be corrected. A digital data video and a suitable log shall be prepared by the Contractor during the Work and provided to the County a minimum of two weeks prior to liner installation.
  3. The Contractor shall provide for the flow of sewage around the section or sections of pipe designated for lining as specified in Section 01516 "Collection System Bypass."
    - a. Flow control shall be exercised as required to ensure that no flowing sewage comes into contact with sections of the sewer under repair.
    - b. A sewer line plug shall be inserted into the sewer upstream from the section to be repaired. The plug shall be so designed that all or any portion of the sewage flows can be released. During the review, testing and installation portion of the operation, flows shall be shut off in order to properly install the cured-in-place pipe lining. The upstream manholes shall be constantly monitored for degree of surcharging. After the installation is complete, flows shall be restored to normal level.
    - c. Wherever lines are blocked off and the possibility of backing up the sewage and causing harm to public and private property is foreseen, it shall be the Contractor's responsibility to bypass flow from manhole to manhole.



- d. Bypassing shall be accomplished using sewer plugs with pump connections, by pumping down surcharged manholes, or by other methods acceptable to the County. All bypassed flow must be discharged to a sanitary sewer. Bypassed flow shall not be allowed to enter any storm line, drainage ditch or street gutter.
  - e. During a bypass operation, the pump shall be manned continuously; the Contractor shall maintain the pump and bypass equipment; and shall be responsible for any damages to public or private property due to the malfunction of same.
4. The Contractor shall clear the line of obstructions such as solids, dropped joints, protruding service connections or collapsed pipe that will prevent the insertion of the liner pipe. If inspection reveals an obstruction that cannot be removed by conventional sewer cleaning equipment, then the County shall be notified immediately.
  5. Do not install liner if ground water temperatures and/or ambient temperatures are excessive for the product installation procedures.
  6. Notification of Public or Customers: Customers shall be notified by the Contractor with door hangers at least 3 days prior to the shutdown of any lateral services. The door hanger shall be approved by the County and advise the customers of when the Work will begin, expected date of completion, the type of work, and contact person for any questions and the door hanger. When it is necessary to shut down a private sewer lateral while work is in progress and before the laterals are reconnected, the customers shall be notified by the Contractor. No sewer or water service is to remain shut down for more than a period of 8-hours unless the Contractor provides substitute services for the residents. Commercial sewer services shall be maintained at all times that the business is open. No sewage from the services or main line shall be discharged on the ground or in waterways.
  7. Contractor shall coordinate pump stations, force main and sanitary sewer operation, bypass and shutdown control with the County
  8. Traffic Control: The Contractor shall provide all traffic control measures required for the safety of the public, workers and equipment during the Work and in accordance with FDOT and the County.
  9. The Contractor shall provide critical backup equipment to insure that the lining operation progresses without interruption. Required backup equipment shall include at a minimum 1 additional lateral cutter system and 1 additional CCTV camera system.

### 3.02 INSTALLATION OF LINER

- A. The CIPP liner shall be installed and cured in the host pipe per the manufacturer's specifications as described and submitted in the Performance Work Statement. CIPP installation shall be in accordance with the applicable ASTM Standards with the following modification:
  1. Prior to installation and as recommended by the manufacturer remote temperature gauges or sensors shall be placed inside the host pipe to monitor the temperatures during the cure cycle. Liner and/or host pipe interface temperature shall be monitored and logged during curing of the liner.

2. The heat source shall be fitted with suitable monitors to gauge the temperature of the incoming and outgoing heat source. Another such gauge shall be placed between the impregnated reconstruction tube and the pipe invert at the remote manhole to determine the temperatures during cure. The resin manufacturer shall recommend temperature in the line during the cure period.
3. The wet-out tube shall be positioned in the pipeline using the method specified by the manufacturer. Care should be exercised not to damage the tube as a result of installation. The tube shall be inverted through an existing manhole or approved access point and fully extend to the next designated manhole or termination point. Sufficient excess resin will be provided to insure excretion into cracked pipe and/or joints of the host pipe after curing.
4. After inversion is completed, the Contractor shall supply suitable heat source and recirculation equipment. The equipment shall be capable of delivering the heat source throughout the section uniformly to raise the temperature above the temperature required to affect a cure of the resin. This temperature shall be determined by the resin/catalyst system employed. Temperatures shall be monitored and recorded throughout the installation process to ensure that each phase of the process is achieved at the manufacturer's recommended temperature levels. Copies of these records shall be given to the County at the completion of each installation.
5. Curing shall be accomplished by utilizing the appropriate medium in accordance with the manufacturer's recommended cure schedule. The curing source input and output temperatures shall be monitored and logged during the cure cycles if applicable. The manufacturer's recommended cure method and schedule shall be used for each line segment installed, and the liner wall thickness and the existing ground conditions with regard to temperature, moisture level, and thermal conductivity of soil, per ASTM Standards as applicable, shall be taken into account by the Contractor.
6. For heat cured liners, if any temperature sensor or multiple sensors do not reach the temperature as specified by the manufacturer to achieve proper curing or cooling, the installer can make necessary adjustments to comply with the manufacturer's recommendations. The system computer should have an output report that specifically identifies each installed sensor station in the length of pipe, indicates the maximum temperature achieved and the sustained temperature time. Each sensor should record both the maximum temperature and the minimum cool down temperature and comply with manufacturer's recommendations.
7. For UV cured liners, all light train sensor readings, recorded by the tamper proof computer, shall provide output documenting the cure along the entire length of the installed liner. The cure procedure shall be in accordance with the manufacturer's recommendation as included in the performance work statement.
8. Temperatures and curing data shall be monitored and recorded by the Contractor throughout the installation process to ensure that each phase of the process is achieved as approved in accordance with the CIPP system manufacturer's recommendations.
9. The Contractor shall immediately notify the County of any delays taking place during the insertion operation. Such delays shall possibly require sampling and testing by an independent laboratory of portions of the cured liner at the County's discretion. The cost of such test shall be borne by the Contractor and no extra compensation will be allowed. Any failure of sample tests or a lack of immediate notification of delay shall be automatic cause for rejection of that part of the Work at the County's discretion.

10. Initial cure shall be deemed to be completed when inspection of the exposed portions of cured pipe appear to be hard and sound and the remote temperature sensor indicates that the temperature is of a magnitude to realize an exotherm. The cure period shall be of a duration recommended by the resin manufacturer, as modified for the cured-in-place inversion process, during which time the recirculation of the heat source and cycling of the heat exchanger to maintain the temperature continues. Contractor shall retain a resin-impregnated sample (wick) to provide verification of the curing process taking place in the host pipe.
11. The Contractor shall cool the hardened pipe to a temperature below 100°F before relieving the static head in the inversion standpipe. Cool-down may be accomplished by the introduction of cool water into the inversion standpipe to replace water being drained and disposed per the approved pre-treatment plan. Care shall be taken in the release of the static head so that a vacuum will not be developed that could damage the newly installed pipe.
12. Seal the area where the line enters or leaves each manhole. Finish the inside of the manhole with a quick set cement grout to raise the invert to the grade of the liner pipe. Also use this grout to dress up around the end of the liner. This space may be sealed with a mechanical seal, chemical seal, or combination of both. The Contractor shall seal the liner at all manhole reconnections with an approved product, compatible with the liner, to completely seal any annular space present.
13. If the pipe liner fails to make a tight seal due to broken or misaligned pipe at the manhole wall or other reason, the Contractor shall apply a seal at that point.
14. The temperature of water discharged to the sewer system from processing liners shall not exceed 100°F maximum or the level allowed by State or Local standards. When draining water, care shall be exercised not to create a vacuum in the line.
15. After the liner has been installed, all active, existing services shall be temporarily reinstated. This shall be done without excavation in pavement areas, and in the case of non-man-entry pipes, from the interior of the pipeline by means of a 360° (degree) television camera and a cutting device that re-establishes the service connection. When a remote cutting device is used and a cleanout is available, then a mini-camera down the service may also be used to assist the operator in cutting or trimming. All coupons shall be recovered at the downstream manhole and removed.
16. The cost for maintaining sanitary sewer service for the property owners shall be included in the prices bid and no additional compensation will be allowed.

### 3.03 POST INSTALLATION

#### A. Service Lateral Renewal

1. The number of service connections on some sewer segments may exceed the number of buildings actually served. It is the Contractor's responsibility to determine through dye testing, or other acceptable methods, the services that are live and require reinstatement prior to commencing lining of the sewer main.
2. Inactive services to vacant parcels shall be renewed, unless otherwise directed by the County.

3. The exact location and number of service connections or side sewers shall be verified during the initial television inspection. It shall be the Contractor's responsibility to accurately field locate all existing service connections or side sewers and establish means for access for flow control. The Contractor shall reconnect all service connections or side sewers to the liner pipe as indicated in accordance with the Contract Documents.
  4. The Contractor shall be responsible for restoring/correcting, without any delay, all missed or faulty reconnections, as well as any damage caused to property owners for not reconnecting the services soon enough or for not giving notice to the property owners.
  5. Any lateral not initially reinstated by the Contractor that proves to be active shall be reinstated by the Contractor at no additional cost to the County and the Contractor shall be responsible for any resulting property damage of floods.
  6. All existing service connections shall be reconnected by a remote controlled cutting device directed internally by a television camera or by internal manual cutting. Cuts shall be made by experienced operators so that no blind attempts or holes are made in the liner pipe. Locations shall be verified carefully to match earlier tapes for accurate lateral location, especially where dimples are not well defined. The County reserves the right to require service connection by excavation at the Contractor's expense at any location if the quality or workmanship of the cut is not satisfactory.
  7. A 2-pass process of utilizing a cutter to open the lateral followed by wire brush (or similar) attachment to complete the cutting flush with the lateral walls should be utilized, or approved alternate. It shall be properly aligned, invert to invert, to the existing connection with no obstructions to the flow. Resin slugs shall be removed as necessary from reinstated service connections. Any mis-cuts shall be repaired at no cost to the County and shall be performed utilizing an additional thinner liner to prevent water from entering behind the liner to the full satisfaction of the County. All coupons cut from the liner for reopening of lateral connections shall be retrieved from the sewer, accounted for by the Contractor, and turned over to the County.
  8. Service connections shall be reinstated to at least 95% of the original area as it enters the host pipe.
  9. All service connections and side sewers to be reconnected to the main sewer, shall be cleaned up to a length of 1-foot from the inside face of the existing wall of the main pipe. All deposits within the first foot of the service connection or side sewer in the service connections shall be removed and laterals reinstated.
  10. Contractor shall provide a sound, smooth transition from laterals/side sewers to the main sewer. Contractor shall submit for approval a detailed repair plan for the permanent repair of any gaps between the installed liner and the face of the lateral/side sewer connections.
  11. For PVC laterals or laterals that have been previously lined with cured-in-place pipe the Contractor shall take care during the reinstatement to avoid damage to the lateral pipe.
- B. Each pipe lined shall be post-CCTV inspected in accordance with Section 02762 "Televising Sanitary Sewer Systems" as soon as practical after processing to assure complete curing.

1. The Contractor shall not reactivate any section of lined sewer pipe until authorized to do so by the County. Segments not fully conforming to these Specifications must be immediately brought to the County's attention with a proposed method of correction.
2. Immediately prior to conducting the post-lining CCTV, the Contractor shall thoroughly clean the newly installed liner removing all debris and build-up that may have accumulated, at no additional cost to the County.
3. The post-CCTV inspection documentation shall be submitted within 5 working days of the liner installation. The County may at its discretion suspend any further installation of CIPP until the post-installation documentation is submitted.
  - a. As a result of this suspension, no additional working days will be added to the contract, nor will any adjustment be made for increase in cost

#### C. Defects

1. The liner shall be continuous and free of all visual and material defects except those resulting from pre-lined conditions (such conditions shall be brought to the attention of the County prior to lining).
2. There shall be no damage, deflection, holes, delaminating, uncured resin or other visual defects in the liner.
3. The liner surface shall be smooth and free of waviness throughout the pipe.
4. No visible leakage through the liner or at manhole or service lateral connections will be allowed.
5. Any defects located during the inspection shall be corrected by the Contractor to conform to the requirements of the specifications and to the satisfaction of the County.
6. Defects in the installed CIPP shall be identified and defined as specified in Section 02762 Televising Sanitary Sewer Systems.
7. Repairable defects that may occur in the installed CIPP shall be specifically defined by the Contractor based on manufacturer's recommendations, including a detailed step-by-step repair procedure, resulting in a finished product meeting the requirements of these contract specifications.
8. Un-repairable defects that may occur to the CIPP shall be clearly defined by the Contractor based on the manufacturer's recommendations, including a recommended procedure for the removal and replacement of the CIPP.

#### D. Manhole Connections

1. Where liners of any type are installed in 2 or more continuous manhole segments, the liner invert through the intermediate manholes shall be left intact. Final finishing of the installation in those intermediate manholes shall require removal of the top of the exposed liner and neat trimming of the liner edge where it touches the lip of the manhole bench.
2. Reinstate openings for all manhole drop assemblies after relining mainline sewer
  - a. Outside drop assemblies shall be lined with a cured-in-place liner compatible with the mainline liner, for the full length of the drop assembly and bend.
  - b. Inside drop assemblies are not required to be relined.
3. A seal consisting of a resin mixture or hydrophilic seal compatible with the installed CIPP shall be applied at manhole/wall interface in accordance with the CIPP system manufacturer's recommendations.

- E. Portions of any piece of liner material removed during installation shall be available for inspection and retention by the County.

### 3.04 TESTING

- A. The physical properties of the installed CIPP shall be verified through field sampling and laboratory testing. All testing shall be furnished by the Contractor. All materials testing shall be performed at the Contractor's expense, by an independent third party laboratory selected by the County as recommended by the CIPP manufacturer. All tests shall be in accordance with applicable ASTM test methods to confirm compliance with the requirements in these documents.
- B. The Contractor shall pay for all testing included in this section
- C. The Contractor shall provide samples for testing from the actual installed CIPP liner. The Contractor shall determine sampling location and procedures to ensure representative samples are obtained from the finished liner, subject to the approval by the County. The contractor shall provide removable sizing sleeves, when possible, to collect liner samples, which accurately replicate the host pipe diameter.
  - 1. A minimum of 1 sample shall be taken of the first segment installed or as directed by the County.
  - 2. A minimum of 2 samples shall be taken for each 2,500 lineal feet of liner material installed or for each manufacturing lot, if less, or as directed by the County.
  - 3. A minimum of 6 samples per project shall be taken for each type of liner furnished or as directed by the County.
  - 4. A sample shall be cut from a section of cured liner that has been inverted or pulled through a like diameter pipe which has been held in place by a suitable heat sink such as sand bags.
  - 5. All curing, cutting, and identification of samples shall be witnessed by the County.
- D. Tests of the samples shall be conducted in accordance with ASTM standards
  - 1. Short term flexural properties: The initial tangent flexural modulus of elasticity and flexural strength shall be measured in accordance with test methods in ASTM D790.
  - 2. Fiber reinforced flexural properties: specimens should be sampled in accordance with ASTM F1743, section 8.1.2 and flexural properties shall be determined in accordance with ASTM F1743, section 8.1.3 along the longitudinal and circumferential axis of the install CIPP.
  - 3. Fiber reinforced tensile properties: Where the CIPP is reinforced with oriented continuous or discontinuous fibers to enhance the physical properties of the CIPP, specimens shall be sampled in accordance with ASTM F1743, section 8.1.2 and tensile properties shall be determined in accordance with ASTM D3039 and tested along the longitudinal axis and circumferential axis of the installed CIPP.

4. CIPP wall thickness shall be determined in a manner consistent with ASTM D5813, section 8.1.2. Thickness measurements shall be made in accordance with the practice in ASTM D3567 for ASTM D5813, section 8.1. Deduct from the measured values the thickness of any plastic coating or CIPP layer not included in the structural design of the CIPP. The average thickness shall be calculated using all measured values and shall meet or exceed the minimum design thickness. The minimum wall thickness at any point shall not be less than 87.5% of the approved specified thickness.
- E. The installed CIPP thickness shall be measured for each liner shipment to the job site. If the CIPP thickness does not meet that specified in the contract and submitted as the approved design by the Contractor, then the liner shall be repaired or removed. The samples shall be made by core drilling 2-inch diameter test plugs at random locations selected by the County. As an alternative the Contractor may use industry proven, non-destructive methods for confirming the thickness of the installed CIPP if it can be shown the calibrated thickness is the same as core test plugs.

### 3.05 ACCEPTANCE

#### A. Liner

1. It is the intent of these specifications that the completed liner with all appurtenances shall be essentially equivalent in final quality and appearance to new sewer installation.
2. The finished liner shall be continuous over the entire segment between manholes and homogenous throughout.
3. The finished liner shall be fully rounded and as free as commercially practicable from visible defects, including but not limited to damage, deflection, holes, delamination, ridges, cracks, uncured resin, foreign inclusions or other objectionable defects.
4. Where a defect in the liner requires removal of a section of the liner in the County's opinion, the Contractor shall make all repairs as required by the County and shall install a segmental liner, compatible with the liner, to accomplish a continuous finished liner.
5. The pipe shall be neatly and smoothly cut off at each manhole. The manhole trough shall be raised to the invert of the liner to preclude snagging and shoaling of debris.

#### B. Defects: Any defect which will or could affect the structural integrity, strength of the lining, flow impairment, or leaks shall be repaired as outlined below or in accordance with the approved repair or replacement procedures as recommended by the CIPP system manufacturer. The repair or replacement of the defects will be at the Contractor's expense.

##### 1. Leaks

- a. There shall be no visible infiltration through the liner, around the liner at manhole connections, at lined service connections or in lined services. Contractor shall repair any visible leaks and the repair method shall be approved by the County.

##### 2. Wrinkles/Fins

- a. Wrinkles outside the flow line of the pipeline:

- (1) Wrinkles/fins in height up to a maximum of 5% of the inside diameter of the host pipe are acceptable

- (2) Wrinkles/fins over 5%, particularly those of a longitudinal configuration, may be acceptable and should be evaluated, by the project engineer for acceptance, on a case-by-case basis.
  - b. Wrinkles in the flow line:
    - (1) Wrinkles/fins projecting more than 5% into the flow that are generally longitudinal in their orientation may be deemed acceptable by the County on a case-by-case basis by considering any potential operation and maintenance issues that would result from their being left in place.
    - (2) Wrinkles/fins in the lower third or flow line of the finished CIPP (based upon the depth of flow) that are generally circumferential in their orientation should not exceed 0.5-inches, whichever is smaller. Acceptability of larger wrinkles/fins meeting this characterization shall be, on a case-by-case basis by the County with consideration given to potential operations and maintenance issues that would result from their being left in place.
  - c. Repair when wrinkles/fins are removed:
    - (1) Wrinkles should be fully cured, tight and the resin should be homogeneous across the full width of the wrinkle.
    - (2) In most cases, when wrinkles/fins are removed from the installed CIPP, the resin in the liner pipe is fully cured and homogeneous and no further repair is required. If a repair is required the manufacturer should be contacted for the correct repair procedure.
- 3. Blisters should be probed and punctured to determine the existence of water behind the blister.
  - a. No action required unless the pipe is leaking at the blisters.
- 4. Lifts in Liner
  - a. Soft lifts should be re-processed by the Contractor to fully cure the CIPP.
  - b. Hard lift shall be removed and a new short liner as required being equivalent to the original installed CIPP.
- 5. A bulge in the invert caused by residual debris left in the pipe that impedes the flow characteristics of the pipeline should be cut out.
  - a. Cut out the section of the bulge and replace with a new short liner equivalent to the original product or as recommended by the manufacturer.
- 6. Pinholes: the area where the liner has pinholes should be patched with a short-liner repair or the liner removed and replaced as recommended by the manufacturer.
- 7. Soft spot in liner needs to be reheated and hardened or cut out and replaced or as recommended by the manufacturer.
- 8. Dry tube or white spots are not acceptable and shall be removed and a patch repair shall be performed or as recommended by the manufacturer.
- 9. Liner surface peeled off
  - a. Cut out a representative sample of the CIPP
  - b. Test physical properties and remaining CIPP thickness to verify that the contract design requirements are met.
  - c. Replace liner or as recommended by the manufacturer
- 10. Hole in the liner is not acceptable
  - a. Small holes can be repaired with epoxy
  - b. Short liner installed over larger holes or as recommended by the manufacturer
- 11. Cracks in liner are unacceptable and shall be repaired



12. Loose liner seam tape shall be removed to prevent potential hang-up of debris.
13. Annular space between host pipe and liner at manhole
  - a. If leaking between the host pipe and the CIPP, inject a hydrophilic type grout to stop the leakage.
  - b. If the pipe is located in groundwater, inject a hydrophilic type grout to stop possible future leakage.
  - c. If the pipe is not in groundwater, a cementitious grout can be used to fill the space.
14. Liner delamination
  - a. Cut out the section of delaminated liner and replace with a new short liner equivalent to the original product or as recommended by the manufacturer.
15. CIPP discoloration
  - a. Obtain a sample for testing the CIPP physical properties. Follow manufacturer's recommendations for repair.
  - b. Remove and replace the CIPP physical if the physical properties do not meet the contract minimum requirements.
  - c. No action required if the tested samples meet the physical properties.
16. Improper repair of CIPP: duct tape is not an acceptable repair for any situation.
17. The CIPP should fit tight inside the host pipe.
  - a. If the CIPP does not fit tightly against the original pipe at its termination point(s), the full circumference of the CIPP exiting the existing host pipe should be sealed by filling with a resin mixture compatible with the CIPP.
18. Overcut connection not allowed
  - a. Opening cut to match bottom of service pipe to eliminate debris build-up
  - b. If an overcut is made, grout the interface between the connection and the mainline
  - c. Install a connection hat
  - d. Install a short liner, then re-cut the service connection opening
19. Leakage between CIPP and host pipe at service connection
  - a. Leakage shall be stopped
  - b. Grout the interface between the connection and the mainline
  - c. Install a connection hat
20. Connection hat issue
  - a. Coating from mainliner not removed before installing the hat
  - b. Loose material shall be removed
  - c. Remove and replace the connection hat as recommended by the manufacturer
21. Undercut service connection
  - a. Finish cut with brush to create a smooth opening
22. Resin slug in service connection
  - a. If not blocking the flow from the service connection and slug does not impede more than 20% of the connection opening, no action required
  - b. If blocking the flow, remove slug or dig up and replace the connection

#### C. Service Connections

1. The CIPP lateral lining shall not inhibit the CCTV post video inspection of the mainline or service lateral pipes.
2. Reinstatement of all lateral connections shall be done neatly and smoothly.

### 3.06 CLEAN-UP AND RESTORATION

- A. The Contractor shall not allow the site of the Work to become littered with trash and waste material, but shall maintain the site in a neat and orderly condition throughout the construction period.
- B. On or before completion, the Contractor shall clean and remove from the site of the Work all surplus and discarded materials, temporary structures, stumps and portions of trees, and debris of any kind. He shall leave the site of work in a neat and orderly condition, similar or equal to that prior to construction.
- C. All private and public property along or adjacent to the Work disturbed by construction operations shall be restored to a condition similar or equal to that existing prior to construction.
- D. Before final acceptance by the County, the Contractor shall replace and/or restore any water, sewer, drain, and gas lines and appurtenances; electrical, telephone, telegraph conduits and wires, both underground and aboveground, and appurtenances; traffic signals, fire and police alarm systems and appurtenances; sidewalks, curbs, gutter, drainage ditches and pavements and all other public utility facilities and appurtenances along or adjacent to the Work that may have been disturbed by construction operations.
- E. Conditions permitting, property cleanup and restoration shall begin and be prosecuted to completion on a timely basis as set forth herein.

### 3.07 PROGRESSIVE CIPP INSTALLATION RECORD (SHOT RECORD)

- A. The Contractor shall provide a progressive CIPP Installation Record (Shot Record) with monthly application for partial payments. The progressive shot record shall indicate quantities actually installed and deviations to the parameters included in the shot record (i.e. shot number and corresponding manhole to manhole pipe reaches for each scheduled installation, design thickness, actual thickness delivered to the site, pipe diameter, reach length, total length of shot, and number of laterals).
- B. Monthly partial payments will not be approved without prior approval of the progressive CIPP Installation record (Shot Record) including verification and acceptance of all quantities by the County.

### 3.08 WARRANTY INSPECTION

- A. The County shall conduct the warranty television inspection within 1-year following completion of the project. If it is found that any of the CIPP has developed abnormalities since the completion of the project, the abnormalities shall be repaired and/or replaced by the Contractor promptly as per these specifications and as recommended by the manufacturer.

END OF SECTION

**SECTION 02774**  
**WASTEWATER GRAVITY COLLECTION SYSTEM**

**PART 1 - GENERAL**

1.01 DESCRIPTION

- A. Scope of Work: Construction of sanitary sewers, sewer connections and appurtenances as shown on the Drawings or specified herein.

1.02 QUALITY ASSURANCE

- A. Storage: PVC pipe shall be stored on level ground, preferably turf or sand, free of sharp objects which could damage the pipe. Stacking of the PVC pipe shall be limited to a height that will not cause excessive deformation of the bottom layers of pipes. Where necessary, due to ground conditions, the pipe shall be stored on wooden sleepers, spaced suitably and of such width as not to allow deformation of the pipe at the point of contact with the sleeper or between supports.
- B. Tests: Certified records of tests made by the manufacturer or by a reliable commercial laboratory shall be submitted with each shipment of pipe. All pipe shall be inspected upon delivery and that which does not conform to the requirements of these specifications shall be rejected and must be immediately removed by the Contractor. The Contractor shall furnish and provide samples of pipe for the performance of such additional tests as the County may deem necessary.

1.03 SHOP DRAWINGS AND SUBMITTALS

- A. Submittals shall be submitted to the County for review and acceptance prior to construction in accordance with the General Conditions and specifications Section 01300 "Submittals."
  - 1. Precast manholes
  - 2. Manhole frames, covers, and other castings
  - 3. Manufacturer's certified test report on castings
  - 4. Certification of admix installation from pre-caster
  - 5. Certified test records for polyvinyl chloride pipe
  - 6. Mill Test Certificates on ductile iron pipe
  - 7. Manhole pipe connections
  - 8. Coal tar epoxy
  - 9. Special interior linings
- B. Record Information: The Contractor shall submit to the County the elevations of the center of the manhole covers and inverts of all pipes in the manholes.

## **PART 2 - PRODUCTS**

### **2.01 GENERAL**

- A. All material supplied shall be one of the products specified in Appendix D "List of Approved Products" appended to these technical specifications.

### **2.02 MATERIALS**

- A. Ductile Iron Pipe and Fittings: Ductile iron pipe shall meet the requirements of Section 15062 "Ductile Iron Pipe and Fittings."
- B. Polyvinyl Chloride Pipe and Fittings: Polyvinyl Chloride (PVC) Pipe shall meet the requirements of Section 15064 "Polyvinyl Chloride Pipe and Fittings."
- C. Precast Concrete Manholes
  - 1. Precast manholes shall conform to the requirements of ASTM Designation C 478.
    - a. The minimum shell thickness shall be 5-inches.
    - b. Lifting holes through the structures are not permitted.
    - c. The design of the structure shall include a precast base of not less than 8-inches in thickness poured monolithically with the bottom section of the manhole walls.
    - d. Where drop structures are required, the design of the structure shall include a precast base, for the drop structure, of not less than 8-inches in thickness poured monolithically with the bottom section of the manhole walls.
    - e. New manholes shall contain a crystalline waterproofing concrete admix. Crystalline waterproofing concrete admix shall be added to the concrete during the batching operation. Admix concentration shall be added based upon manufacturer design percent concentration of admixture to the required weight of cement. The amount of cement shall remain the same and not be reduced. A colorant shall be added to verify the admix was added to the concrete for all precast manholes. Colorant shall be added and provided at the admix manufacturing facility, not at the concrete batch plant. Contractor shall provide certification from the pre-caster that the admix was installed in accordance with the manufacturers recommendations.
  - 2. Top sections shall be eccentric, except that concrete top slab shall be used where shallow cover requires a top section less than 3-feet deep.
  - 3. New manholes shall be lined with Interior Linings where shown on the Drawings.
- D. Concrete and Reinforcing Steel: Concrete and reinforcing steel shall conform to the requirements of Division 3 - Concrete. Concrete classes for the various purposes shall be as follows:
  - 1. Manhole bottoms, Class A
  - 2. Precast manholes, Class A (4,000-psi)
  - 3. Pipe and riser encasement, Class C
  - 4. Protective slabs, Class C

- E. Castings: Gray iron castings for manhole frames, covers, adjustment rings, and other items shall conform to the ASTM Designation A 48, Class 30. Castings shall be true to pattern in form and dimensions and free of pouring faults and other defects in positions which would impair their strength, or otherwise make them unfit for the service intended. No plugging or filling will be allowed. Lifting or "pick" holes shall be provided, but shall not penetrate the cover. Casting patterns shall conform to those shown or indicated on the Drawings. The words SANITARY and ORANGE COUNTY, FLORIDA shall be cast in all manhole covers as shown on the Drawings. All manhole frames and covers shall be traffic bearing to meet AASHTO H-20 loadings unless otherwise specified.
- F. Brick: Brick for manhole construction shall be dense, hard burned, shale, or clay brick conforming to ASTM Designation C 32, Grade MM or C 62, Grade MW, except that brick absorption shall be between 5 and 25-grams of water absorbed in 1-minute by dried brick, set flat face down, in 1/8-inch of water.
- G. Cement Mortar: Cement mortar for manhole construction shall comply with ASTM Designation C 270, Type M, except that the cement shall be Portland Type II only. No mortars that have stood for more than 1-hour shall be used.
- H. Pipe Adapter: Connection of PVC gravity sewer lines to precast manholes and wetwells shall be made by using a flexible boot type manhole coupling adapter.
- I. Interior Linings (existing structures): Interior surfaces of existing manholes and wetwells shall be coated or lined to resist corrosion where shown on the Drawings. Coatings and linings shall meet the requirements of Section 09901 Coatings and Linings.
- J. Interior Linings (proposed structures): Interior surfaces of new wetwells shall be lined. Interior surfaces of new manholes shall be lined where shown on the Drawings. Coatings and linings shall meet the requirements of Section 09901 Coatings and Linings.
- K. Joint Sealer: Joint sealer material for precast manhole structures shall be pre-formed flexible plastic conforming to Federal Specification SS-S-00210 (GSA-FSS). Seal all exterior joints with Portland Type II cement after setting of joint sealer and placement of manhole section to form a watertight joint.
- L. Non-Shrink Mortar: Non-shrink mortar shall be used for filling annular spaces and holes in precast manholes and wetwells.
- M. Manhole Encapsulation: Manhole cones, riser rings, iron frame, cover, and all joints shall be encapsulated with a heat shrink-wrap with a minimum thickness of 98-mils (2.5-mm).
  - 1. Wrap shall have a cross-linked polyolefin backing coated with a protective heat activated adhesive. The wrap shall effectively bond to the substrate via primer provided by the manufacturer. The wrap shall be applied with a high intensity propane torch.
  - 2. Heat shrink-wrap for all barrel section joints of manholes shall be a minimum 9-inch width. Corbel section, riser rings, and ring and cover shall have a minimum 12-inch width wrap.
  - 3. Adhesive tap materials shall not be allowed.

- N. Coupling Gravity Sewer Couplings: Pipe coupling for gravity sewer may require transitioning between two dissimilar materials where pipe thickness may differ. Specialty couplings may be required to maintain gravity sewer flow.
1. Gaskets: Gaskets for the coupling shall meet the material requirements of ASTM D 5926 and ASTM C 1173 with a minimum tensile strength of 1000 psi and a minimum tear strength of 150 pounds per inch.
  2. Clamps: Clamp housing and band shall be manufactured of Type 301 or 316 Stainless Steel. Clamp screw shall be manufactured of Type 305 Stainless Steel.

## **PART 3 - EXECUTION**

### **3.01 PREPARATION**

- A. Upon satisfactory excavation of the pipe trench, as specified in Section 02220 "Excavating, Backfilling and Compacting" a continuous trough for the pipe barrel and recesses for the pipe bells shall be excavated by hand digging so that, when the pipe is laid in the trench, true to line and grade, the pipe barrel will receive continuous uniform support and the bell will receive no pressure from the trench bottom.
- B. The interior of all pipe shall be thoroughly cleaned of all foreign material before being lowered in the trench and shall be kept clean during laying operations by means of plugs or other approved methods.

### **3.02 INSTALLATION**

#### **A. Sewer Pipe**

##### **1. General**

- a. Laying of pipe shall proceed upgrade with spigot ends pointing in the direction of flow. Before pipe is joined, gaskets shall be cleaned of all dirt, stones, and other foreign material. The spigot ends of the pipe and/or pipe gaskets shall be lubricated lightly with a lubricant as specified by the pipe manufacturer and approved by the County. Sufficient pressure shall be applied to the pipe so as to properly seat the socket into the bell of the pipe. Any damage to the pipe due to over-exertion shall be replaced at the Contractor's expense. All pipe shall be laid straight, true to the lines and grades shown on the Drawings.
- b. Variance from established line and grade, at any point along the length of the pipe, shall not be greater than 1/32-inch per inch of pipe diameter and not to exceed 1/2-inch, provided that any such variation does not result in a level or reverse sloping invert.
- c. Any pipe, which is disturbed or found to be defective after installation, shall be taken up and relayed or replaced at the Contractor's expense.
- d. Approved utility crossing signs shall be placed on the pipe alignment at each side of any waterway crossing.

##### **2. PVC Pipe**

- a. Handling PVC pipe: The handling of PVC pipe shall be in such a manner that the pipe is not damaged by dragging it over sharp and cutting objects. Sections of pipe with deep cuts and gouges shall be removed and discarded at no expense to the County.

- b. Lowering pipe into trench: Care shall be exercised when lowering pipe into the trench to prevent damage to or twisting of the pipe.
3. Building Laterals/Service Connections
  - a. Service connections shall be constructed in accordance with the details as indicated on the Drawings.
  - b. Sewer lateral pipe shall be extended to the right-of-way and plugged at the right-of-way line to avoid leakage (unless otherwise indicated on the Drawings). All connections and changes of direction shall be made using standard fittings designed for that purpose.
  - c. Locator balls shall be placed under all sanitary sewer service cleanouts.
  - d. On curbed streets, the exact location for each service connection shall be marked by etching or cutting an "S" in the concrete curb. Where no curb exists or is planned, locations shall be marked by a method approved by the County.
4. PVC C-900 DR 14 Pipe Section: PVC C-900 DR 14 pipe shall be substituted for the specified PVC pipe where:
  - a. The sewer or service pipe is to be constructed with less than 30-inches of cover between the top of the pipe and the final top of pavement or ground line.
  - b. The PVC sewer main crosses over a water main, or is at a depth which results in less than 18-inches clear distance between pipes when crossing under a water main. The DR 14 pipe shall extend a minimum of 10-feet on each side of the point of crossing.
  - c. The lateral separation of the sewer pipe and potable water piping is less than 10-feet.

B. Manholes:

1. Manhole excavation and bedding at manhole junctions shall be performed in accordance with the provisions of Section 02220 "Excavating, Backfilling and Compacting" of these specifications.
2. The invert channels shall be smooth and accurately shaped to a semicircular bottom conforming to the inside of the adjacent sewer section using 2,500-psi concrete. Steep slopes outside the invert channels shall be avoided. Changes in size and grade shall be made gradually and evenly. Changes in the direction of the sewer or entering branch shall be a smooth curve with radius as long as practicable. Invert channels shall also be formed for pipe stubouts.
3. The first pipe joint outside the manhole shall be located a minimum distance of 24-inches from the outside surface of the manhole.
4. Precast manhole tops shall terminate at such elevations to permit laying brick courses under the manhole frame to make allowance for future street grade adjustments.
5. Frames and covers shall be set accurately to conform to the finished grade.
6. Outside drop connections shall be made in accordance with the details shown on the Drawings.
7. Drop connection base slab extensions on precast manholes shall be manufactured monolithically with the manhole elements at the casting yard. The manufacturer shall submit for approval the method of drop manhole construction.
8. Where additional pipe connections or modifications of existing factory made openings are required on new or existing precast concrete manholes or wetwells, all cutting relative thereto shall be performed only by a power driven abrasive wheel or saw. It is specifically noted that such connections to existing manholes or wetwells

- shall be installed in accordance with the details for new units shown on the Drawings, and shall be caulked watertight with non-shrink grout.
9. Connection of the pipe entering the manhole shall be made by using a flexible boot type manhole coupling adapter. At the entry into the manhole, no part of the horizontal pipe shall rest against the concrete.
  10. Manholes shall be completed as the work progresses so that testing may be conducted as prescribed in paragraph 3.03 Field Quality Control.
- C. Concrete encasement: Class C concrete encasement shall be constructed in accordance with details shown on the Drawings.
1. The County may order the line encased when:
    - a. The sewer main crosses over a water main, or is at a depth which results in less than 18-inches clear distance between pipes when crossing under a water main. Encasement shall extend a minimum of 10-feet on each side of the point of crossing. In lieu of encasement, the sewer line may be constructed of PVC DR 14 pipe and shall be laid such that both joints will be a distance of 10-feet from the crossing.
    - b. The maximum width for trench excavations is exceeded. The Contractor shall construct concrete encasement around the pipe for the length of the excessive excavation. No payment will be made for the concrete encasement required due to excessive trench widths.
  2. The points of beginning and ending of pipe encasement shall be not more than 6-inches from a pipe joint to protect the pipe from cracking due to uneven settlement of its foundation or the effects of superimposed live loads.
- D. Concrete protective slabs: Concrete protective slabs as shown on the Drawings shall be constructed over gravity sewers that have less than 3-feet of cover from finished grade.
- E. Connections to existing structures: Proposed sewer lines shall be connected to the existing manholes by core drilling the proper size opening and installing a flexible boot type manhole adapter as specified in paragraph 2.01.H of this Section.
- F. Invert channels (benching) shall be provided for all new manholes and existing manholes which are connected into. No brick shall be allowed in construction of the manhole invert. Inverts shall be poured using 2,500-psi concrete.

### 3.03 FIELD QUALITY CONTROL

- A. Workmanship: Sewers and appurtenances shall be built watertight. The sewage must be pumped for disposal and special care and attention must be paid to securing watertight construction. Upon completion, the sewers, or sections thereof, will be tested and gauged and if leakage is above the allowable limits specified, the sewer will be rejected.
- B. Inspection: On completion of each block or section of sewer, or such other times as the County may direct, the block or section of sewer shall be cleaned, tested, and inspected.
1. Each section of the sewer shall show, on examination from either end, a full circle of light between manholes.
  2. Each manhole or other appurtenance to the system shall be of the specified size and



form, be watertight (no leakage allowed by visual inspection), and be constructed with the top set permanently to specified position and grade. All repairs shown necessary by the inspection shall be made; broken or cracked pipe replaced; all deposits removed and the sewer left true to line and grade, entirely clean and ready for use.

3. No pipe shall exceed a deflection of 5%. After the final backfill has been in place at least 30-days, the Contractor shall perform deflection testing using a rigid ball or mandrel with a diameter of not less than 95% of the base inside diameter or average inside diameter of the pipe, depending which is specified in the ASTM standard to which the pipe is manufactured. If the mandrel does not pass the completed section of sewer, the entire section of sewer will be rejected.

C. Closed Circuit Television Inspection:

1. Internal gravity sewer video inspection shall be performed by the Contractor to check for alignment and deflection. The television inspection shall also be used to check for cracked, broken, or otherwise defective pipe and overall pipe integrity.
2. The video internal inspection will be performed in 2 stages. The first inspection shall be within 30-days after the installation of the gravity sewer pipe provided the road base is in place and the manhole rings and covers are to grade. The second inspection of the gravity sewer pipe shall be before the end of the 1-year warranty period.
3. If the first or second video inspection reveals cracked, broken, or defective pipe, or pipe misalignment resulting in vertical sags in excess of 1-1/2-inch or a ring deflection in excess of 5%, the Contractor shall be required to repair or replace the pipeline. Successful passage of both the low-pressure air exfiltration test and video inspection is required before acceptance by the County.
4. Prior to repair or replacement of failed sewer pipe, the method of repair or replacement shall be submitted to the County for approval. Pressure grouting of pipe or manholes shall not be considered as an acceptable method of repair.

D. Low Pressure Air Exfiltration Testing:

1. The Contractor shall provide all labor, equipment, and materials and shall conduct all testing required under the direction of the County
2. Low pressure air testing shall conform to the requirements of UNI-B6-79 "Recommend Practice for Low-Pressure Air Testing of Installed Sewer Pipe", as published by UNI-Bell Plastic Pipe Association.
3. During sewer Construction, all service laterals, stubs, and fittings into the sewer test section shall be properly capped or plugged so as not to allow for air loss that could cause an erroneous air test result. Where necessary, the Contractor shall restrain caps, plugs, or short pipe lengths such that blowouts are prevented.
4. Each test section shall not exceed 400-feet in length and shall be tested between adjacent manholes.
5. Before testing, Contractor shall install monitoring wells at each manhole to determine groundwater level and adjust test pressure accordingly. In no case shall the test pressure exceed 9.0-psig. All pressurizing equipment shall include a regulator or relief valve set no higher than 9.0-psig to avoid over-pressurizing.
6. Low-pressure air shall be slowly introduced into the sealed line until the internal air pressure reaches 4.0-psig greater than the average backpressure of any groundwater above the invert of the pipe, but not greater than 9.0-psig.

7. When temperatures have been equalized and pressure stabilized at 4.0-psig greater than the average groundwater backpressure, the air hose from the control panel to the air supply shall be shut off or disconnected. The continuous monitoring pressure gauge shall then be observed while the pressure is decreased to no less than 3.5-psig greater than the average groundwater backpressure. At a reading of 3.5-psig greater than the average groundwater backpressure, timing shall commence with a stopwatch or other timing device that is at least 99.8% accurate.
8. If the time shown in the table, for the designated pipe size and length, elapses before the air pressure drops 1-psig; the section under-going test shall have passed. The test may be discontinued once the prescribed time has elapsed.
9. If the pressure drops 1-psig before the appropriate time shown in the table has elapsed, the air loss rate shall be considered excessive and the section of pipe has failed the test.
10. Should the section fail to meet test requirements, the Contractor shall determine the source or sources of leakage, and make all necessary repairs and shall repeat the test until the test section is within established limits. All corrective work shall be at the Contractor's expense.

E. Correction of Non-Conforming work:

1. All non-conforming work shall be repaired or replaced by the Contractor at no additional expense to the County. Non-conforming work shall be defined as failure to adhere to any specified or implied directive of these technical special provisions and/or the Drawings, including but not limited to pipe not laid straight, true to the lines and grades as shown on the Drawings, damaged or unacceptable materials, misalignment or diameter ring deflection in pipe due to bedding or backfilling, water standing in any pipe segment or structure, visible or detectable leakage, and failure to pass any specified test or inspection.

**Table 02774-1  
Test Time Table**

TEST TIME: For sewer diameter between 8 inches and 36 inches inclusive, the pipe shall be tested between adjacent manholes. The test time for the air pressure to drop the specified one pound shall be as listed below:											
SPECIFICATION TIME REQUIRED FOR A 1.0 PSIG PRESSURE DROP											
1 Pipe Dia. (in.)	2 Minimum Time (min:sec)	3 Length for Minimum Time (ft)	4 Time for Longer Length (sec)	Feet							
				100	150	200	250	300	350	400	450
6	5:40	398	0.854 L	5:40	5:40	5:40	5:40	5:40	5:40	5:42	6:24
8	7:34	298	1.520 L	7:34	7:34	7:34	7:34	7:36	8:52	10:08	11:24
10	9:26	239	2.374 L	9:26	9:26	9:26	9:53	11:52	13:51	15:49	17:48
12	11:20	199	3.148 L	11:20	11:20	11:24	14:15	17:05	19:56	22:47	25:38
15	14:10	159	5.342 L	14:10	14:10	17:48	22:15	26:42	31:09	35:36	40:04
18	17:00	133	7.692 L	17:00	19:13	25:38	32:03	38:27	44:52	51:16	57:41
21	19:50	114	10.470 L	19:50	26:10	34:54	43:37	52:21	61:00	69:48	78:31
24	22:40	99	13.674 L	22:47	34:11	45:34	56:58	68:22	79:46	91:10	102:33
27	25:30	88	17.306 L	28:51	43:16	57:41	72:07	86:32	100:57	115:22	129:48
30	28:20	80	21.366 L	35:37	53:26	71:13	89:02	106:50	124:38	142:26	160:15
36	34:00	66	30.768 L	51:17	76:55	102:34	128:12	153:50	179:29	205:07	230:46

END OF SECTION

**SECTION 02775**  
**WASTEWATER MANHOLE REHABILITATION**

**PART 1 - GENERAL**

1.01 DESCRIPTION

- A. Scope of Work: Sanitary sewer manhole rehabilitation including:
  - 1. Rehabilitation and leak proofing of manholes by lining with spray applied or centrifugally cast light-weight structural reinforced concrete, spray applied epoxy resin systems, or equal as determined by County.
  - 2. The repair and sealing of the manhole base, bench, invert, walls, corbel/cone, and chimney of brick, block, or precast manholes, including the removal of any unsound material.
  - 3. The inspection and testing of the various types of work to insure compliance.

1.02 REFERENCES

- A. Codes, Specifications, and Standards (Not Used)
- B. Testing and Materials Standards
  - 1. American Society of Testing and Materials (ASTM)
- C. Related Sections
  - 1. Section 01516 "Collection System Bypass"
  - 2. Section 02774 "Wastewater Gravity Collection Systems"
  - 3. Section 09901 "Coatings and Linings"
  - 4. Section 09910 "Prefabricated Fiberglass Liners"

1.03 DEFINITIONS (NOT USED)

1.04 RESPONSIBILITY FOR OVERFLOWS AND SPILLS

- A. It shall be the responsibility of the Contractor to schedule and perform his work so as to result in no overflows or spills of sewage from the system. If sewage flows are such that they interfere with the Contractor's ability to perform work, the Contractor shall be responsible for scheduling his work during low flow periods or provide bypass pumping. Bypass pumping shall be provided only with the specific written approval of the County.
- B. In the event of overflows caused by the Contractor's work activities, the Contractor shall immediately take appropriate action to contain and stop the overflow, clean up the spillage, disinfect the area affected by the spill, and notify County in a timely manner.

- C. Contractor will indemnify and hold harmless the County for any fines or third-party claims for personal or property damage arising out of a spill or overflow that is fully or partially the responsibility of the Contractor. Should fines subsequently be imposed as a result of any overflow for which the Contractor is fully or partially responsible, the Contractor shall pay all such fines and all of the County's legal, engineering, and administrative costs in defending such fines and claims associated with the overflow.

#### 1.05 SHOP DRAWINGS AND SUBMITTALS

- A. Shop Drawings shall be submitted to the County for review and acceptance prior to starting construction in accordance with the General Conditions and 01300 "Submittals" for the following:
  - 1. Manhole Liner
- B. Submittals shall be submitted to the County for review and acceptance at least 14-days prior to starting manhole rehabilitation in accordance with the General Conditions and Division 1 for the following:
  - 1. Manufacturers' Certificate of Compliance certifying compliance with the applicable Specifications and Standards. The certifications shall list all materials furnished under this Section.
  - 2. Certified copies of factory tests required by the applicable Standards, the Manufacturer, and this Section.
  - 3. Manufacturer's handling, storage, and installation instructions and procedures.
  - 4. Recommended lining thickness design to withstand groundwater pressure as specified in Part 3 of this Section.

### **PART 2 - PRODUCTS**

#### 2.01 GENERAL

- A. Materials
  - 1. All materials furnished for this work shall be in accordance with the "List of Materials and Approved Manufacturers" as appended to these Specifications.
  - 2. The materials used shall be designed, manufactured, and intended for sewer manhole rehabilitation and the specific application in which they are used. The materials shall have a proven history of performance in sewer manhole rehabilitation. The materials shall be delivered to the job site in original unopened packages clearly labeled with the manufacturer's identification and printed instructions. All materials shall be stored and handled in accordance with recommendations of the manufacturer. All materials shall be mixed and applied in accordance with the manufacturer's written instructions.
  - 3. The Contractor shall warrant and hold harmless the County against all claims for patent infringement and any loss thereof.
  - 4. Handle and store all materials and dispose of all wastes in accordance with applicable regulations.

5. Each lining system shall be designed for application over wet surfaces (but not active running water) without degradation of the final product and/or the bond between the product and the manhole surfaces.
- B. The following shall be used for stopping active leaks in concrete and masonry manholes:
1. A premixed fast-setting, volume-stable waterproof cement plug consisting of hydraulic cement, graded silica aggregates, special plasticizing, and accelerating agents. It shall not contain chlorides, gypsum's, plasters, iron particles, aluminum powder, or gas-forming agents, or promote the corrosion of steel it may come in contact with. Set time shall be approximately 1-minute. Ten (10) minute compressive strength shall be approximately 500-psi.
  2. A silicate-based liquid accelerator field mixed with neat Portland cement. The set time shall be approximately 1-minute.
  3. The elastomeric polyurethane resin-soaked method, using dry twisted jute oakum, or resin-rod with polyurethane resin (water activated).
- C. The following shall be used for patching, repointing, filling, and repairing non-leaking holes, cracks, and spalls in concrete and masonry manholes:
1. A premixed non-shrink cement-based patching material consisting of hydraulic cement, graded silica aggregates, special plasticizing and accelerating agents, which has been formulated for vertical or overhead use. It shall not contain chlorides, gypsums, plasters, iron particles, aluminum powder, or gas-forming agents or promote the corrosion of steel with which it may come into contact. Set time (ASTM C-191) shall be less than 30-minutes. One-hour compressive strength (ASTM C-109) shall be a minimum of 200-psi and the ultimate compressive strengths (ASTM C-882-Modified) shall be a minimum of 1,700-psi.
- D. Spray applied or centrifugally cast structural reinforced cement manhole lining
1. The material applied to the surface of the manhole shall be a cementitious blend of calcium aluminate cement and manufactured calcium aluminate aggregates for constructing a liner that is impervious to the flow of water, is resistant to sulfide attack, and restores structural integrity to existing manhole walls.
  2. A monolithic liner shall be formed which covers all interior manhole surfaces and shall have the following minimum requirements at 28-days:

Compressive Strength (ASTM C-579B)	3,000-psi
Tensile Strength (ASTM C-496)	300-psi
Flexural Strength (ASTM C-293) (Modified)	600-psi
Shrinkage (ASTM C-596)	0% at 90% R.H.
Bond (ASTM C-321)	130-psi
Density, when applied	105± pcf
- E. Spray applied epoxy resin system manhole lining.
1. The material sprayed onto the surface of the manhole shall be an epoxy resin system formulated for application within a sanitary sewer environment. The resin will exhibit suitable corrosion resistance and enhance the structural integrity of the existing manhole.

F. Multi-component stress skin panel liner system.

1. The material applied onto the surface of the manhole shall be a multi-component stress skin panel liner system designed to withstand the effects of hydrogen sulfide without any deterioration to the liner. The liner shall be a solvent free, two-component polymeric, moisture/chemical barrier specifically developed for the wastewater environment.
2. The cured epoxy resin system shall conform to the following minimum Structural Standards:

**Table 02775-1**  
**Minimum Structural Standards**

Cured Product	Test Method	Results
Tensile Stress	ASTM D-638	7,000-psi
Flexural Stress	ASTM D-790	13,000-psi
Flexural Modulus	ASTM D-790	500,000-psi
Compressive Strength	ASTM D-695	13,000-psi

**PART 3 - EXECUTION**

**3.01 REHABILITATION OF MANHOLE STRUCTURE**

**A. General Procedures**

1. Safety: The Contractor shall perform all work in strict accordance with all applicable OSHA, state, local, and manufacturer's safety standards. Each method of manhole rehabilitation in this Section requires some degree of manhole entry by workers. Particular attention is drawn to those safety requirements regarding confined space entry and respiratory protection from airborne particulate materials during cleaning, product mixing, and application.
2. Cleaning: All concrete and masonry surfaces to be rehabilitated shall be clean. All grease, oil, laitance, coatings, loose bricks, mortar, unsound brick or concrete, and other foreign materials shall be completely removed. Water blasting utilizing a 210°F steam unit and proper nozzles shall be the primary method of cleaning; however, other methods such as wet or dry sandblasting, acid wash, concrete cleaners, degreasers, or mechanical means may be required to properly clean the surface. All surfaces on which these methods are used shall be thoroughly rinsed, scrubbed, and neutralized to remove cleaning agents and their reactant products. Debris resulting from cleaning shall be removed from the manhole and not discharged downstream.
3. Stopping Infiltration: After surface preparation and prior to the application of mortars and coatings, infiltration shall be stopped either by plugging with a waterstop compound or chemical grout sealing.
4. Patching: All large holes or voids around joints, or pipes and all spalled areas and all holes caused by missing or cracked brick shall be patched. All missing mortar shall be repointed using a non-shrink patching mortar. All cracked or disintegrated material shall be removed from the area to be patched or repointed, exposing a sound sub base. All cracks not subject to movement and greater than 1/16-inch in width shall be routed out to a minimum width and depth of 1/2-inch and patched with non-

- shrink patching mortar.
5. Flow Control: The Contractor shall be responsible for plugging or diverting the flow of sewage as needed for repair and lining of manhole inverts and benches.
  6. Remove all loose grout and rubble from existing channel. Rebuild channel if required by reshaping and repairing slope of shelves or benches. Work shall include aligning inflow and outflow ports in such a manner as to prevent the deposition of solids at the transition point. All inverts shall follow the grades of the pipe entering the manhole. Changes in direction of the sewer and entering branch or branches shall have a true curve with the largest possible radius and shall be shaped to allow easy entrance of maintenance equipment including buckets or T.V. camera.
  7. Each lining system shall be installed in accordance with the manufacturer's recommendation to withstand groundwater pressures. For manholes greater than 12-feet in depth, the lining shall withstand the pressures associated with a groundwater depth equal to the manhole depth. Linings for all other manholes shall withstand the pressures associated with groundwater depth of 12-feet. Measure groundwater depth from manhole bench to top of ground surface.
  8. Application of products shall be by factory certified applicators.

### 3.02 SPRAY APPLIED LIGHT-WEIGHT STRUCTURAL REINFORCED CEMENT

- A. The surface prior to spraying shall be damp without noticeable free water droplets or running water. Materials shall be spray-applied to a minimum uniform thickness to insure that all cracks, crevices, and voids are filled and a somewhat smooth surface remains after light troweling. The light troweling is performed to compact the material into voids and to set the bond.
- B. The first application shall have begun to take an initial set (disappearance of surface sheen, which could be 15-minutes to 1-hour depending upon ambient conditions) before the second application to assure a minimum total finished thickness of 1/2-inch. The final finished thickness may need to be greater than 1/2-inch as recommended by the manufacturer to withstand groundwater pressures. A depth gauge shall be used during application, at various locations, to verify the required thickness. The surface then shall be trowelled to smooth finish with care taken not to over trowel so as to bring additional water to the surface and weaken it. Manufacturer's recommendations shall be followed whenever more than 24-hours have elapsed between applications.
- C. The bench covers used to catch debris shall be removed and the bench and invert sprayed such that a gradual slope is produced from the walls to the invert with the thickness at the edge of the invert being no less than 1/2-inch. The wall-bench intersection shall be rounded to a uniform radius the full circumference of the intersection.
- D. No application shall be made to frozen surfaces or if freezing is expected to occur within the manhole for 24-hours after application. If ambient temperatures are in excess of 95°F, precautions shall be taken to keep the mix temperature at time of application below 90°F, using ice if necessary.
- E. The final application shall have a minimum of 4-hours cure time before being subjected

to active flow.

### 3.03 CENTRIFUGALLY CAST STRUCTURAL REINFORCED CEMENT

- A. Application procedures shall conform to the recommendations of the manufacturer.
- B. The rotating casting applicator shall be positioned to evenly apply the material and be withdrawn at a rate to assure a final minimum thickness of 1-inch. The final finished thickness may need to be greater than 1-inch as recommended by the manufacturer to withstand groundwater pressures. A depth gauge shall be used during application, at various locations to verify the required thickness.
- C. The bench covers used to catch debris shall be removed and the bench and invert sprayed or hand applied so that a gradual slope is produced from the walls to the invert with the thickness at the edge of the invert being no less than 1/2-inch. The wall-bench intersection shall be rounded to a uniform radius the full circumference of the intersection.
- D. No application shall be made to frozen surfaces or if freezing is expected to occur within the manhole for 24-hours after application. If ambient temperatures are in excess of 95°F, precautions shall be taken to keep the mix temperature at time of application below 90°F.
- E. The final application shall have a minimum of 1-hour cure time as recommended by the manufacturer before being subjected to active flow.

### 3.04 SPRAYED APPLIED EPOXY RESIN SYSTEM

- A. Application procedures shall conform to the recommendations of the manufacturer.
- B. The epoxy resin shall be sprayed onto the surfaces of the manhole walls, benches, and inverts to produce a smooth coating and yield the required structural integrity and corrosion resistance. A depth gauge shall be used during application at various locations to verify the required thickness.
- C. The epoxy resin shall be applied to a minimum thickness of 0.125-inches (125-mils) at the top of the manhole and gradually thickened in accordance with manufacturer's recommendations to withstand groundwater pressures. The application shall have a minimum cure time as recommended by the manufacturer before being subjected to active flow.
- D. The sloped surface of the manhole bench shall be made non-skid by broadcasting aluminum oxide or sand into the surface prior to gelatin/set.

### 3.05 MULTI-COMPONENT LINER SYSTEM

- A. Application procedures shall conform to the recommendations of the manufacturer.



- B. The liner system shall be sprayed onto the surfaces of the manhole walls, benches, and inverts to produce a smooth surface. The spray equipment shall be specifically designed to accurately ratio and apply the liner system.
- C. Final installation shall be a minimum of 500-mils.
- D. The application shall have a minimum cure time as recommended by the manufacturer before being subjected to active flow.

3.06 SANITARY SEWER LATERAL CONNECTIONS TO MANHOLES

- A. Sanitary sewer lateral connections to rehabilitated manholes shall be reinstated to provide a seamless, leak free, and unobstructed flow connection between the new manhole lining or coating system and the lateral connection per 3.01A.
- B. Sanitary sewer laterals requiring rehabilitation shall be renewed per Section 02772 "Cured-In-Place Pipe (CIPP) For Lateral Renewal."

3.07 MANHOLE REHABILITATION ACCEPTANCE

- A. Test all rehabilitated manholes using the vacuum test method as per ASTM C 1244 "Standard Test Method for Concrete Sewer Manholes by the Negative Air Pressure (Vacuum) Test", following the manufacturer's recommendations for proper and safe procedures. Vacuum testing of manholes and structures shall be performed after curing of linings. Any visible leakage in the manhole or structure before, during, or after the test shall be repaired regardless of the test results.
- B. All pipes for vacuum testing entering the manhole shall be installed at the top access point of the manhole. A vacuum of 10-inches of mercury (5.0-psi) shall be drawn on the manhole, and the time shall be measured for the vacuum to drop to 9-inches of mercury (4.5-psi). Manholes will be considered to have failed the air test if the time to drop 1-inch of mercury is less than what is shown in the following table:

**Table 02775-2  
Vacuum Test Timetable**

Vacuum Test Timetable				
Manhole Diameter – Inches				
Depth – feet	48-inches	60-inches	72-inches	96-inches
4	30 sec.	30 sec.	30 sec.	30 sec.
8	30 sec.	30 sec.	32 sec.	38 sec.
12	30 sec.	39 sec.	48 sec.	57 sec.
16	40 sec.	52 sec.	64 sec.	76 sec.
20	50 sec.	65 sec.	80 sec.	95 sec.
24	60 sec.	78 sec.	96 sec.	114 sec.
+ Each 2'	+5 sec.	+6.5 sec.	+8.0 sec.	+9.5 sec.

- C. Manhole depths shall be rounded to the nearest foot. Intermediate values shall be interpolated. For depths above 24-feet, add the values listed in the last line of the table for each 2-feet of additional depth.
- D. If the manhole or structure fails the vacuum test, the Contractor shall perform additional repairs and repeat the test procedures until satisfactory results are obtained.
- E. After the manhole rehabilitation work has been completed, the manhole shall be inspected by the Contractor in the presence of the County and the work shall be accepted if found satisfactory to the County. No evidence of visible leaks shall be allowed. Non-uniformity, sagging, lamination, holidays or other defects will be cause for rejection of the coating. All surfaces shall be tested for the presence of holidays and pinholes via spark testing at 100-volts per millimeter. The Contractor shall provide the testing equipment and perform the testing in the presence of the County. Any holidays or pinholes found during the testing shall be repaired and the surface re-tested until the surfaces are completely free of holidays and pinholes.

### 3.08 CLEANUP

- A. After the installation work has been completed and the testing is acceptable, the Contractor shall clean up the entire project area. The Contractor shall dispose of all excess material and debris. The work area shall be left in a condition equal to or better than the prior condition.

### 3.09 WARRANTY

- A. The Contractor shall guarantee his work for a warranty period of 1-year from the date of acceptance.
- B. If at anytime during the warranty period any leakage, cracking, loss of bond, or other discontinuity is identified, the Contractor shall remove and replace the manhole liner with new material at no cost to the County. No field repair shall be approved.
- C. Furnish an extended warranty for manhole rehabilitation materials from the Contractor and liner manufacturer for a total of 5-years from date of final completion.

END OF SECTION

**SECTION 02784**  
**CHAIN LINK FENCES AND GATES**

**PART 1 - GENERAL**

1.01 DESCRIPTION

- A. Scope of Work: This section specifies aluminum coated steel chain link fence, nominally 6-feet high, complete with gates to be constructed around the area indicated on the Drawings.

1.02 QUALITY ASSURANCE

- A. Chain link fences and gates shall be constructed in accordance with specified standards, as well as all pertinent codes and regulations. Where provisions of pertinent codes conflict with the specifications, the more stringent provisions shall govern.
- B. Chain link fences and gates shall be manufactured by established, reputable manufacturers that have been engaged in the manufacture of chain link fencing for at least 10-years.

1.03 SHOP DRAWINGS AND SUBMITTALS

- A. Submittals shall be submitted to the County for review and acceptance prior to construction in accordance with the General Conditions and specifications Section 01300 "Submittals."
- B. The Contractor shall submit layout drawings of all fence and gate installations along with details and manufacturer's literature of all fence and gate materials in the Project.
- C. The Contractor shall submit all motor data, connection diagrams, wiring diagrams, and O&M instructions for all gate operators in the Project.

**PART 2 - PRODUCTS**

2.01 GENERAL

- A. All material supplied shall be one of the products specified in Appendix D "List of Approved Products" appended to these technical specifications.

## 2.02 MATERIALS

- A. Fabric: The fabric shall be aluminum coated steel chain link, 72-inches high, No. 9-gauge wire woven in a 2-inch mesh. The fabric shall conform to the requirements of ASTM Designation A491. The aluminum coating shall be a minimum of 0.40-ounces per square foot of wire surface for No. 9-gauge fabric. The fabric shall have a minimum tensile strength of 75,000-psi. The weight of the coating shall be determined by the strip test as defined in ASTM Designation A428. The fabric shall be coated with an ultra violet stable black PVC coating which meets ASTM standards F688 Class I.
- B. Post and Other Appurtenances: All posts and other appurtenances used in the construction of this fence shall be hot dipped galvanized with a minimum of 1.8-ounces per square foot of surface. Pipe sections shall conform to the requirements of ASTM Designation A120. All posts, rails, and fittings shall be coated with an ultra violet stable black PVC coating which meets ASTM standards F688 Class I.
- C. Sizes of Posts, Gate Frames, and Rails:

COMPONENT	DIMENSIONS	
	Nominal Diameter	NPS Pipe Schedule
1. End, corner & pull posts	3-inch	40
2. Gateposts (one leaf width 8-feet or less)	3-inch	40
3. Intermediate posts	2-3/8-inch	40
4. Gate Frames	1-5/8-inch	40
5. Braces	1-5/8-inch	40
6. Top Rails	1-5/8-inch	20

### D. Gates

1. Swing Gates: Gates shall be complete with latches, stops, keepers, and hinges. Gate frames shall be constructed of round tubular members continuously welded at all corners or assembled with fittings. Welds shall be painted with aluminum or zinc based paint prior to application of PVC coating. Gate filler shall be of the same fabric as specified for the fence and shall be attached securely to the gate frame with No. 9 tie wires at intervals not exceeding 12-inches. Hinges shall be of adequate strength for the gate and with large bearing surfaces for clamping in position. The hinges shall not twist or turn under the action of the gate. The gates shall be easily operable by one person. Latches, stops, and keepers for all gates, along with 1-inch stainless steel chain and padlock, shall be provided.
2. Sliding Gates: Sliding gates shall be complete with latches, stops, keepers, rollers, and roller tracks. Gate shall ride on a double wheel carrier. Gateposts shall be 3-inch Sch. 40 and frame shall be 1-5/8-inch Sch. 40. Slide pipe tracks shall be 1-5/8-inch Sch. 40. Safety post (outside of gatepost) shall be 3-inch Sch. 40. Fabric shall match fence.

3. Gate padlocks shall be the County standard, case brass, shackle-case hardened steel, 1-inch links with 12-inch chain, 606 finish and keyed alike when more than one.
- E. Top Rail: The top rail shall be provided with couplings approximately every 20-feet. Couplings are to be the outside sleeve type, at least 6-inches long.
- F. Concrete: Concrete shall have a minimum compressive strength of 2,500-psi at 28-days.
- G. Hardware: Miscellaneous hardware shall be of steel, malleable iron or ductile iron of standard design and conform to the requirements of the Chain Link Fence Manufacturer's Institute. All parts shall be galvanized except ties and clips may be aluminum.
- H. Power Gate Operators: The operators for sliding gates shall be Robot Industries, Inc. Model LSG-100, Venco Model SJH, or acceptable equal units designed for use on cantilever sliding gates. Operator motors shall be 1 horsepower and shall be wound for 208 volt, 3 phase, and 60 Hz power supply. Units shall provide gate speed of not less than 75-feet per minute. Units shall be arranged for ground level mounting on 6-inch concrete pads. A quick disconnect for manual operation with a padlock control shall be provided. The cover for the operator shall be of galvanized steel, and the units shall be provided with electric overload protection.

## **PART 3 - EXECUTION**

### **3.01 ARRANGEMENT**

- A. Posts: Posts shall be uniformly spaced, not to exceed 10-feet on centers. Intermediate posts shall have waterproof tops, which have integrally cast openings through which the top rails shall pass. Terminal posts shall consist of end, corner, and pull posts.
- B. Braces: Braces shall be provided at each gate, corner, pull, and end post.
- C. Top Rails: The top rails shall pass through the line post tops and form a continuous brace from end to end of each stretch of fence. The top rail shall be securely fastened to the terminal posts by heavy pressed steel brace bands and malleable end connections.
- D. Bottom Tension Wire: The bottom tension wire shall be No. 7-gauge aluminum coated spring coil or crimped wire. Minimum weight of aluminum coating shall be 0.40-ounces per square foot of wire surface. The tension wire shall be stretched taut between terminal posts and securely fastened to each intermediate post 2-inches above the finish grade line. Tension wire shall be attached to the fence fabric with aluminum hog rings every 24-inches.
- E. Stretcher Bars: Stretcher bars shall be no less than 3/16-inch by 3/4-inch in cross section and shall have minimum length 2-inches longer than the fabric height. Stretcher bars shall be used for attaching the fabric to all terminal posts by threading through the fabric and being attached to the posts with No. 9-gauge tension bands, or other positive mechanical means, spaced at 24-inch centers. One (1) stretcher bar shall be provided for each gate and end post and 2 for each corner and pull post.

- F. Ties and Clips: Fabric shall be fastened to all intermediate posts with 9-gauge tie wires, spacing not to exceed 12-inches apart. Fabric shall be tied to top rail with 9-gauge tie wires, spacing not to exceed 24-inches on centers.

### 3.02 INSTALLATION

- A. Post Setting: Line and terminal posts shall be set in holes 12-inches in diameter, 42-inches deep with 36-inch post embedment. After the post has been set and plumbed, the hole shall be filled with concrete. The exposed surface of the concrete shall be crowned to shed water.
- B. Terminal and Gateposts: Terminal and gateposts shall be set as specified above and shall be braced to the nearest post with a galvanized horizontal brace used as a compression member and a galvanized 3/8-inch steel truss rod and turnbuckle used as a tension member.
- C. Fabric: Fabric shall not be stretched until concrete footings have cured a minimum of 3-days. Chain link fabric shall be placed on the side designated by the County and shall be stretched taut approximately 2-inches above finish grade and securely fastened to all posts. Rolls of wire fabric shall be joined by weaving a single strand into the ends of the rolls to form a continuous mesh.

END OF SECTION

**SECTION 03100**  
**CONCRETE FORMWORK**

**PART 1 - GENERAL**

1.01 DESCRIPTION

- A. Scope of Work: This Section specifies all labor, materials and equipment necessary for providing and installing formwork for concrete.
- B. Related Work Described Elsewhere:
  - 1. Section 03200 "Concrete Reinforcement"
  - 2. Section 03300 "Cast-in-Place Concrete"
- C. General Design: The Contractor shall be responsible for the design of all formwork and for safety in its construction, use and removal.

1.02 QUALITY ASSURANCE

- A. Qualifications: Formwork shall be constructed in accordance with the specified standards, as well as all pertinent codes and regulations. In cases where requirements of pertinent codes conflict with the requirements of these specifications, the more stringent shall govern.
- B. Standards: Unless otherwise indicated, all materials, workmanship and practices shall conform to the following standards:
  - 1. Standard Building Code
  - 2. ACI 347 "Recommended Practice for Concrete Formwork"
  - 3. Local codes and regulations

1.03 SHOP DRAWINGS AND SUBMITTALS

- A. Submittals shall be submitted to the County/Professional for review and acceptance prior to construction in accordance with the General Conditions and specifications Section 01300 "Submittals."
- B. Materials: Submit manufacturer's literature on form ties, spreaders, corner formers, form coatings and bond breakers.

**PART 2 - PRODUCTS**

2.01 GENERAL

- A. All material supplied shall be one of the products specified in Appendix D "List of Approved Products" appended to these technical specifications.

## 2.02 MATERIALS

- A. Form Lumber: Use form lumber when in contact with exposed concrete, conforming to the following or acceptable equivalent.
- B. Lumber: Douglas Fir/Larch No. 2 grade, seasoned, surfaced on four sides.
- C. Plywood: "Plyform", Class I or II, bearing the label of the Douglas Plywood Association. (Minimum 3/4-inch thickness).
- D. Form Ties: Use form ties which do not leave an open hole through the concrete and which permit neat and solid patching at every hole. Use embedded rods with integral waterstops and cones to provide a 1-inch breakback. Wire ties and wood spreaders will not be permitted.
- E. Form Coatings: Form release coating shall be a paraffin base oil or mineral oil coating which effectively prevents absorption of moisture; prevents bonding with concrete; is non-staining to concrete; and leaves the concrete with a paintable surface.
- F. Chamfer Strips: Chamfer strips shall be polyvinyl strips or acceptable equal, designed to be nailed in the forms to provide a 3/4-inch chamfer (unless indicated otherwise) at exposed edges of concrete members.

## PART 3 - EXECUTION

### 3.01 INSTALLATION

- A. Construction of Formwork: Forms shall be sufficiently strong to withstand the pressure resulting from the placement and vibration of concrete and shall be sufficiently rigid to maintain specified tolerances. Forms shall be sufficiently tight to prevent loss of mortar, and shall be adequately braced against lateral, upward or downward movement.
- B. Coating of Forms: Apply form coating to board forms prior to placing reinforcing. Keep form coatings off steel reinforcing, items to be embedded, and previously placed concrete.
- C. Form Erection:
  - 1. Provide a means of holding adjacent edges, ends of panels, and ends of sections tightly together and in accurate alignment so as to prevent the formation of ridges, fins, offsets, or similar surface defects of the finished concrete. Insure that forms may be removed without damage to the surface of the finished concrete.
  - 2. Provide a positive means of adjustment of shores and struts. Insure that all settlement is taken up during concrete placing.
  - 3. Temporary openings shall be provided in wall forms to limit the free fall of concrete to a maximum of 6-feet unless an elephant trunk is used. Such openings shall be located to facilitate placing and consolidation and shall be spaced no more than 8-feet apart. Temporary openings shall also be provided in the bottom of the wall, column forms, and elsewhere as necessary to facilitate cleaning and observation immediately prior to placing.



4. Do not embed any form-tying device or part thereof other than metal in concrete.
5. Form surfaces of concrete members except where placement of the concrete is against the ground. The dimensions of concrete members shown on the Drawings apply to formed surfaces, except where otherwise indicated.

D. Form Reuse: Reuse only forms which maintain a uniform surface texture on exposed concrete surfaces. Apply light sanding between uses to obtain such a uniform texture. Plug unused tie rod holes with corks, shave flush, and sand the concrete surface side of the plug.

E. Removal of Forms

1. Forms and shoring for elevated structural slabs, girders, and/or beams shall remain in place until the concrete has reached a compressive strength equal to the specified 28-day compressive strength as determined by test cylinders. Do not remove supports and re-shore. The following table indicates the minimum allowable time after the last concrete is placed before forms, shoring, and/or bracing may be removed.

Structural Item	Minimum Allowable Time
Bottom side of slabs, girders, beams	When concrete reaches specified 28-day compressive strength
Vertical sides of girders, beams	48-hours
Walls not supporting vertical or horizontal loads	48-hours
Walls supporting vertical or horizontal loads	When concrete reaches specified 28-day compressive strength
Footings, pipe encasements, pipe supports	24-hours

2. Do not remove forms from concrete which has been placed with outside air temperature below 50° F without first determining if the concrete has properly set regardless of the minimum times specified in the table above. Do not apply heavy loading on recently poured concrete. Immediately after forms are removed, the surface of the concrete shall be carefully examined and any irregularities in the surface shall be repaired and finished as specified.

F. Formed Openings: Openings shall be of sufficient size to permit final equipment alignment without deflection or offsets of any kind. Where the items pass through the wall, allow space for packing to ensure watertightness. Provide openings with continuous keyways with waterstops where required. Provide a slight flare to facilitate grouting and the escape of entrained air during grouting. Provide reinforcement as indicated and specified. Reinforcing steel shall be at least 2-inches clear from the opening.

G. Embedded Items: Set anchor bolts and other embedded items accurately and hold securely in position in the forms until the concrete is placed and set. Check all special castings, channels, or other metal parts that are to be embedded in the concrete prior to and again after concrete pour. Check all nailing, blocks, plugs, and strips necessary for the attachment of trim, finish, and similar work prior to concrete pour.

H. Pipes and Wall Spools Cast in Concrete

1. Install wall spools, wall flanges, and wall anchors before placing concrete. Do not weld, tie or otherwise connect the wall spools to the reinforcing steel.
2. Support pipe and fabricated fittings to be encased in concrete on concrete piers or pedestals. Carry concrete supports to firm foundations so that no settlement will be possible during Construction.

I. Form Tolerances

1. Failure of the forms to produce the specified concrete surface tolerance shall be grounds for rejection of the concrete work. Rejected Work shall be repaired or replaced at no cost to the County.
2. The following table indicates tolerances or allowable variations from dimensions or positions of structural concrete work:

	Maximum Tolerance
Sleeves and inserts	+1/4-inch to -1/4-inch
Projected ends of anchors	+1/4-inch to -0.0-inch
Anchor bolt setting	+1/4-inch to -1/4-inch
Finished concrete	+ 1/4-inch to -1/4-inch in 10 feet of length

The planes or axes from which the above tolerances are to be measured shall be as follows:

Sleeves and inserts	Centerline of sleeve or insert
Projected ends of anchors	Plane perpendicular to the end of the anchor as located on the Drawings
Anchor bolt setting	Centerline of anchor bolts
Finished concrete	The concrete surface as located on the Drawings

3. Where equipment is to be installed, comply with manufacturer's tolerances if more stringent than above.

END OF SECTION

**SECTION 03300**  
**CAST-IN-PLACE CONCRETE**

**PART 1 - GENERAL**

**1.01 DESCRIPTION**

- A. Scope of Work: This Section specifies cast-in-place concrete including all materials, mixing and transport, and performing all labor for the proportioning, mixing, transporting, placing, consolidating, finishing, and curing of concrete.
- B. Related Work Described Elsewhere:
  - 1. Section 03100 "Concrete Formwork"
  - 2. Section 03200 "Concrete Reinforcement"

**1.02 QUALITY ASSURANCE**

- A. Standards: Unless otherwise indicated, all materials, workmanship and practices shall conform to the requirements of the following standards:
  - 1. Standard Building Code
  - 2. Local Codes and Regulations
  - 3. ACI 318-83, Building Code Requirements for Reinforced Concrete
- B. Plant Qualification: Plant equipment and facilities shall meet all requirements of the checklist for Certification of Ready Mixed Concrete Production Facilities of the National Ready Mixed Concrete Association and ASTM C 94.
- C. Evaluation and Acceptance of Concrete: Evaluation and acceptance of concrete will be in accordance with ACI-318, Chapter 4.

**1.03 SHOP DRAWINGS AND SUBMITTALS**

- A. Submittals shall be submitted to the County for review and acceptance prior to construction in accordance with the General Conditions and specifications Section 01300 "Submittals."
- B. Materials and Shop Drawings: The following information shall be submitted for review. No concrete shall be furnished until the County has reviewed submittal and no exceptions taken or other favorable response has been returned.
  - 1. Plant Qualification: Satisfactory evidence shall be submitted indicating that the plant and operators have sufficient experience in providing the applicable design mix.

2. Materials: Satisfactory evidence shall be submitted indicating those materials to be used (including cement, aggregates and admixtures) meet the specified requirements.
3. Design Mix: The design mix to be used shall be prepared by qualified persons and submitted for review. Submit affidavit as to design mix performance over the preceding 6-months. The design of the mix is the responsibility of the Contractor subject to the limitations of the Specifications. Acceptance of this submission will be required only as minimum requirements of the Specifications have been met. Such acceptance will in no way alter the responsibility of the Contractor to furnish concrete meeting the requirements of the Specifications relative to strength and slump.
4. Ready Mix Concrete: Provide delivery tickets or weigh master's certificate per ASTM C 94, including weights of cement and each size aggregate, amount of water in the aggregate, and amount of water added at the plant. The amount of water added on the job shall be written on the ticket.

## **PART 2 - PRODUCTS**

### **2.01 GENERAL**

- A. All material supplied shall be one of the products specified in Appendix D "List of Approved Products" appended to these technical specifications.

### **2.02 MATERIALS**

#### **A. Cement**

1. Cement for all concrete shall be domestic Portland cement that conforms to the requirements of ASTM Designation C 150 Type I, Type II or Type III. All sanitary sewer manholes, wetwells, pumping stations, tanks and structures exposed to wastewater shall be constructed with Type II cement. Type III cement for high early strength concrete shall be used only for special locations and only with the review and acceptance of the County. Type I cement may be used for buildings and tremie concrete.
2. Only 1 brand of cement shall be used in any individual structure unless acceptable by the County. Cement that has become damaged, partially set, lumpy or caked shall not be used and the entire contents of the sack or container that contains such cement will be rejected. No salvaged or reclaimed cement shall be used.
3. Fly ash shall not be used in either Class A or Class B concrete.

#### **B. Aggregates:**

1. ASTM C 33. Coarse aggregates shall be size No. 57. Block cell fill shall be size No. 89.
2. In addition to requirements of ASTM C 33 for structures exposed to wastewater, the following shall apply:
  - a. Soft particles: 2% (2.0 percent)
  - b. Chert as a soft impurity (defined in Table 3 of ASTM C 33): 1% (1.0 percent)
  - c. Total of soft particles and chert as a soft impurity: 2% (2.0 percent)
  - d. Flat and elongated particles (long dimension > 5 times short dimension): 15%.

- C. Water: Clean and free from injurious amounts of deleterious materials.
- D. Air Entraining Admixture: ASTM C 260.
- E. Water Reducing and Retarding Admixture: ASTM C 494, Type D. Admixture shall not contain calcium chloride.
- F. Epoxy Bonding Agent: Sikastix 370, Sikadur Hi Mod, Concrevice 1001-LPL or acceptable equal.
- G. Waterproofing Material: Concrete admixture shall be manufactured and supplied by an approved manufacturer as shown in the Appendix D "List of Approved Products."

## 2.03 MIXES

### A. General Requirements

1. Mix Design: Proportioning shall be on the basis of field experience and/or trial mixtures as specified in ACI 318, Section 4.3. Data on consecutive compression tests and standard deviation shall be submitted. Proportioning for small structures may be by the water/cement ratio under special review and acceptance by the County. Concrete mix design shall comply with the Standard Building Code requirements.
2. Air Content: 5% plus or minus ( $\pm$ ) 1% (Class A and B).
3. Slump: 4-inches plus or minus ( $\pm$ ) 1-inch. 8-inches plus or minus ( $\pm$ ) 1-inch for tremie concrete.
4. Water/cement ratio = 0.45 maximum (all concrete exposed to hydrostatic loading), 0.50 maximum (all other concrete).
5. Minimum Compressive Strength at 28-days
  - a. Class A, 4,000-psi: Water and wastewater structures inclusive of tanks, ditches, pumping stations, tremie concrete and other structures in contact with process water.
  - b. Class B, 3,000-psi: Building structures, curb and gutters, slabs, walks, encasements, thrust blocks, and pipe supports, etc. not in contact with process water.
  - c. Class C, 2,500-psi: Mix wherever specified in the standard drawings such as A103, A112, A303, A406 and A407-2.

### B. Production of Concrete

1. General: Concrete shall be ready mixed and shall be batched, mixed and transported in accordance with ASTM C 94, except as otherwise indicated.
2. Air Entraining Admixture: Air entraining admixture shall be charged into the mixture as a solution and shall be measured by means of an acceptable mechanical dispensing device. The liquid shall be considered a part of the mixing water.

3. Waterproofing admixture: New concrete structures shall contain a crystalline waterproofing concrete admixture. Crystalline waterproofing concrete admixture shall be added to the concrete during the batching operation. The admixture concentration shall be added based upon manufacturer design percent concentration of admixture to the required weight of cement. The amount of cement shall remain the same and not be reduced. A colorant shall be added to verify the admixture was added to the concrete for all precast structures. Colorant shall be added and provided at the admixture manufacturing facility, not at the concrete batch plant. It is recommended that the admixture be added first to the rock and sand and blended thoroughly before adding cement and water or per the manufacturer's recommendations. Concrete structures without crystalline waterproofing admixture or admixture without colorant for field verification shall be rejected. Contractor shall provide certification the admixture was installed in accordance with the manufacturer's recommendations.
  4. Water Reducing and Retarding Admixture: Water reducing and retarding admixture shall be added and measured as recommended by the manufacturer. The addition of the admixture shall be completed within 1-minute after addition of water to the cement has been completed, or prior to the beginning of the last 3/4 of the required mixing, whichever occurs first. Admixtures shall be stored, handled and batched in accordance with the recommendations of ACI 68.
- C. Delivery Tickets: In addition to the information required by ASTM C 94, delivery tickets shall indicate the cement content and the water/cement ratio.
- D. Temperatures: The temperature of the concrete upon delivery from the truck shall not exceed 90° F.
- E. Modifications to the Mix: No modifications to the mix shall be made in the plant or on the job which will decrease the cement content or increase the water/cement ratio beyond that specified.

## **PART 3 - EXECUTION**

### **3.01 PREPARATION**

- A. Preparations before Placing: No concrete shall be placed until the review and acceptance of the County has been received. Acceptance will not be granted until forms are clean and reinforcing and all other items required to be set in concrete have been placed and thoroughly secured. The County shall be notified a minimum of 24-hours before concrete is placed.
- B. Conveying:
1. General: Concrete shall be handled from the truck to the place of final deposit as rapidly as practicable by methods which will prevent segregation or loss of ingredients to maintain the quality of the concrete. No concrete shall be placed more than 90-minutes after mixing has begun for that particular batch.

2. Buckets and Hoppers: Buckets and hoppers shall have discharge gates with a clear opening equal to no less than 1/3 of the maximum interior horizontal area, or 5 times the maximum aggregate size being used. Side slopes shall be no less than 60° (degrees). Controls on gates shall permit opening and closing during the discharge cycle.
3. Runways: Extreme care shall be exercised to avoid displacement of reinforcing during the placing of concrete.
4. Elephant Trunks: Hoppers and elephant trunks shall be used to prevent the free fall of concrete of more than 6-feet.
5. Chutes: Chutes shall be metal or metal lined and shall have a slope not exceeding 1 vertical to 2 horizontal and not less than 1 vertical to 3 horizontal. Chutes more than 20-feet long and chutes not meeting the slope requirements may be used only if they discharge into a hopper before distribution.
6. Pumping Equipment: Pumping equipment and procedures shall conform to the recommendations contained in the report of ACI Committee 304 on "Placing Concrete by Pumping Methods," ACI 304.2R-71. The specified slump shall be measured at the point of discharge. The loss of slump in pumping shall not exceed 1-1/2-inches.
7. Conveying equipment Construction: Aluminum or aluminum alloy pipe for tremies or pump lines and chutes, except for short lengths at the truck mixer shall not be permitted.
8. Cleaning: Conveying equipment shall be cleaned at the end of each concrete operation.

### 3.02 APPLICATION

#### A. Placing:

1. General: Concrete shall be deposited continuously, or in layers of such thickness (not exceeding 2-feet in depth) that no concrete will be deposited on concrete that has hardened sufficiently to cause the formation of seams or planes of weakness.
2. Supported Elements: At least 2-hours shall elapse after depositing concrete in columns or walls before depositing in beams, girders, or slabs supported thereon.
3. Segregation: Concrete shall be deposited as nearly as practicable in its final position to avoid segregation due to rehandling or flowing. Concrete shall not be subjected to procedures that will cause segregation.
4. Concrete Underwater: All concrete, except that indicated on the Drawings as tremie concrete, shall be placed in the dry.

#### B. Seals and Tremie Concrete

##### 1. General

- a. Wherever practicable, all foundation excavations shall be dewatered and the concrete deposited in the dry. Where conditions are encountered which render it impracticable to dewater the foundation before placing concrete, a concrete foundation seal shall be placed. The foundation shall then be dewatered, and the balance of the concrete placed in the dry.

- b. When seal concrete is required to be placed, the satisfactory performance of the seal in providing a watertight excavation for placing structural concrete shall be the responsibility of the Contractor. Seal concrete placed by the Contractor, which subsequently fails to perform properly, shall be repaired as necessary to perform its required function, at the expense of the Contractor.
  2. Method of Placing: Concrete deposited underwater shall be carefully placed in the space in which it is to remain by means of a tremie, a closed-bottom dump bucket of not less than 1-cubic yard capacity, or other approved method, and shall not be disturbed after it is deposited. All seal concrete shall be deposited in 1 continuous pour. No concrete shall be placed in running water. All formwork designed to retain concrete underwater shall be watertight, and the design of the formwork and excavation sheeting shall be by a Professional Engineer, registered in the State of Florida.
  3. Use of Tremie: The tremie shall consist of a tube having a minimum inside diameter of 10-inches, and shall be constructed in sections having tight joints. No aluminum parts that have contact with the concrete will be permitted. The discharge end shall be entirely seated at all times, and the tremie tube kept full to the bottom of the hopper. When a batch is dumped into the hopper, the tremie shall be slightly raised (but not out of the concrete at the bottom) until the batch discharges to the bottom of the hopper, after which the flow shall be stopped by lowering the tremie. The means of supporting the tremie shall be such as to permit the free movement of the discharge end over the entire top surface of the Work, and shall permit it being lowered rapidly when necessary to choke off or retard the flow. The flow shall preferably be continuous, and in no case shall be interrupted until the Work is completed. Special care shall be exercised to maintain still water at the point of deposit.
  4. Use of Bottom-dump Bucket: When the concrete is placed by means of a bottom-dump bucket, the bucket shall be lowered gradually and carefully until it rests upon the concrete already placed. The bucket shall then be raised very slowly during the discharge travel; the intent being to maintain, as nearly as possible, still water at the point of discharge and to avoid agitating the mixture. Aluminum buckets will not be permitted.
  5. Time of Beginning Pumping: Pumping to dewater a sealed cofferdam shall not commence until the seal has set sufficiently to withstand the hydrostatic pressure, and in no case earlier than 72-hours after placement of the concrete.
- C. Consolidating Concrete:
1. General: Concrete shall be consolidated by means of internal vibrators operated by competent workmen.
  2. Vibrators: Vibrators shall have a minimum head diameter of at least 2-inches, a minimum centrifugal force of 700-pounds and a minimum frequency of 8,000 vibrations per second.
  3. Vibrators for Confined Areas: In confined areas, the specified vibrators shall be supplemented by others having a minimum head diameter of 1-1/2-inches, a minimum centrifugal force of 300-pounds and a minimum frequency of 9,000 vibrations per second.



4. Spare Vibrator: One (1) spare vibrator for each 3 in use shall be kept on the site during all concrete placing operations.
  5. Use of Vibrators: Vibrators shall be inserted and withdrawn at points approximately 18-inches apart. The duration of each insertion shall be from 5 to 15-seconds. Concrete shall not be transported in the forms by means of vibrators.
- D. Protection: Rainwater shall not be allowed to increase the amount of mixing water, or to damage the surface finish. Concrete shall be protected from construction over-loads. Design loads shall not be applied until the specified strength has been attained.

### 3.03 CONCRETE FINISHING AND CURING

- A. All slabs exposed to view shall receive a steel trowel finish without local depressions or high points and apply a light hair-broom finish. Do not use stiff bristle brooms or brushes. Leave hair-broom lines parallel to the direction of slab drainage.
- B. All other slabs and footings shall receive a smooth steel trowel finish.
- C. All walls of structures or parts of buildings exposed to view shall receive the following:
  1. Repair defective concrete, remove fins, fill depressions 1/4-inch or deeper, and fill tie holes.
  2. Any surface not receiving a special applied finish, shall receive a slurry finish consisting of 1 part cement and 1-1/2 parts sand by damp loose volume. Dampen surfaces and then apply the slurry with clean burlap pads or sponge rubber floats. Remove any surplus by scraping and then rubbing with clean burlap.
  3. Surfaces that will receive a special applied finish shall be of even color, have no pits, pockets, holes, or sharp changes of surface elevation. Scrubbing with a stiff bristle fiber brush shall produce no dusting or dislodging of cement or sand.
- D. All concrete shall be wet cured a minimum of 7-days; or if not to receive special finishes, coatings or concrete toppings, an acceptable curing compound may be utilized.
- E. All surface defects shall be repaired by removing defective concrete down to sound concrete and repairing with patching mortar. Finished repair shall match adjacent concrete and be cured as specified.

### 3.04 TESTING

- A. A testing laboratory, acceptable by the County, shall perform required testing. The Contractor shall pay for all tests indicating a failure to comply with the Specifications. The Contractor shall keep the laboratory informed of his schedule.

- B. Standard laboratory compressive test cylinders shall be obtained by the laboratory when concrete is discharged at the point of placing (i.e., discharge end of pumping equipment), and cylinders shall be made and cured in accordance with the requirements of ASTM Designation C 31. A set of 4 cylinders shall be obtained for each 50-cubic yards, or fraction thereof, placed each day for each type of concrete. The cylinders shall be cured under laboratory conditions and shall be tested at 7 and 28-days of age in accordance with the requirements of ASTM Designation C 39.
  
- C. The testing laboratory shall make slump tests of Class A and Class B concrete as it is discharged from the mixer at the point of placing. Slump tests shall be made for each 25-cubic yards or "pour" of concrete placed. Slump tests may be made on any batch, and failure to meet specified slump requirements shall be sufficient cause for rejection of that batch.

END OF SECTION

**SECTION 03410**  
**PRECAST CONCRETE STRUCTURES**

**PART 1 - GENERAL**

1.01 DESCRIPTION

- A. Scope of Work: This Section specifies the materials, labor and equipment required to construct manholes, wetwells, valve vaults, mitered end sections, meter boxes and all other precast concrete structures, as shown on the Drawings and as specified herein.

1.02 QUALITY ASSURANCE

- A. Standards: Unless otherwise indicated, all materials, workmanship and practices shall conform to the following standards.
  - 1. Standard Building Code
  - 2. Local Codes and Regulations
  - 3. ACI Building Code Requirements for Reinforced Concrete
  - 4. American Society for Testing and Materials (ASTM)
  - 5. American Concrete Institute (ACI)
- B. The forms, dimensions, concrete, and construction methods shall be acceptable to the County in advance of construction.

1.03 SHOP DRAWINGS AND SUBMITTALS

- A. Submittals shall be submitted to the County for review and acceptance prior to construction in accordance with the General Conditions and specifications Section 01300 "Submittals."
- B. The Contractor shall submit Shop Drawings to the County, showing all details of construction, reinforcing and joints.
- C. Submit manufacturer's data on certifications and testing for concrete waterproofing additive, joint mastic, gaskets and grout material to be used.

## 1.04 INSPECTION

- A. The quality of all materials, the process of manufacture, and the finished sections shall be subject to inspection and acceptance by the County. Such inspection may be made at the place of manufacture or at the site after delivery, or at both places, and the sections shall be subject to rejection at any time due to failure to meet any of the specification requirements; even though sample sections may have been acceptable as satisfactory at the place of manufacture. Sections rejected after delivery to the job shall be marked for identification and shall be removed from the job at once. All damaged sections will be rejected. If damaged sections have already been installed; they shall be acceptably repaired if authorized by the County, or removed and replaced at the Contractor's expense.
- B. At the time of inspection, the sections will be carefully examined for compliance with the ASTM designation specified and the acceptable manufacturer's drawings. All sections shall be inspected for general appearance, dimension, "scratch strength", blisters, cracks, roughness, and soundness. The surface shall be dense and close textured.
- C. Imperfections may be repaired subject to the review and acceptance of the County after demonstration by the manufacturer that strong and permanent repairs result. Repairs shall be carefully inspected before final review and acceptance. Cement mortar used for repairs shall have a minimum compressive strength of 4,000-psi at the end of 7-days and 5,000-psi at the end of 28-days, when tested in 3-inch by 6-inch cylinders stored in the standard manner. Epoxy mortar may be utilized for repairs subject to the review and acceptance of the County.

## PART 2 - PRODUCTS

### 2.01 GENERAL

- A. All material supplied shall be one of the products specified in Appendix D "List of Approved Products" appended to these technical specifications.

### 2.02 PRECAST CONCRETE SECTIONS

- A. Precast concrete wetwell sections, manhole barrel and eccentric top sections shall conform to specifications for precast reinforced concrete manhole sections, ASTM Designation C478, except as otherwise specified below or as shown on the Drawings. Details of precast sections shown on the Drawings, including thickness and reinforcing, shall supersede ASTM C-478 when such details are more stringent than ASTM C-478. The method of construction shall conform to the detailed Drawings appended to these specifications and the following additional requirements:
  - 1. The minimum wall thickness for the various size barrel sections shall be 5-inches, or as indicated in the Drawings.
  - 2. Barrel sections shall have tongue and groove joints. Joints shall be sealed with cold adhesive preformed plastic gaskets set in double rows on the tongue and in the groove prior to setting the next section. Gaskets shall be K.T. Snyder "Ram-Nek", Conseal "CS-102" or acceptable equal. All extension joints shall be sealed with Portland Type II cement after setting of gasket and placement of manhole section into a watertight joint.

3. Type II cement shall be used except as otherwise accepted.
4. New concrete structures shall contain a crystalline waterproofing concrete admix for all new concrete structures including but not limited to manholes, ARV vaults, wetwells, and wetwell top slabs. Crystalline waterproofing concrete admix shall be added to the concrete during the batching operation. Admixture concentration shall be added based upon manufacturer's design percent concentration of admixture to the required weight of cement. The amount of cement shall remain the same and not be reduced. A colorant shall be added to verify the admixture was added to the concrete. Colorant shall be added and provided at the admixture manufacturing facility, not at the concrete batch plant. It is recommended that the admixture be added first to the rock and sand and blended thoroughly before adding cement and water or per the manufacturer's recommendations. Concrete structures without crystalline waterproofing admixture or admixture without colorant for field verification shall be rejected. Contractor shall provide certification from the pre-caster that the admixture was added in accordance with the manufacturer's recommendations. Concrete admixture shall be manufactured and supplied by an approved manufacturer as shown in Appendix D "List of Approved Products."
5. The date of manufacture and the name or trademark of the manufacturer shall be clearly marked on the inside of each precast section. Each section must be inspected and stamped by an accredited testing laboratory.
6. Sections shall be cured by an acceptable method for at least 28-days.
7. Manhole top sections shall be eccentric except that precast concrete slabs shall be used where cover over the top of the pipe is less than 4-feet for all manholes. Lift rings or non-penetrating lift holes shall be provided for handling precast manhole sections. Non-penetrating lift holes shall be filled with non-shrink grout after installation of the manhole sections.
8. Precast concrete slabs over top section, where required, shall be capable of supporting the overburden plus a live load equivalent to ASHTO H 20 loading.
9. The tops of bases shall be suitably shaped to mate with the adjoining precast section.
10. Precast leveling rings for setting cast iron frames over manholes shall be 2-inch thick and have 1 (one) Number 2 continuous reinforcing steel bar.
11. Concrete surfaces shall have form oil, curing compounds, dust, dirt, and other interfering materials removed by brush sand blasting and shall be fully cured prior to delivery.
12. Interior surfaces of manholes, wetwells and valve vaults shall be lined in accordance with Appendix D "List of Approved Products."
13. Manholes to be installed around existing gravity sewers shall consist of a cast-in-place concrete base slab and precast concrete barrel and top sections; lined per Section 3410 – 2.01.11. The base slab shall be as shown on the Drawings and include a joint which is compatible with the bottom barrel section and acceptable to the County. The bottom barrel section shall include an inverted "U-shaped" slot to allow installation of the section over existing pipes. Flow channels shall be provided within the manholes as shown on the Drawings. Annular space between the existing pipe and slot shall be made watertight with non-shrink grout. Existing pipes shall be removed within the manhole and outlets plugged watertight with non-shrink grout as shown on the Drawings.

14. The manholes shall have an invert channel shaped to correspond with the lower half of the pipe. The top of the shelf shall be at the elevation indicated and shall be sloped to drain toward the flowing through channel. Every effort shall be made by the Contractor to construct watertight structures.

## **PART 3 - EXECUTION**

### **3.01 INSTALLATION**

- A. All manholes and other precast structures shall be set in the dry.
- B. Manholes and other precast structures shall be constructed to the dimensions as shown on the Drawings and as specified herein.
- C. The base structure may be cast-in-place concrete as specified in Division 3. The concrete structure shall be placed on the required crushed stone base as shown in the Drawings over a dry sub base of structural fill that has been compacted to 95% (percent) of the maximum dry density as determined by the modified proctor test, ASTM D1557. The tops of the cast in place bases shall be shaped to mate with the precast barrel section and shall be adjusted in grade so that the top of the dome section is at the correct elevation.
- D. Precast bases conforming to all requirements of ASTM C478 and other requirements for precast sections may be used and shall be set on a sub base as described above.
- E. Precast concrete structure sections shall be set vertically with sections in true alignment with a 1/4-inch maximum tolerance per 5-feet of depth. The outside and inside joint shall be filled with a non-shrink mortar and finished flush with the adjoining surfaces. Allow joints to set for 24-hours before backfilling. Backfilling shall be accomplished bringing the fill up evenly on all sides. If leaks appear in the structures, the inside joints shall be caulked with non-shrink grout to the satisfaction of the County. The Contractor shall install the precast sections in a manner that will result in a watertight joint.
- F. Lift rings or non-penetrating lift holes shall be provided for handling pre-cast manhole sections. Non-penetrating lift holes shall be filled with non-shrink grout after installation.
- G. Where holes must be cut in the precast sections to accommodate pipes, cutting shall be done prior to setting them in place to prevent any subsequent jarring which may loosen the mortar joints.
- H. Cast iron frames shall be placed over precast concrete leveling rings, shimmed and set in cement mortar to the required grade. No more than 3 courses of leveling rings shall be used.

END OF SECTION

## **SECTION 03600**

### **GROUTING**

#### **PART 1 - GENERAL**

##### **1.01 DESCRIPTION**

- A. Scope of Work: This Section specifies the grouting of the annular space between the host pipe and the new liner and the grouting of the space left void in the abandonment of the existing pipelines and structures. The Work consists of furnishing all labor, equipment and materials, and performing all Work connected with the placement of the cementaceous grout to fill the void.

##### **1.02 QUALITY ASSURANCE**

- A. Grouting shall be performed by a crew under the direct supervision of a superintendent that has experience in grouting of this nature.
- B. Storage, mixing, handling and placement shall be in accordance with manufacturer's instructions and specifications.

##### **1.03 SHOP DRAWINGS AND SUBMITTALS**

- A. Submittals shall be submitted to the County for review and acceptance prior to construction in accordance with the General Conditions and specifications Section 01300 "Submittals."
- B. In addition, the following shall be submitted to the County for review and acceptance prior to construction.
  - 1. A detailed description of equipment and operational procedures to accomplish the grouting operation.
  - 2. Grout mixture design data, grout mixer type, grout samples, and test data.
  - 3. A detailed description of the grouting time schedule.

#### **PART 2 - PRODUCTS**

##### **2.01 GENERAL**

- A. All material supplied shall be one of the products specified in Appendix D "List of Approved Products" appended to these technical specifications.

## 2.02 GROUT MATERIAL

- A. The grout shall be a "flowable fill" consisting of a mixture of Type 1 Portland Cement, Type "F" Flyash (ASTM 618), sand and water.

The following is a suggested trial grout mixture for a 1-cubic yard yield:

Cement: 500-pounds  
Fly Ash: 500-pounds  
Water: 350-pounds (42-gallons)  
Sand: 2,248-pounds  
Darex (W.R. Grace): 3-ounces (Air Entrainment Additive or equivalent)

The actual grout mixture to be used shall meet the minimum requirements specified below.

- B. The mixture shall contain a minimum of 500-pounds cement and minimum of 400-pounds flyash per cubic yard of grout.
- C. Samples of the grout mixture when set aside in a standard concrete test mold shall show less than 1% of the mixture height of free water on the surface after standing not less than 12-hours.
- D. One (1) set of 3 (three) 3-inch by 6-inch sample test cubes shall be made for each mix preparation. The minimum 28-day strength shall be no less than 1,000-psi. The minimum required slump is 5-inches. The maximum allowable slump is 9-inches. Slump should be as low as practical to maintain viscosity, proper flow, and still retain the ability to pump.

## 2.03 EQUIPMENT

- A. All grout shall be mixed with a high shear, high-energy colloidal type mixer to achieve the best uniform density.
- B. The grout shall be pumped with a non-pulsating centrifugal or tri-plex pump.
- C. The mixer shall be capable of continuous mixing. Batch mixing shall not be permitted.

## PART 3 - EXECUTION

### 3.01 GROUTING OF ABANDONED PIPE

- A. Where utility pipes are to remain in place (inactive) they shall be filled with a sand/cement grout as specified herein.
- B. The grouting program shall consist of pumping sand-cement grout with suitable chemical additives at pressures necessary to fill the pipe sections in order to prevent the potential for future collapse.



- C. Grouting of pipes shall be in sections not exceeding 300 linear feet.
- D. Grout shall be placed in a maximum of 3 stages, with the initial stage volume equal to or greater than 50% of the total volume for that section of pipe being grouted. The maximum time wait between grouting stages shall be 24-hours.
- E. For each stage, mix and pump the material in one continuous process so as to avoid partial setting of some grout material during that stage; thus, eliminating voids and possible subsequent surface damage due to cave-ins.
- F. Each section shall be grouted by injecting grout from the lowest point and allowing it to flow toward the highest point to displace water from the annulus and assure complete void-free coverage. Grout shall be placed through tubes installed in the bulkheads at the insertion pits or manholes. Grout tubes shall be at least 2-inch nominal diameter.
- G. After the ends of each section of pipe are exposed, the entire space, not to exceed 300 linear feet end to end, shall be sealed by controlled pumping of grout until it flows from the pipe at the opposite end of the grouting. Grouting shall be carried out until the entire space is filled. The ends of these sections shall be capped and/or plugged.
- H. Grout pressure in the void space is not to exceed 5-psi above maximum hydrostatic groundwater level. An open ended, highpoint tap or equivalent vent must be provided and monitored at the bulkhead opposite to the bulkhead through which grout is injected. This bulkhead will be blocked closed as grout escapes to allow the pressuring of the annular space.

### 3.02 FIELD QUALITY CONTROL

- A. The quality of the grout, application of the equipment, and installation techniques are the responsibility of the Contractor. The review and acceptance or approval of specific mix design, equipment, or installation procedures shall in no way relieve the Contractor of his obligation to provide the final product as specified herein.
- B. The County may stop the grouting operations at any time if the operation does not comply with these Specifications.

END OF SECTION

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## **SECTION 04050**

### **MASONRY**

#### **PART 1 - GENERAL**

##### **1.01 DESCRIPTION**

- A. Scope of Work: This section specifies the labor, materials, equipment, and incidentals required to construct all masonry work as shown on the Drawings and specified herein.
- B. The work under this Section includes, but is not necessarily limited to, the following:
  - 1. Split-face concrete masonry units (CMU)
  - 2. Reinforced CMU block and lintels
  - 3. Masonry reinforcing, ties, and anchors
  - 4. Grouting for masonry work

##### **1.02 QUALITY ASSURANCE**

- A. Prior to construction of any masonry buildings, sample wall sections shall be constructed in location(s) approved by the County, to establish a standard of quality for masonry construction for the entire Project. A sample wall section shall be constructed for each type of concrete masonry units (standard, split-face, etc.) to be used on the Project. Include 1 complete exterior and interior control joint to be caulked. Each sample wall section shall have a minimum of 50-square feet of wall face and shall be at least 6 block courses high and 12.67-feet long. For multi-colored, split-face CMU sample walls, at least 3-courses shall be constructed for each color of split-face CMU to be used on the Project. The sample wall(s) will be inspected and approved by the County and shall be maintained by the Contractor throughout the length of the project for use as the "standard of quality" for comparative purposes with masonry walls constructed on the Project. Sample wall section(s) shall be removed by the Contractor upon substantial completion of the Project.

##### **1.03 SHOP DRAWINGS AND SUBMITTALS**

- A. Submittals shall be submitted to the County for review and acceptance prior to construction in accordance with the General Conditions and specifications Section 01300 "Submittals."
- B. Submit manufacturer's certifications that all masonry units meet or exceed all specified standards.
- C. Product data for split-face CMU types indicating composition, shape, surfaces, and dimensions.

- D. Submit 3-color samples for integral colored split-face concrete masonry units and colored mortar mixers.
- E. Submit catalog data for metal ties and anchors, joint reinforcement, and control joint material.
- F. Samples of split-face CMU illustrating face profile, color range, surface, and texture.
- G. Installation instructions.

#### 1.04 PROTECTION OF MATERIALS

- A. All perishable materials for the work of this Section shall be delivered, stored, and handled so as to preclude damage of any nature. Manufactured materials, such as cement and lime, shall be delivered and stored in their original containers, plainly marked with identification of material and maker. Materials in broken containers or in packages showing water marks or other evidence of damage shall not be used and shall be removed from the site.
- B. All masonry shall be shipped stacked with hay or straw protection or other suitable protective device and shall be similarly stacked off the ground on the site. Any masonry damaged or chipped during shipment, storage, or installation shall be rejected and removed from the site. In addition, all masonry stored on the site shall be protected from the weather and staining with the use of tarpaulins or other covering accepted by the County.

#### 1.05 COLD WEATHER CONSTRUCTION

- A. Masonry construction in cold weather shall conform to the applicable requirements of "Construction and Protection Recommendations for Cold Weather Masonry Construction" Section 2.3.2.2, Specifications for Masonry Structures ACI 530.1 of the Technical Notes on Brick and Tile Construction by the Brick Institute of America.

#### 1.06 HOT WEATHER CONSTRUCTION

- A. Masonry construction in hot weather shall conform to the applicable requirements of hot weather construction, Section 2.3.2.3, Specifications for Masonry Structures ACI 530.1.

### **PART 2 - PRODUCTS**

#### 2.01 GENERAL

- A. All material supplied shall be one of the products specified in Appendix D "List of Approved Products" appended to these technical specifications.

## 2.02 MATERIALS

### A. MASONRY

1. Split-face concrete masonry units
  - a. Standard and lightweight CMU shall conform to ASTM C90, Grade N, Type I, as shown on the Drawings.
  - b. CMU shall be free from substances that will cause staining or pop-outs and shall be fine, even textured with straight and true edges. All units shall have been wet steam cured for at least 18-hours and then air cured in covered storage for not less than 28-days before delivery. Units shall have a maximum linear drying shrinkage of 0.25% (percent) (ASTM C426) and have a moisture content at time of delivery not exceeding 30% (percent) of total absorption.
  - c. Split-face CMU's for interior and exterior walls where indicated on the Drawings, shall be as manufactured by DeMaco Corporation, Rockblock, Inc., or approved equal. Units shall have 8-inch by 16-inch nominal face size. Matching end and corner units shall be selected from samples provided by the block manufacturer. Split-face units shall be high strength units having a minimum compressive strength of 3,000-psi for any 1-unit, and an average compressive strength of 3,500-psi for an average of 3-units. Minimum acceptable water absorption rate shall be 6% of the oven dry weight of the masonry unit in pounds per cubic feet. Split-face CMU's shall be factory prefinished with an integral coloring agent that is added during the mixing process. The coloring agent used for this project shall be from the same lot and batch numbers. The color for the split-face CMU's shall be selected by the County from the CMU manufacturer's standard color samples.
  - d. CMU noted as fire rated on the Drawings shall conform to Underwriters Laboratories, Inc. Standard for Concrete Masonry Units UL618, and shall have a 2-hour fire resistant rating.
  - e. All split rib CMU shall have a height minimum of 7-1/2-inch equally spaced 3/4-inch deep by 3/4-inch wide bevels. The projected face shall have a rough texture.
  - f. Units shall be obtained from 1 manufacturer to ensure even color and texture.
  - g. Provide special units required by the Drawings including solid, corner, pilaster, lintels, and jamb units.
  - h. Split-face CMU units shall be Dillon Company, Swords Creek, Virginia or DeMaco Concrete Products, Sarasota, Florida or equal. Equivalent design patterns are subject to the approval of the County.
2. Concrete Masonry Units
  - a. CMU's for structures shall conform to ASTM C90, Grade N, Type II normal weight units with minimum compressive strength of 3,000-psi.
  - b. Vertical Reinforcing: Provide as shown on the Drawings.

## B. REINFORCING, TIES, ANCHORS, AND MISCELLANEOUS MATERIALS

1. Reinforcement shall be welded wire units prefabricated in straight lengths of not less than 10-feet with matching corner and tee units fabricated from cold drawn steel wire complying to ASTM A82, with deformed continuous side rods and plain cross-rods, crimped for cavity wall construction, if required, and a unit width of 1-1/2-inches to 2-inches less than thickness of wall or partition. Reinforcement for decorative masonry block shall be 2-inches wide. Reinforcement shall be placed at every other course (16-inches on center) unless otherwise noted on Drawings.
2. Reinforcing Steel: ASTM Designation A615, Grade 60, unless otherwise specified. Single width reinforcement shall be ladder or truss type, fabricated with a single pair of galvanized 9-gauge side rods and continuous 9-gauge cross-rods spaced not more than 16-inches on center
3. Galvanized dovetailed anchor slots shall be Heavy Filled, Catalog Number 8334 by Vulcan Metal Products, Inc. or equal, and shall be 5-inches long, 16-gauge galvanized.
4. Dovetail anchors shall be placed at 16-inches on center for anchorage to concrete framework or walls.
5. Corrugated non-ferrous 16-gauge metal ties manufactured for use with the anchor slots provided shall be spaced at a maximum of 8-inches on center vertically and 16-inches on center horizontally.
6. The Contractor shall provide and install miscellaneous anchors and attachment members required both for the anchorage of his own work and that of other trades requiring attachment to masonry, which are not specifically provided under separate sections.
7. Control joints shall be factory extruded preformed styrene-butadiene-rubber compound, conforming to ASTM D2000 2AA805 and shall be as manufactured by Dur-O-Wal, Hohmann and Bernard, Inc., AA Wire Products or equal. Control joints shall be installed as shown on the Drawings.
8. Weep holes shall be 1/4-inch outside diameter by 4-inches long, clear plastic tubing that will not strain brickwork, by Hohmann and Bernard, Inc., or equal.
9. Cleaning compound shall be mild, non-caustic detergent solution such as 801 Super Real Clean by Superior Manufacturing Co., or 600 Sureclean by Process Solvent Co., Inc., or equal.

## C. MORTAR AND GROUT MATERIALS

1. Portland Cement shall conform to ASTM C150 Type II requiring only sand and water for mixing. Masonry cements may be used for colored mortar when specifically accepted.
2. Lime for masonry mortar shall be hydrated, conforming to ASTM C207, Type S.
3. Sand shall be clean, durable particles, free from detrimental amounts of organic matter. The sand shall conform to the limits of ASTM C14. Sand for grout shall conform to ASTM C144 or C33 as required.
4. Water shall be potable, free from detrimental amounts of oils, acids, alkalis, or organic mater, and shall be clean and fresh.

5. Premix Mortar shall conform to ASTM C270, Type S. Mortar proportions shall conform to ASTM C270, Type S, or as otherwise accepted by the County. Ingredients shall be accurately measured by volume in boxes especially constructed for the purpose by the Contractor. Measurement by shovel will not be allowed.
6. Masonry cements used for integral colored CMU's shall be specifically approved for colored mortar. Colored mortar mixers shall be factory premixed with color pigments and Portland cement, requiring only sand and water for mixing. Colored mortar for the project shall be from the same factory lot and batch numbers. Color of the mortar mix shall be selected by the County from the mortar manufacturer's standard color samples.
7. Water repellent admixture added to mortar shall match water repellent used in manufacture of split-face CMU.
8. Strength of mortars shall exceed 1,800-pounds per square inch, when tested with 2-inch cubes at the end of a 28-day aging period.
9. Grout for setting bearing plates, machinery, or any other non-masonry use shall be as specified in Section 03600 "Grouting."
10. Grout
  - a. Portland cement shall conform to ASTM C150, Type I.
  - b. Aggregates shall conform to ASTM C144.
  - c. Grout for constructing CMU lintel blocks and for grouting cores to receive embedded anchors or reinforcing shall conform to ASTM C476, fine or coarse grout. Strength shall be 2,500-psi minimum at 28-days. Grout will have a slump of 10-inches, plus or minus 1-inch, at time of placement.
  - d. Concrete grout for filling structural CMU cells shall use 3/8-inch pea rock mix with a minimum compressive strength of 3,000-psi.

## **PART 3 - EXECUTION**

### **3.01 INSTALLATION, GENERAL**

- A. Provide formwork and shores as required for temporary support of reinforced masonry elements. Design, erection, support, bracing, and maintenance of formwork are the Contractor's responsibility.
- B. Construct formwork to conform to shape, line, and dimensions shown and sufficiently tight to prevent leakage of mortar grout or concrete.
- C. Do not remove forms and shoring until reinforced masonry member has hardened sufficiently to carry its own weight and all other reasonable temporary loads that may be placed on it during construction. Do not remove forms and shoring supporting the weight of concrete in beams, slabs, and other members until concrete has attained its specified 28-day compressive strength.

### 3.02 MORTAR

- A. Mortar shall be machine mixed in an approved type of mixer in which the quantity of water can be accurately and uniformly controlled. The mixing time shall not be less than 5-minutes, approximately 2-minutes of which shall be for mixing the dry materials and not less than 3-minutes for continuing the mixing after the water has been added. Where hydrated lime is used for mortar requiring lime content, the Contractor will have the option of using the dry-mix method or first converting the hydrated lime into putty.
- B. Where the dry-mix method is employed, the materials for each batch shall be well turned over together until the even color of the mixed, dry materials indicates that the cementaceous material has been distributed throughout the mass, after which the water shall be gradually added until a thoroughly mixed mortar of the required plasticity is obtained.
- C. Mortar that has begun to set shall not be used.

### 3.03 MASONRY INSTALLATION

- A. Masonry shall not be laid at temperatures below 40°F, without the approval of the County, and all work shall be done in such a manner as to insure the proper and normal hardening of all mortar. All masonry work shall be so protected and heated that the temperature at the surface will not fall below 50°F for a period of 72-hours after placing. Any completed work found to be affected by cold weather shall be taken down and rebuilt by the Contractor at his expense.
- B. All CMU shall be laid in a full bed of mortar, applied to shells only. Butter the vertical joint of unit already set in the wall and all contact faces of the unit to be set. Each unit shall be placed and shoved against the unit previously laid so as to produce a well compacted vertical mortar joint for the full shell thickness. Units shall be set with all cells in a vertical position. The moisture content of the units when laid shall not exceed 35% (percent) of the total absorption as determined by laboratory test. Split-face CMU's shall be laid with the horizontal stringline control to the inside face of block in a full bed of mortar on all 4 sides.
- C. Masonry units shall be laid in a running bond unless otherwise shown.
- D. Sizes shall be as specified and called for on the Drawings and where "Soaps" and "Splits" are used, the space between these members and the backup material shall be slushed full of mortar.
- E. Masonry joints which are exposed to view shall be tooled in accordance with the following:
  - 1. Wait until unit mortar is thumbprint hard before tooling joint.
  - 2. Both vertical and horizontal joint spacing shall be uniform.
  - 3. Joints for CMU shall be 3/8-inch.
  - 4. Joints for structural block shall be 1/4-inch.
  - 5. Joints shall be tooled slightly concave.



6. Joints for standard CMU shall be rubbed with a sponge to provide a flush, neat, rubbed joint.
  7. Exterior joints for split-face CMU shall be rubbed with a sponge, paddle, or Styrofoam tool to cause the joint to blend with the masonry unit's exterior split-face. Interior face joints of split-face CMU shall match standard CMU joints.
- F. Install all frames required to be set in masonry. Set masonry tightly against frames, build in and mortar in all frame anchors and fill frames solid with mortar.
  - G. Control joints shall be installed at the intersection of masonry walls with structural concrete members and elsewhere as detailed on the Drawings. Joints shall be raked out to a depth of 3/4-inch for the full height or full width of the wall suitable for caulking. The maximum length, horizontally, between vertical control joints shall be 40-feet, but joints shall be located only as directed or shown. Joints shall be equal in width to the standard mortar joint.
  - H. All masonry slots, chases, or openings required for the proper installation of the work of other sections shall be constructed as indicated on the Drawings or in accordance with information furnished before the work is started at the points affected. No chase shall be cut into any wall constructed of hollow units after it is built, except as directed by the County.
  - I. Field cut split-face CMU with power tools to provide straight true edge and avoid damage to split-face. Do not install chipped or broken units.
  - J. Exercise care that wet mortar is not splashed onto split-face during installation. Excess or splashed mortar shall be cleaned from face with a burlap wipe.
  - K. During grouting, placement of foamed-in-place insulation, and application of sealants, ensures that materials are not smeared onto split-faces of CMU. Remove smeared materials as recommended by manufacturer.
  - L. Surfaces shall be brushed as work progresses and maintained as clean as practical. Unfinished work shall be raked back where possible, and toothed only where absolutely necessary. Before leaving fresh or unfinished work, walls shall be fully covered and protected against rain and wind, and before continuing work, previously laid surfaces shall be swept clean. The tops of walls or other unfinished work shall be protected against all damage by frost or the elements by means of waterproof paper, tarpaulins, boards, or other means reviewed by the County.
  - M. The Contractor shall build in all miscellaneous items to be set in masonry for which placement is not specifically provided under separate Divisions, including reglets, lintels, ties, electrical panel boxes, sleeves, vents, grilles, anchors, grounds and exterior electrical conduits, and fixtures, and shall cooperate with other trades whose work is to be coordinated with the work under this Section.

- N. All anchorage, attachment, and bonding devices shall be set so as to prevent slippage and shall be completely covered with mortar or grout.
- O. All ties and reinforcing for masonry shall be furnished and installed by the Contractor.
- P. Loose lintels shall be set in a full bed of mortar and supported by solid or mortar filled hollow concrete blocks as detailed on the Drawings.
- Q. Bed and grout all items coming in contact with masonry where grouting is required, including door bucks and frames set in masonry. The Contractor shall install all anchor bolts, base plates, and seats in masonry walls, and build in all items required for the completion of the building as they apply to masonry.

### 3.04 REINFORCED CONCRETE UNIT MASONRY INSTALLATION

#### A. General

- 1. Do not wet CMU's.
- 2. Place CMU with full-face shell mortar beds. Fill vertical head joints (end joints between units) solidly with mortar from face of unit to a distance behind face equal to not less than the thickness of longitudinal face shells. Solidly bed cross-webs of starting courses in mortar. Maintain head and bed joint widths as shown, or if not shown, provide 3/8-inch joints.
- 3. Where solid CMU units are shown, lay units with full mortar head and bed joints.

#### B. Walls

- 1. Pattern Bond: Lay CMU wall units as specified in Section 04050 "Masonry." Bond and interlock each course at corners and intersections and use special-shaped units where shown, and as required for corners, jambs, sash, control joints, lintels, bond beams, and other special conditions.
- 2. Maintain vertical continuity of core or cell cavities, which are to be reinforced and grouted, to provide minimum clearance and grout coverage for vertical reinforcement bars. Keep cavities free of mortar. Solidly bed webs in mortar where adjacent to reinforced cores or cells.
- 3. Where horizontal reinforced beams (bond beams) are shown, use special units or modify regular units to allow for placement of continuous horizontal reinforcement bars. Place small mesh expanded metal lath or wire screening in mortar joints under bond beam courses over cores or cells of non-reinforced vertical cells, or provide units with solid bottoms.
- 4. Option: Where all vertical cores are not shown to be grouted, Contractor may elect to fill all vertical cores with grout, in which case, requirements for mortar bedding of cross-webs and closing of core spaces below bond beams will not apply.

#### C. Columns, Piers, and Pilasters:

- 1. Use CMU of the size, shape, and number of vertical core spaces shown. If not shown, provide units which provide minimum clearances and grout coverage for number and size of vertical reinforcement bars shown.

2. Provide pattern bond as shown, or if not shown, provide alternate head joints in vertical alignment.
3. Where bonded pilaster construction is shown, construct wall and pilaster units together to the maximum pour height specified.

#### D. Grouting

1. Use fine grout for filling spaces less than 4-inches in both horizontal directions.
2. Use course grout for filling 4-inch spaces or larger in both horizontal directions.
3. Grouting Technique: At the Contractor's option, use either low-lift or high-lift grouting techniques subject to the requirements which follow.

#### E. Low-Lift Grouting:

1. Provide a minimum clear dimension of 2-inches and clear area of 8-square inches in vertical cores to be grouted.
2. Place vertical reinforcement prior to laying of CMU. Extend vertical reinforcement above elevation of maximum pour height as required to allow for splicing and support it in position at vertical intervals exceeding neither 192-bar diameters nor 10-feet. Lay CMU to maximum pour height. Limit pour height to 5-feet. If bond beam occurs below the 5-foot height stop, pour at course below bond beam.
3. Preparation of Grout Spaces: Prior to grouting, inspect and clean out the grout spaces. Remove dust, dirt, mortar droppings, loose pieces of masonry, and other foreign materials from grout spaces. Clean reinforcement and adjust to proper position. Clean top surface of structural members supporting masonry to ensure bond.
4. Pour grout using container with spout or by chute. Rod or vibrate during placing. Place grout continuously. Do not interrupt pouring of grout for more than 1-hour. Terminate grout pours 1-1/2- inches below top course of pour.
5. Bond Beams: Terminate grout in vertical cells 1-1/2-inches below bond beam course. Place horizontal reinforcement in bond beams with corners and intersections lapped as shown. Place grout in bond beam course before filling vertical cores above bond beam.

#### F. High-Lift Grouting

1. Do not use high-lift grouting technique for grouting of CMU unless minimum cavity dimension and area is 3-inches and 10-square inches, respectively.
2. Provide cleanout holes in first course at all vertical cells which are to be filled with grout. Use units with 1 shell removed and provide temporary supports for units above, or use header units with concrete brick supports, or cut openings in 1 face shell.
3. Construct masonry to full height of maximum grout pour specified, prior to placing grout.
4. Limit grout lifts to a maximum height of 5-feet and grout pour to a maximum height of 24-feet, for single wythe hollow concrete masonry walls, unless otherwise indicated.
5. Place vertical reinforcement before grouting. Tie vertical reinforcement to dowels at base of masonry where shown and thread CMU over or around reinforcement. Support vertical reinforcement at intervals exceeding neither 192 bar diameters nor 10-feet.

6. Where reinforcement is prefabricated into cage units before placing, fabricate the units with vertical reinforcement bars and lateral ties of the size and spacing shown.
7. Place horizontal beam reinforcement as the masonry units are laid.
8. Embed lateral tie reinforcement in mortar joints where shown as masonry units are laid.
9. Where lateral ties are shown in contact with vertical reinforcement bars, embed additional lateral tie reinforcement in mortar joints. Place as shown, or if not shown, provide as required to prevent grout blowout or rupture of CMU face shells, but provide not less than No. 2 bars or 8-gauge wire ties spaced 16-inches on center for members with 20-inches or less side dimensions, and 8-inches on center for members with side dimensions exceeding 20-inches.
10. Preparation of Grout Spaces: Prior to grouting, inspect and clean out the grout spaces. Remove dust, dirt, mortar droppings, loose pieces of masonry and other foreign materials from grout spaces. Clean reinforcement and adjust to proper position. Clean top surface of structural members supporting masonry to ensure bond. After final cleaning and inspection, close cleanout holes and brace closures to resist grout pressures.
11. Do not place grout until entire height of masonry to be grouted has attained sufficient strength to resist displacement of masonry units and breaking of mortar bond. Install shores and bracing, if required, before starting grouting operations.
12. Place grout by pumping into grout spaces unless alternate methods are acceptable to the County.
13. Limit grout pours to sections which can be completed in 1 working day with not more than 1-hour interruption of pouring operation. Place grout in lifts which do not exceed 5-feet. Allow neither less than 30-minutes nor more than 1-hour between lifts of a given pour. Rod or vibrate each grout lift during pouring operation.
14. Place grout in lintels or beams over openings in 1 continuous pour.
15. Where bond beam occurs more than 1 course below top of pour, fill bond beam course to within 1-inch of vertically reinforced cavities during construction of masonry.
16. When more than 1 pour is required to complete a given section of masonry, extend reinforcement beyond masonry as required for splicing. Pour grout to within 1-1/2-inches of top course of first pour. After grouted masonry is cured, lay masonry units and place reinforcement for second pour section before grouting. Repeat sequence if additional pours are required.

### 3.05 REINFORCED MASONRY

- A. Provide vertical reinforcing in filled cores of masonry units of size, spacing, and locations as indicated on the Drawings and specified herein.
- B. All cores containing reinforcing shall be filled, full height, with concrete conforming to these Specifications, except that maximum slump may be 6-inches and course aggregate shall consist of a 3/8-inch maximum size and conform to a #89 gradation (ASTM C33). Provide clean-out openings at the bottom of each cell for removing mortar droppings. Do not block openings until they have been reviewed by the County.

- C. Cores shall be filled in lifts not to exceed 4-feet. Vertical reinforcing shall be continuous through the full height of the wall. This may be accomplished by lapping bars with a full class "C" splice.
- D. Grout for filled cells shall be tested.

### 3.06 PLACING REINFORCEMENT

- A. Clean reinforcement of loose rust, mill scale, earth, or other materials which will reduce bond to mortar or grout. Do not use reinforcement bars with kinks or bends not shown on Drawings or final Shop Drawings. Bars with reduced cross-section due to excessive rusting or other causes shall not be used.
- B. Place reinforcement accurately at the spacing shown. Support and secure vertical bars against displacement. Horizontal reinforcement may be placed as the masonry work progresses. Where vertical bars are shown in close proximity, provide a clear distance between bars of not less than the nominal bar diameter or 1-inch, whichever is greater.
- C. For columns, piers, and pilasters, provide a clear distance between vertical bars as shown, but not less than 1-1/2-times the nominal bar diameter or 1-1/2-inches, whichever is greater. Provide lateral ties as shown.
- D. Splice reinforcement bars only as shown. Do not splice at other points unless approved by the County. Provide lapped splices unless otherwise shown. In splicing vertical bars or attaching to dowels, tie splices with wire.
- E. Provide not less than the minimum lap shown or if not shown, as required by governing code.
- F. Embed metal ties in mortar joints as work progresses, with a minimum mortar cover of 5/8-inch on exterior face of walls and 1/2-inch at other locations.
- G. Anchor reinforced masonry work to supporting structure as indicated.

### 3.07 PROTECTION

- A. During erection: Cover top of walls with waterproof sheeting at end of day. Cover partially completed walls when work is not in progress. Extend 24-inches minimum down both sides and hold securely in place.
- B. Protect face of walls, sills, and other projections from roof run-off, water, mud, grout, and mortar.
- C. Spread sand or straw at base of walls to minimize dirt and clay splashed.
- D. Without damaging completed work, provide protective boards at exposed external corners, which may be damaged by construction activities.

E. Clean installed block at the end of each work day.

### 3.08 CLEANING

- A. All holes in exposed masonry shall be pointed, and defective joints shall be cut out and re-pointed with mortar of same color as that of the original and adjoining work.
- B. Exposed masonry shall be protected against staining by wall coverings, and excess mortar shall be wiped off the surface as the work progresses.
- C. All masonry shall be cleaned with approved detergent solution in accordance with manufacturer's printed directions. No acid or metal scrapers shall be used on masonry.
- D. Before applying any cleaning agent to the entire wall, it shall be applied to a sample wall area of approximately 20-square feet in a location reviewed by the County. No further cleaning work may proceed until the sample area has been reviewed by the County, after which time the same cleaning materials and method shall be used on the remaining wall area.
- E. After cleaning, treat exposed split-face CMU surfaces and mortar joint sealer applied in accordance with manufacturer's instructions. Verify surfaces are clean and thoroughly dry prior to application.

END OF SECTION

**SECTION 09901**  
**COATINGS AND LININGS**

**PART 1 - GENERAL**

**1.01 SCOPE OF WORK**

- A. This specification pertains to the specialty coating and lining of manholes and lift station wet wells and valve vaults. As well as the coating of above ground assets including but not limited to: steel, ductile iron pipe, ductile iron fittings, valves, hydrants, hardware and all appurtenances. Brass, bronze and 316 Stainless Steel shall not be coated.
- B. Precast concrete rehabilitation and new structures: The Work shall include the furnishing and installation of an interior protective lining/coating corrosion protection system including all necessary materials, equipment and tools as required for a complete installation in accordance with the manufacturers recommendations. The completed system shall provide a waterproof, corrosion protection system to prevent any deterioration of concrete surfaces from hydrogen sulfide and other corrosive gases/acids produced by wastewater and to prevent infiltration. To ensure total unit responsibility, all materials and installation thereof shall be furnished by, and coordinated with, 1 supplier/manufacturer.

**1.02 QUALITY ASSURANCE**

- A. All work shall be proved to be in first class condition and constructed in accordance with the Drawings and specifications. All defects disclosed by tests and inspections shall be remedied immediately by the Contractor at no expense to the County.
- B. Fiberglass liner manufacturers shall certify that the liner has been manufactured, sampled, tested, and inspected in accordance with ASTM D 3753.
- C. Polyethylene liner manufacturers shall certify that the liner has been designed and manufactured in accordance with ASTM F 1759 and these specifications.
- D. Holiday Testing: Each coat shall be holiday tested at the recommended 100-125 volts DC per mil in accordance with the latest edition of the following standards: NACE SP0188-2006, NACE Standard RP0490, ASTM G62

**1.03 SHOP DRAWINGS AND SUBMITTALS**

- A. Submittals shall be submitted to the County for review and acceptance prior to construction in accordance with the General Conditions and specifications Section 01300 "Submittals."

## 1.04 COVERAGE

- A. The protective lining/coating corrosion protection shall cover all concrete surfaces within the wetwell or manhole including the adjustment ring area.
- B. Coatings and lining surfaces shall be holiday free and all defects shall be repaired in accordance with the manufacturer's recommendations prior to the next coat being applied.

## 1.05 REFERENCE STANDARDS

- A. American Society for Testing and Materials (ASTM)
  - 1. ASTM C1244: Standard Test Method for Concrete Sewer Manholes by the Negative Air Pressure (Vacuum) Test Prior to Backfill
  - 2. ASTM D3299: Filament-Wound Glass-Fiber Reinforced Thermoset Resin Corrosion-Resistant Tanks
  - 3. ASTM D3350: Standard Specification for Polyethylene Plastics Pipe and Fittings Materials
  - 4. ASTM D3753: Glass-Fiber-Reinforced Polyester Manholes and Wetwells
  - 5. ASTM D6365: Nondestructive Testing of Geomembrane Seams using the Spark Test.
  - 6. ASTM F1759: Design of High-Density Polyethylene (HDPE) Manholes for Sub-surface Applications
  - 7. ASTM F1869: Measuring Moisture Vapor Emission Rate of Concrete Subfloor Using Anhydrous Calcium Chloride
  - 8. ASTM G62: Standard Test Methods for Holiday Detection in Pipeline Coatings.
- B. NACE INTERNATIONAL (Formerly The National Association of Corrosion Engineers)
  - 1. NACE SP0188-2006 (formerly RP0188): Discontinuity (Holiday) Testing of New Protective Coatings on Conductive Substrates.
  - 2. NACE Standard SP0490-2007 (formerly RP0490): Holiday Detection of Fusion-Bonded Epoxy External Pipeline Coating of 250 to 760  $\mu\text{m}$  (10 to 30-mils).
  - 3. NACE Standard SP0178-2007 (formerly RP0178): Design, Fabrication, and Surface Finish Practices for Tanks and Vessels to Be Lined for Immersion Service

## **PART 2 - PRODUCTS**

### 2.01 GENERAL

- A. All material supplied shall be one of the products specified in Appendix D "List of Approved Products" appended to these technical specifications.



## 2.02 HDPE LINERS

- A. The Work shall include the furnishing and installation of an interior protective liner system including all necessary labor, materials, equipment and tools as required for a complete installation. Liner shall be high-density polyethylene (HDPE). This liner shall provide a waterproof, corrosion resistant liner to prevent any deterioration of concrete surfaces from hydrogen sulfide and other corrosive gases/acids produced by wastewater and to prevent infiltration. To ensure total unit responsibility, all materials and installation thereof shall be furnished by, and coordinated with, 1 supplier/manufacturer.
- B. Manhole HDPE Liner shall have a minimum thickness of 2-mm (78-mil) and wetwell HDPE shall have a minimum thickness of 5-mm (195-mil). All HDPE liner sheets shall be extruded with a large number of anchoring studs, a minimum of (420/m<sup>2</sup>, 39/ft<sup>2</sup>), manufactured during the extrusion process in 1-piece with the sheet so there is no welding and no mechanical finishing work to attach the studs to the sheet. The liner shall have a pull out of 112.5-lbs/anchoring stud. A manufacturer certified fabricator shall custom fit the liner to the formwork in order to protect the concrete surfaces from sewer gases.
- C. All welding shall be performed in accordance with the published directives and procedures of the manufacturer and by welders certified by the manufacturer and documentation shall be provided to the County prior to the Work. Completion of welding will provide a 1-piece monolithic HDPE protective liner system that will provide excellent resistance to hydrogen sulfide attack and will not pull off the wall in the event that infiltration occurs. Flat liner sheet, not anchored, used for overlapping joints, shall have a minimum thickness of 3-mm for manholes or 5-mm for wetwells and shall contain a co-extruded bottom surface layer of conductive polyethylene. Conductive cap strip material shall have a free path from the back side of the sheet to a portion of the concrete surface.
- D. Field welding of the liner at the riser joints shall be completed only after vacuum testing (ASTM C1244) of the new structure has been completed and any concrete joint deficiencies have been rectified. Vacuum testing is not required on rehabilitation of existing structures.
- E. Testing and supervision of the installation and welding shall be performed by qualified staff only and must be checked when completed by visually checking and by Spark Testing all welded joints per ASTM D6365. Holiday testing 20,000 to 35,000 volts. All high voltage discontinuity (spark) testing shall be performed using a Tinker & Rasor model AP/W Holiday Detector or equal.
- F. Penetrations (Forcemain, conduit, etc) shall have an internal boot comprising of minimum of 3/8-inch 316SS band clamp compressing a 2-inch wide neoprene with full circumferential welded boot around each penetration in accordance with the manufacturer's details.

## 2.03 PREFORMED POLYPROPYLENE (PP) LINERS

- A. The Work shall include the furnishing and installation of an interior protective liner system including all necessary labor, materials, equipment and tools as required for a complete installation. This liner shall provide a waterproof, corrosion resistant liner to prevent any deterioration of concrete surfaces from hydrogen sulfide and other corrosive gases/acids produced by wastewater and to prevent infiltration. To ensure total unit responsibility, all materials and installation thereof shall be furnished by, and coordinated with, 1 supplier/manufacturer.
- B. All joints shall be field welded by hot air extrusion welding with PP welding bead. Field welding of the PP liner at the riser joints shall be completed only after vacuum testing (ASTM C1244) of the new structure has been completed and any concrete joint deficiencies have been rectified. Vacuum testing is not required on rehabilitation of existing structures.
- C. Testing and supervision of the installation and welding shall be performed by qualified staff only and must be checked when completed by visually checking and by Spark Testing all welded joints per ASTM D6365. Holiday testing 20,000 to 35,000 volts. All high voltage discontinuity (spark) testing shall be performed using a Tinker & Rasor model AP/W Holiday Detector or equal.
- D. Penetrations (Forcemain, conduit, etc) shall be gasketed PP pipe bell connectors or PP sleeves for boot type connectors and shall be attached to the PP liner by hot air extrusion welding with PP welding bead in accordance with the manufacturer's details.

## 2.04 FIBERGLASS LINERS

- A. General: Fiberglass reinforced polyester wetwell and manhole liners shall be manufactured from commercial grade polyester resin or other vinyl ester resin with fiberglass reinforcements. The resin system shall be suitable for atmospheres containing hydrogen sulfide and dilute sulfuric acid, as well as other gases associated with the wastewater collection systems. Fiberglass products shall be manufactured in accordance with National Bureau of Standards, Voluntary Product Standard PS 1569 and ASTM D-3753. All inserts and sleeves for piping shall be in accordance with the liner manufacturer's recommendations and shall result in complete coverage of all pre-cast sections and be capable of passing a spark test. The manufacturer shall have a minimum of 5-years experience in manufacturing products which meet the specified standards and shall provide 3 references to verify the qualifications of the manufacturer.
- B. Materials: Resins shall be a commercial grade unsaturated polyester resin. Reinforcing materials shall be commercial grade "E" type glass in the form of mat, chopped roving, continuous roving, roving fabric or a combination of the above, having a coupling agent that will provide a suitable bond between the glass reinforcement and resin. All materials including resins, glass reinforcement, fillers and additives shall be chemically resistant to hydrogen sulfide gas and the sanitary sewer environment. The combined thickness of the inner surface and the interior layer shall not be less than 0.10-inch. Seams shall be sealed

at the factory with the same glass-resin jointing process.

- C. Fabrication: The exterior surface shall be relatively smooth with no sharp projections and no exposed fibers. The exterior surface shall have a gray Gel-coat coating. The interior surface shall be resin rich with no exposed fibers and shall be free of crazing, delaminations, blisters larger than 1/2-inch diameter, wrinkles of 1/8-inch or greater in depth, resin runs, dry areas, sharp projections, or surface pits greater than 6 per square foot if they are less than 3/4-inch diameter and less than 1/16-inch deep. The exterior surface shall be free of blisters larger than 1/2-inch in diameter. To provide UV protection, the exterior surface shall have a factory applied gray pigment for a minimum thickness of 0.125-inches.
- D. Physical Properties: The fiberglass reinforced wetwell and manhole liner shall be designed for H-20 wheel loading and tested in accordance with ASTM D 3753 8.5 (note 1). The fiberglass reinforced wetwell liner and manholes shall meet the following physical requirements:

	Hoop Direction	Axial Direction
Tensile Strength (psi)	18,000	5,000
Tensile Modulus (psi)	0.6 x 10 <sup>6</sup> for MH's 0.8 x 10 <sup>6</sup> for Wetwell's	0.7 x 10 <sup>6</sup>
Flexural Strength (psi)	26,000	4,500
Flexural Modulus (psi)	1.4 x 10 <sup>6</sup>	0.7 x 10 <sup>6</sup>
Compressive MH's(psi)	18,000	12,000

- E. Chemical Resistance: When tested in accordance with ASTM D3753 8.7 the log of percent retention of each property after immersion testing when plotted against the log of immersion time and extrapolated to 100,000-hours shall assure retention of at least 50% of the initial properties.
- F. FRP liner shall be 1-piece with no vertical or horizontal seams allowed. The FRP shall be fabricated in accordance with NBS PS 15-69, and shall consist of commercial grade polyester resin, UV inhibitor, chopped strand, woven roving, and continuous reinforcement. Minimum liner thickness shall be 1/2-inch for all diameter wells, and shall not have external ribs. Liner size shall be field verified by liner manufacturer's representative. Tolerance of the inside diameter shall be +/- 1% of the required liner diameter.
- G. Testing: All tests shall be performed as specified in ASTM D3753 latest edition, Section 8, test method D-790 (note 5) and test method D695. Each completed liner shall be examined for dimensional requirements, hardness and workmanship. All required ASTM D3753 testing shall be completed and records of all testing provided to the County. As a basis of acceptance, the manufacturer shall provide an independent certification which shall consist of a copy of the manufacturer's test report, and be accompanied by a copy of the test results that the liner has been sampled, tested and inspected in accordance with the provisions of this specification and meets all its requirements. The independent certification and manufacturer's test report shall be provided to the County prior to delivery of the Liner.

- H. **Fiberglass Reinforced Top:** The fiberglass manhole liner top shall be fabricated using fiberglass material as above. Material and installation to meet all physical requirements as above. Top to be attached to wetwell liner pipe with fiberglass layup to comply with ASTM D3299. When reinforcement is necessary for strength, the reinforcement shall be fiberglass channel laminated to the inside of the liner top and shall comply with ASTM D3299. 4,000-psi concrete shall be poured around the entire manhole fiberglass cone section. Lift station top slabs shall be re-poured with HDPE interior liner. Contractor shall ensure an airtight connect between the Pump Station HDPE lined top slab and interior wetwell liner.
- I. **Non-Shrink Grout:** Non-shrink grout used in the bench area of manholes and fillet areas of wetwells, or on pipe penetrations shall be 100% calcium aluminate, un-thinned and un-altered, as manufactured by Sewpercoat, Strong-Seal, or an approved equal.
- J. **Miscellaneous Materials:** Additional items of construction necessary for the complete installation of the fiberglass liner shall conform to specific details on the Drawings and shall be constructed of first-class materials conforming to the applicable portions of these Specifications.

2.05 FERROUS METAL SURFACES (INCLUSIVE OF STEEL AND DIP, HYDRANTS, FITTINGS AND APPURTENANCES)

Cleaning, surface preparation, coating application, and thickness shall be as specified herein and shall meet or exceed the coating manufacturer's recommendations. When the manufacturer's minimum recommendations exceed the specified requirements, Contractor shall comply with the manufacturer's minimum recommendations. All cleaning, surface preparation, coating application, thickness, testing, and coating materials (where available) shall be in accordance with the referenced standards of AWWA, ANSI, NACE, SSPC, NSF, and ASTM. Color-coding shall be Safety Blue, Safety Green and Pantone Purple 522-C for water, wastewater and reclaimed water respectfully. Surfaces shall be holiday detected in accordance with ASTM G 62. Areas found to have holidays shall be marked and repaired in accordance with the paint manufacturer's instructions. The County shall be notified of time of testing so that he might be present to witness testing.

- A. **Procedures for Coating Exterior of DIP, Hydrants, Fittings and Appurtenances**
  - 1. **Surface Preparation:** Do not abrasive blast or prepare more surface area than can be coated in the same day; prepare surfaces and apply prime coatings within an 8-hour period.
    - a. **Steel:** Shall require NACE-1/SSPC-SP5 White Metal Blast Cleaning minimum angular anchor profile of 1.5-mils. White metal blast cleaning removes all of the coating, mill scale, rust, oxides, staining, corrosion products, and other foreign matter from the surface.
    - b. **DIP:** DIP with asphaltic seal coat, Hydrants, FBE (Valves and appurtenances), Shall require NACE-3/SSPC-SP6 Commercial Blast Cleaning minimum angular anchor profile of 1.5-mils. Commercial blast cleaning removes all visible oil, grease, dust, dirt, mill scale, rust, coating, oxides, corrosion products, and other

foreign matter from all surfaces and allows stains to remain on 33% (percent) of each unit area of surface.

- c. Note: Primer Option - Hydrants, FBE (Valves and appurtenances), existing factory coatings: Where specifically called out in the Coating System Table below, NACE-4/SSPC-SP7 may be substituted for the commercial blast for hydrants and factory applied FBE (Valves and appurtenances) where the coating manufacturer has specifically provided compatible coatings with existing coatings including urethane, epoxy, alkyd and water-based coatings. Under no circumstances shall DIP with asphaltic seal coat be over-coated. NACE-4/SSPC-SP7 Brush-Off Blast Cleaning shall be free of all visible oil, grease, dirt, dust, loose mill scale, loose rust, and loose coating. Tightly adherent mill scale, rust, and coating may remain on the surface. Mill scale, rust, and coating are considered tightly adherent if they cannot be removed by lifting with a dull putty knife after abrasive blast cleaning has been performed.
2. Contaminants: Remove dirt, dust, oil and all other contaminants that could interfere with adhesion of the coating in accordance with SSPC-SP1 for the substrate and between each coating layer.
3. Temperature: Surface temperature of substrate shall be a minimum of 5°F above the dew point and rising and generally between 40°F to 100°F. Temperatures shall not exceed manufacturer's recommendations.
4. Stripping: Edges, corners, crevices, welds, and bolts shall be given a brush coat/stripe coat for each material/layer. The stripe coat shall be applied by a brush and worked in both directions.
5. Coatings Systems: Two (2) options for coating systems are provided. Each coat shall be a distinctive color or shade to verify each coating in the system.
6. Prime coat: DIP, DIP with asphaltic seal coat, Hydrants, FBE (Valves and appurtenances) prime coat shall be zinc-rich. Zinc-rich shall only be used on bare metal. Factory applied FBE/Asphaltic/Mastic coatings on valves and appurtenances shall be completely removed per NACE 3 / SSPC-SP6.
7. Note: Where specifically called out in the Coating System Table for factory applied FBE (Valves and appurtenances) surface preparation may be NACE-4/SSPC-SP7 and the prime coat shall be an Inorganic water based epoxy. Asphaltic seal coats and mastics shall not be overcoated with Inorganic water based epoxy.
8. Intermediate coat: Varies per coating system.
9. Final Coat: Varies per coating system.
10. Holiday Testing: Each coating layer shall be holiday tested at the recommended 100-125 volts DC per mil in accordance with the latest edition of the following standards: NACE SP0188-2006, NACE Standard RP0490, ASTM G62 and per the manufacturers recommendations. All low voltage holiday testing shall be performed using a Tinker & Razor model M-1 Holiday Detector or equal.
11. Coating Systems: Either System 1 or System 2 shall be used for above ground, non-immersion ferrous metal surfaces (Inclusive of Steel, DIP, Hydrants, Fittings and Appurtenances).

### Color Codes

Generic Name	Application	Tnemec	Carboline	PPG / Ameron
Safety Blue	Water Master Meters	True Blue / Safety 11SF	9122	BL Safety Blue
Safety Green	Pump Station Piping	Hunter Green 08SF	V358	GN Safety Green
Pantone Purple 522C	Reclaimed Master Meters	Purple Rain / Safety 14 SF	7528	PL Safety Purple
Safety Green	Hydrant Bonnet & Caps	Hunter Green 08SF	V358	GN Safety Green
Safety Orange	Hydrant Bonnet & Caps	Tangerine Orange / Safety 04 SF	1420	OR 2 Safety Orange
Safety Red	Hydrant Bonnet & Caps	Candy Apple Red / Safety 06SF	7573	RD 2 Safety Red
Safety Silver	Hydrant Barrel	Aluminum 57GR	J766	SL Safety Silver

### System 1 - Zinc / Urethane / Fluoropolymer

Description	Generic Coating Name	Tnemec	DFT mils	Carboline	DFT mils
Prime Coat all materials. Surface Prep NACE 1 or NACE 3	Zinc-Rich	Zinc Series 90-97	2.5 - 3.5	Carbozinc 621	3.0 - 8.0
Prime Coat - option for FBE or Hydrants only. Surface Prep NACE 4	Inorganic water based epoxy – overcoat existing coatings	Typoxy Series 27WB	4.0 - 14.0	NA	NA
Intermediate Coat.	Aliphatic Acrylic Polyurethane	Endura-Shield Series 73	2.0 - 3.0	Carbothane 133 HB	3.0 - 5.0
Final Coat.	Advanced Thermoset Fluoropolymer Polyurethane	Hydroflon Series 700	2.0 - 3.0	Carboxane 950	2.0- 3.0

### System 2 - Zinc / Epoxy / Urethane

Description	Generic Coating Name	Tnemec	DFT mils	Carboline	DFT mils	PPG / Ameron	DFT mils
Prime Coat all materials. Surface Prep NACE 1 or NACE 3	Aromatic Urethane, Zinc-Rich	Zinc Series 90-97	2.5 - 3.5	Carbozinc 621	3.0 - 8.0	Amercoat 68HS	3
Prime Coat option for FBE, Hydrants. Surface Prep NACE 4	Inorganic water based epoxy – overcoat existing coatings	Typoxy Series 27WB	4.0 - 14.0	NA	NA	NA	NA
Intermediate Coat.	Polyamidoamine Epoxy	Color Hi-Build Epoxoline II Series N69	4.0 - 10.0	Carboguard 60	4.0 - 6.0	Amerlock 2/400	4.0 - 6.0
Final Coat.	Aliphatic Acrylic Polyurethane	Endura-Shield Series 73	2.0 - 3.0	Carboxane 950	2.0 - 3.0	Amercoat 450H	2.0 - 3.0

## 2.06 SPECIALTY COATINGS

- A. The Specialty Coatings are for rehabilitation of existing precast concrete manholes and existing valve vaults. New precast structures shall be lined only. All specialty coatings applicators shall follow the procedure as outlined below:
1. Pre-Inspection: Applicator shall take appropriate action to comply with all local, state and federal regulations including those set forth by OSHA, EPA, the County and any other applicable authorities. Prior to conducting any work, perform inspection of structure to determine need for protection against hazardous gases or oxygen-depleted atmosphere and the need for flow control or flow diversion.
  2. Bypass plan: Bypass plan for flow control or bypass shall be submitted to the County for approval prior to conducting the work. Any active flows shall be dammed, plugged, or diverted as required to ensure all liquids are maintained below or away from the surfaces to be coated until final applications are cured as recommended by the corrosion protection system manufacturer.
  3. Surface Preparation: NACE 6/SSPC-SP13 "Surface Preparation of Concrete." Dry abrasive blasting, wet abrasive blasting, vacuum-assisted abrasive blasting, and centrifugal shot blasting, high pressure water cleaning (5,000 to 10,000-psig), water jetting (10,000 to 30,000-psig) or combination of methods to remove deteriorated concrete, brick or mortar, laitance, hard contaminants, existing coatings, localized micro-organisms and gas contaminants from the concrete walls, floor, ceiling, and other concrete surfaces and shall display a surface profile suitable for application of the system. Minimum surface profile shall be ICRI CSP-5 or greater. Containment shall be provided to capture spent abrasive material and deteriorated concrete for removal by the Contractor.
  4. Substrate Inspection: After completion of surface preparation, the Contractor shall inspect for: Leaks, Cracks, Holes, Exposed Rebar, Ring and Cover Condition, Invert Condition, Inlet and Outlet Pipe Condition. After the defects in the structure have been identified, repair with a manufacturer approved underlayment or material to assure proper rehabilitation of the surface defect and compatibility with the specialty coating system product to be applied. Repairs to exposed rebar, defective pipe penetrations or inverts, shall be recommended by the specialty coating manufacturer and approved by the County prior to proceeding with the repair. Final preparation and cleaning of repaired surfaces is required prior to application of the coating and shall comply with the corrosion protection system manufacturer's recommendations.
  5. Manufacturer's certification: Applicators, installers, welders and application equipment shall be certified by the manufacturer of the corrosion protection system and documentation shall be provided to the County prior to the work.
  6. Area to be coated: All exposed concrete of the entire interior surface of precast structure including but not limited to benching, pipe penetrations, walls, bottom of top slab, chimney, etc. Flow channel inverts are not necessary to coat. Corrosion protection system shall interface with adjoining construction materials/components throughout the manhole structure to effectively seal and protect substrates from attack by corrosive elements and to ensure the effective elimination of infiltration into the sewer system.

7. Application: Application of specialty coating system shall be in strict accordance with manufacturer's recommendation. Specified surfaces should be shielded to avoid exposure of direct sunlight, other intense heat source or, where cementitious products are employed, excessive ventilation. Where varying surface temperatures do exist, coating installation should be scheduled when the temperature is falling versus rising. Verification of the corrosion protection system thickness shall be verified during application via wet gauge methods or following cure of the system using appropriate non-destructive or destructive methods.
  8. Holiday Testing: Cure time shall be in accordance with the Manufacturers product data sheet. Final concrete structure corrosion protection system shall be completely free of holidays, pinholes or voids. High voltage Holiday testing shall be required and holidays marked and repaired with same material and to same thickness as required of original installation. All high voltage discontinuity (spark) testing shall be performed using a Tinker & Rasor model AP/W Holiday Detector or equal and at 100-125 volts DC per mil or per the manufacturers recommendations.
  9. Destructive Testing: Destructive testing may be performed as directed by the County to verify coating adhesion and coating DFT. Repairs to areas tested by destructive means shall be repaired by the certified applicator at the Contractor's expense.
  10. Reporting: Provide final written report to the County detailing the location, date of report, description of repair or original installation and manufacturer data and cut sheets of the corrosion protection system and applicable testing results as per sections 7, 8 and 9.
  11. Warranty: The report shall contain a copy of the warranty.
- B. System SC-1: Sauereisen Sewergard 210 (Trowelable), 210FS (Trowelable Fast Set), 210S (Sprayable) or 210RS (Rotary Spray) shall be applied and then shall be finished with a coat of Sauereisen Sewergard Glaze 210G. The lining system to be utilized shall be an epoxy mortar or aggregate filled epoxy. Material furnished under this specification shall be a pre-packaged from the manufacturer. Materials shall be trowel applied or sprayed and shall conform to the Manufactures product data sheet as supplied by the manufacturer.
1. Additional Preparation: To ensure a good bond, the newly blasted surface shall be thoroughly vacuumed to remove all sand and debris and surface shall be dry prior to application.
  2. Surfacers for Rehabilitation/repair: Substrate in requiring repairs in excess of 1/8-inch shall be repaired with Sauereisen Underlayment No F-120, F-121 or F-209 Filler prior to application of protective lining/coating corrosion protection system.
  3. Thickness:
    - a. Sewergard 210 / 210FS / 210RS: The material shall be applied in 1 or more layers for a total thickness of minimum of 125-mils DFT (1/8-inch). After application, the material shall be damp rolled with excess water shaken off prior to back rolling.
    - b. Sprayable 210S: The material shall be applied in 1 or more layers for a total thickness of minimum of 60-mils shall be required for the Spray applied 210S.
  4. Finishing Glaze: After application, and curing of either the 210, 210FS, 210RS or 210S, the material shall be coated with a minimum of 20-mils of Sauereisen Sewergard Glaze 210G by roller or spray application in accordance with the manufacturers recommendations.



5. Holiday Testing: The protective lining/coating protection system shall be cured in accordance with the manufacturer's recommendations prior to holiday testing at a minimum of 14,500 volts.

C. System SC-2: Tnemec Perma-Shield Coating System.

1. Additional Preparation: To ensure a good bond, the newly blasted surface shall be thoroughly vacuumed to remove all sand and debris and surface shall be dry prior to application and surface shall be minimum 5°F above the dew point. Moisture content not to exceed 3-pounds per 1,000 square feet in a 24-hour period verify dryness using a "plastic film tape-down test" ASTM D4263 and perform Anhydrous Calcium Chloride ASTM F1869.
2. Surfacers for Rehabilitation/repair: Substrate in requiring repairs in excess of 1/8-inch shall be repaired Series 217 or 218 Filler prior to application of protective lining/coating corrosion protection system. Concrete surface shall be pre-wet or dampened with potable water prior to surfacer application.
3. Thickness: Lining Series 434: The material shall be applied in 1 or more layers for a total thickness of minimum of 125-mils DFT (1/8-inch).
4. Finishing Glaze: After application, and curing, the material shall be coated with 15-20-mils of Series 435 in accordance with the manufacturer's recommendations.
5. Holiday Testing: The protective lining/coating protection system shall be cured in accordance with the manufacturer's recommendations prior to holiday testing at a minimum 14,500 volts.

D. System SC-3: Sewercoat (PG and 2000 HS) Calcium aluminate mortar: The lining system to be utilized shall be 100% calcium aluminate cement with 100% calcium aluminate aggregate. Materials shall be spray applied by either a wet gunning (low-pressure spray) or dry gunning (shotcrete) method and shall conform to the manufacturer's product data sheet as supplied by the manufacturer. The equipment shall be clean and free of any hydrated or un-hydrated Portland Cement.

1. Additional Preparation: To ensure a good bond, the newly blasted surface shall be fully saturated with water prior to application.
2. Thickness: The material shall be applied in 1 or more layers to such total thickness as required. A minimum of 1-inch shall be applied.
3. Finishing: After spraying, the material shall be brushed or trowel finished.
4. Curing: Curing by appropriate methods (curing compound, water mist, etc.) should be implemented as the surface begins to harden and dry (as early as 1-hour after application).

E. System SC-4: Raven 405: System shall be 100% solids epoxy. Thinning with solvents shall not be permitted. Surface preparation, mixing, pot life, ambient conditions, application, film thickness per coat, cure time, and recoat time shall be in accordance the manufacturer's recommendations.

1. Applicator/installer shall be certified by the Manufacturer.
2. Surfacers/Repair: Raven 710, 705CA or Raven 700 shall be spray applied or trowelled to repair/fill minor surface defects or applied as an underlayment.

3. Primer: Concrete exhibiting a moisture vapor emission rate greater than 3-lbs/1,000 square feet/24-hours, when tested according to ASTM F1869, shall be primed with Raven 155. Raven 155 primer (2 component waterborne epoxy) shall be applied at a maximum of 8-mil WFT (3-mil DFT). Recoat window minimum 2-4-hours at 72°F with maximum 72-hours at 72°F.
  4. Top Coat: Raven 405 shall be applied with an approved plural component airless spray system. Coating thickness shall be in relation to the profile of the surface to be coated as recommended by the coating product manufacturer. In all cases the coating shall be applied with minimum of 2 coats applied at 40-80-mils WFT/DFT each for minimum final film thickness at 125-mils DFT. Subsequent top coating or additional coats of the coating product(s) shall occur within the product's recoat window: minimum cure to a tacky state; maximum cure of 18-hrs at 72°F substrate temperature. Additional surface preparation procedures will be required if this recoat window is exceeded including inspection for and removal of amine blush and/or other potential contaminants.
  5. Holiday Testing: The protective lining/coating protection system shall be cured in accordance with the manufacturer's recommendations prior to holiday testing at a minimum of 12,500 volts.
- F. SC-5: Spectrashield Multicomponent Liner System. Spectrashield multi-component stress panel liner system composed of moisture barrier (modified polymer), surfaces (polyurethane/polymeric blend foam) and final barrier coat (modified polymer). The system is applied in three-steps and the applicator/installer shall be certified by the Manufacturer.
1. Application
    - a. Moisture barrier: Silicone Modified Polyurea Minimum 40-mils DFT
    - b. Surfacer: Polyurethane/Polymeric blend foam
    - c. Final corrosion barrier: Silicone Modified Polyurea Minimum 60-mils DFT
  2. Film Thickness: Final installation shall be a minimum of 500-mils. A permanent identification and date of work performed shall be affixed to the structure in a readily visible location.
  3. Holiday Testing: The protective lining/coating protection system shall be cured in accordance with the manufacturer's recommendations prior to holiday testing at a minimum of 50,000 volts.

## **PART 3 - EXECUTION**

### **3.01 QUALITY ASSURANCE**

- A. All materials shall be delivered to the job in original sealed and labeled containers of the coating manufacturer, and shall be subject to inspection by the County. Labels shall show name of manufacturer, type of coating, formulation, date, color and manufacturers recommendations. Coatings manufacturer date shall not exceed the manufacturer's recommendations for storage and useful life and Coatings manufactured in excess of 1-year prior to application shall be rejected.

- B. Oil and grease shall be completely removed in accordance with SSPC-SP1 before beginning any other surface preparation method. Surfaces of welds shall be scraped and ground as necessary to remove all slag and weld spatter.
- C. All components of equipment that can be properly prepared and coated after installation shall be installed prior to surface preparation. Components that will be inaccessible after installation shall have the surfaces prepared and coated before installation.
- D. All ferrous metal surfaces shall be free of all defects and have all sharp edges, welds, slag, defects and weld splatter ground smooth in accordance with NACE Standard RPO178.
- E. Edges, corners, crevices, welds, and bolts shall be given a brush coat (stripe coat) for each coating. The stripe coat shall be applied by a brush and worked in both directions. Special attention shall be given to filling all crevices with coating.
- F. Coating shall be applied in a neat manner that will produce an even film of uniform and proper thickness, with finished surfaces free of runs, sags, ridges, laps, and brush marks. Each coat shall be carefully examined and faulty material, poor workmanship, holidays, damaged areas and other imperfections shall be touched up prior to applying succeeding coats. Each coat shall be thoroughly dry and hard before the next coat is applied in accordance with the coating manufacturer's recommendations for drying time between coats. In no case shall coating be applied at a rate of coverage greater than the maximum rate recommended by the coating manufacturer. Each coat shall be uniform in coverage and color. Successive coats shall perceptibly vary in color.
- G. Coating failures will not be accepted and shall be entirely removed down to the substrate and the surface recoated. Failures include but are not limited to holidays, sags, checking, cracking, teardrops, fat edges, fisheyes, or delamination.
- H. Surfaces not required to be coated: Brass, Bronze, Stainless steel (Not including SS bolts and nuts)

### 3.02 INSPECTION FOR ACCEPTANCE

- A. The quality of materials, the process of manufacture and the finished sections shall be subject to inspection and approval by the County. Such inspection may be made at the place of manufacture, at the site after delivery or at both places and the sections shall be subject to rejection at any time due to failure to meet any of the specification requirements; even though sample sections may have been accepted as satisfactory at the place of manufacture. Sections rejected after delivery to the job shall be marked for identification and shall be removed from the job at once. Sections that have been damaged after delivery will be rejected and if already installed removed and replaced, entirely at the Contractor's expense.

- B. At the time of inspection, the sections will be carefully examined for compliance with the specified ASTM designation and with the approved manufacturer's drawings. Sections shall be inspected for general appearance, dimension, "scratch-strength" blisters, cracks, roughness, soundness, etc. The surface shall be dense and close-textured.
- C. Precast concrete structures shall be inspected by the County and defective materials shall be replaced by the Contractor at the Contractor's expense.
- D. Any repairs made on surfaces shall be holiday detected. Areas found to have holidays shall be marked and repaired in accordance with the coating manufacturer's instructions. The County shall be notified of time of testing so that he might be present to witness testing.

### 3.03 FIBERGLASS LINER INSTALLATION

- A. Do not drop or impact the fiberglass liner. Use of chains or cables in direct contact with the liner is prohibited.
- B. The Contractor shall sequence the Work so that wastewater service is maintained to existing customers at all times.
- C. The interior of the wetwell shall be pressure washed with an 800 to 1,000-psi water blast, acid washed with a 20% muratic acid solution, and pressure washed a second time. All loose materials, grease/fats, and hydrogen sulfide contamination shall be removed. The existing bench/fillet areas in the wetwell/manhole shall be removed prior to pressure washing. An inspection of the structures shall be conducted by the County prior to the fiberglass liner installation.
- D. Exterior liner diameter shall be approximately 4-inches smaller than the inside diameter of the barrel section of the structure.
- E. Liner depth shall be from invert to top elevation of manhole and wetwell. The top 12-inches of the manhole liner shall be a fiberglass neck that extends from the liner corbel or cone section to the bottom of the ring and cover. The neck is used to protect the concrete grade rings or brick and mortar adjustments from the sewer environment.
- F. The wetwell top slab and manhole corbel or cone section shall be removed and discarded by the Contractor in accordance with all applicable regulations at the Contractor's expense.
- G. Measure and cut wetwell liner to exact length and invert configuration. Measure and cut all incoming and outgoing line openings.
- H. Lower wetwell liner into wetwell and level.
- I. Extend all incoming and outgoing lines inside the liner with PVC or other approved pipe.
- J. The existing concrete bench area of manholes and fillet areas of wetwells shall be removed

completely during initial preparation. Upon installation of the liner, a new bench/fillet shall be constructed with non-shrink grout and shall be field coated with resin and fiberglass in a dry environment after wastewater flows are diverted. The newly constructed bench shall sufficiently overlap the newly installed liner to prevent migration of fluids or gases between the liner and the bench. There shall be no exposed concrete between the factory manufactured fiberglass liner and the field installed fiberglass bench overlay.

- K. Pipe Penetrations: Piping shall extend past the liner into the fiberglass wetwell or flush with the liner. If the existing piping does not fully penetrate the fiberglass liner, the Contractor must extend similar material piping into the fiberglass wetwell. Any gaps on joints must be sealed with a non-shrink grout specified herein.
- L. Pour or pump 3,000-psi pump mix into the annular space between the liner and existing wet well.
- M. Use concrete grade rings on top of the liner cone section to bring ring and cover to finish grade. Manhole liner neck section shall extend from the ring and cover support area up to the ring and cover. The neck section shall be designed to protect the adjustment ring(s), brick and mortar used to bring the ring and cover to final grade
- N. A non-shrinking grout as specified herein shall be applied to areas that cannot be fiber-glassed due to water.
- O. Following installation, the Contractor shall determine soundness by applying air or water pressure (3-5-psi) to the wet well or manhole liner. While holding at the established pressure, inspect the entire wetwell and manhole for leaks, based on loss of measured pressure. Any leakage through the laminate is cause for failure of the task. The County shall be present during testing. The Contractor shall be responsible for isolating the work of this Contract from existing work and shall be solely responsible for the method of such isolation. Refer to ASTM D-3753 8.6. Any repairs required shall be repaired in accordance with the manufacturer's recommendations at the Contractor's expense.
- P. Prior to final acceptance and final inspection of the fiberglass liner installation, flush and clean all parts of the system. Remove all accumulated construction debris, rocks, gravel, sand, silt, and other foreign material from the wetwell or manhole

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**SECTION 09905**  
**PUMP STATION VALVE IDENTIFICATION SYSTEM**

**PART 1 - GENERAL**

1.01 DESCRIPTION

- A. Scope of Work: The work included under this Section consists of providing an identification system for pump station plug and check valves.

1.02 SUBMITTALS

- A. Submit manufacturer's descriptive literature, illustrations, specifications, and other pertinent data in accordance with Section 01300 "Submittals."
- B. Schedules:
  - 1. Provide a typewritten list of all tagged valves giving tag color, shape, letter code and number, the valve size, type, use, and location.
- C. Samples:
  - 1. Provide a sample of each type valve tag supplied.

**PART 2 - PRODUCTS**

2.01 PUMP STATION VALVE IDENTIFICATION (ABOVE GROUND OR IN VALVE VAULTS)

- A. A coded and numbered tag attached with brass chain and/or brass "S" hooks shall be provided on all valves.
  - 1. Tag Types: Tags for valves on pipe shall be brass or anodized aluminum. Square tags shall be used to indicate normally closed valves and round tags shall indicate normally open valves.
  - 2. Coding: In addition to the color-coding, each tag shall be stamped or engraved with wording or abbreviations to indicate the valve service and number. All color and letter coding shall be approved by the County. Valve numbering shall be as shown on the Drawings.

**PART 3 - EXECUTION (NOT USED)**

END OF SECTION

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**SECTION 09910**  
**PREFABRICATED FIBERGLASS LINERS**

**PART 1 - GENERAL**

1.01 DESCRIPTION

- A. The work included under this Section consists of furnishing all labor, equipment and materials necessary for the installation of prefabricated fiberglass wetwell and manhole liners and appurtenances as described in the specifications herein.

1.02 SHOP DRAWINGS AND SUBMITTALS

- A. Submit Shop Drawings, manufacturer's literature and other descriptive material in accordance with Section 01300 "Submittals."

1.03 QUALITY ASSURANCE

- A. Contractor shall follow all applicable OSHA Standards concerning confined space entry.
- B. Warranty: Prior to its installation, the manufacturer shall provide a warranty for the fiberglass wetwell liners to be free from defects and constructed as specified herein. During and after installation, the Manufacturer shall provide a 20-year warranty on the completed installation to cover the complete cost including costs for materials, equipment, and labor. The warranty shall cover any and all damage to the liners resulting from manufacturing or installation issues such as cracking, deterioration, or leaking due to settlement or chemical attack and as specified in Section 01740 "Warranties and Bonds" herein.

**PART 2 - PRODUCTS**

2.01 FIBERGLASS LINERS

- A. General: Fiberglass reinforced polyester wetwell and manhole liners shall be manufactured from commercial grade polyester resin or other vinyl ester resin with fiberglass reinforcements. The resin system shall be suitable for atmospheres containing hydrogen sulfide and dilute sulfuric acid, as well as other gases associated with the wastewater collection systems. Fiberglass products shall be manufactured in accordance with National Bureau of Standards, Voluntary Product Standard PS 1569 and ASTM D-3753. All inserts and sleeves for piping shall be in accordance with the liner manufacturer's recommendations and shall result in complete coverage of all pre-cast sections and be capable of passing a spark test. The manufacturer shall have a minimum of 5-years experience in manufacturing products which meet the specified standards and shall provide 3 references to verify the qualifications of the manufacturer. All materials furnished for this Work shall be in accordance with the "List of Materials and Approved Manufacturers" as appended to these Specifications.

- B. Materials: Resins shall be a commercial grade unsaturated polyester resin. Reinforcing materials shall be commercial grade "E" type glass in the form of mat, chopped roving, continuous roving, roving fabric or a combination of the above, having a coupling agent that will provide a suitable bond between the glass reinforcement and resin. All materials including resins, glass reinforcement, fillers and additives shall be chemically resistant to hydrogen sulfide gas and the sanitary sewer environment. The combined thickness of the inner surface and the interior layer shall not be less than 0.10-inch. Seams shall be sealed at the factory with the same glass-resin jointing process.
- C. Fabrication: The exterior surface shall be relatively smooth with no sharp projections and no exposed fibers. The exterior surface shall have a gray Gel-coat coating. The interior surface shall be resin rich with no exposed fibers. The interior and exterior surfaces shall be free of crazing, de-laminations, blisters larger than 1/2-inch diameter, wrinkles of 1/8-inch or greater in depth, resin runs, dry areas, sharp projections, or surface pits greater than 6 per square foot if they are less than 1/4-inch diameter and less than 1/16-inch deep. To provide UV protection, the exterior surface shall have a factory applied gray pigment for a minimum thickness of 0.125-inches.
- D. Physical Properties: The fiberglass reinforced wetwell and manhole liner shall be designed for H-20 wheel loading and tested in accordance with ASTM D 3753 8.5 (note 1). The fiberglass reinforced wetwell liner and manholes shall meet the following physical requirements:

	Hoop Direction	Axial Direction
Tensile Strength (psi)	18,000	5,000
Tensile Modulus (psi)	0.6 x 10 <sup>6</sup>	0.7 x 10 <sup>6</sup>
Flexural Strength (psi)	26,000	4,500
Flexural Modulus (psi)	1.4 x 10 <sup>6</sup>	0.7 x 10 <sup>6</sup>
Compressive (psi)	18,000	12,000

- E. Soundness: Following installation, the Contractor shall determine soundness by applying air or water pressure (3-5-psi) to the wetwell liner. While holding at the established pressure, inspect the entire wetwell and manhole for leaks, based on loss of measured pressure. Any leakage through the laminate is cause for failure of the task. The Contractor shall be responsible for isolating the work of this Contract from existing work and shall be solely responsible for the method of such isolation. Refer to ASTM D-3253 8.6.
- F. Chemical Resistance: When tested in accordance with ASTM D3753 8.7 the log of percent retention of each property after immersion testing when platted against the log of immersion time and extrapolated to 100,000-hours shall assure retention of at least 50% of the initial properties.

## 2.02 NON-SHRINK GROUT

- A. Non-shrink grout used in the bench area of manholes and fillet areas of wetwells, or on pipe penetrations shall be 100% calcium aluminate, un-thinned and un-altered, as manufactured by Sewpercoat, Strong-Seal, or an approved equal.

## 2.03 BENCH

- A. The existing concrete bench area of manholes and fillet areas of wetwells shall be removed completely during initial preparation. Upon installation of the liner, a new bench/fillet shall be constructed with non-shrink grout and shall be field coated with resin and fiberglass in a dry environment after wastewater flows are diverted. The newly constructed bench shall sufficiently overlap the newly installed liner to prevent migration of fluids or gases between the liner and the bench. There shall be no exposed concrete between the factory manufactured fiberglass liner and the field installed fiberglass bench overlay.

## 2.04 PIPE PENETRATIONS

- A. Piping shall extend past the liner into the fiberglass wetwell or flush with the liner. If the existing piping does not fully penetrate the fiberglass liner, the Contractor must extend similar material piping into the fiberglass wetwell. Any gaps on joints must be sealed with a non-shrink grout specified herein.

## 2.05 MANWAY NECK OR LIP

- A. Manhole liner neck section shall extend from the ring and cover support area up to the ring and cover. The neck section shall be designed to protect the adjustment ring(s), brick and mortar used to bring the ring and cover to final grade.

## 2.06 MISCELLANEOUS MATERIALS

- A. Additional items of construction necessary for the complete installation of the fiberglass liner shall conform to specific details on the Drawings and shall be constructed of first-class materials conforming to the applicable portions of these Specifications.

## **PART 3 - EXECUTION**

### 3.01 INSTALLATION

- A. Fiberglass Liner
  1. The interior of the wetwell shall be pressure washed with an 800 to 1,000-psi water blast, acid washed with a 20% muratic acid solution, and pressure washed a second time. All loose materials, grease/fats, and hydrogen sulfide contamination shall be removed. The existing bench/fillet areas in the wetwell/manhole shall be removed prior to pressure washing. An inspection of the structures shall be conducted by the County prior to the fiberglass liner installation.

2. Exterior liner diameter shall be approximately 4-inches smaller than the inside diameter of the barrel section of the structure.
3. Liner depth shall be from invert to top elevation of manhole and wetwell. The top 12-inches of the manhole liner shall be a fiberglass neck that extends from the liner corbel or cone section to the bottom of the ring and cover. The neck is used to protect the concrete grade rings or brick and mortar adjustments from the sewer environment.
4. The wetwell top slab and manhole corbel or cone section shall be removed and discarded by the Contractor in accordance with all applicable regulations at the Contractor's expense.
5. Measure and cut wetwell liner to exact length and invert configuration. Measure and cut all incoming and outgoing line openings.
6. Lower wetwell liner into wetwell and level.
7. Extend all incoming and outgoing lines inside the liner with PVC or other approved pipe.
8. Construct new benches/fillets and tie-in and seal bottom of liner with a quick setting non-shrink grout as specified herein.
9. Tie-in and seal all lines extending into the wetwell liner with non-shrink grout.
10. Pour or pump 3,000-psi pump mix into the annular space between the liner and existing wetwell.
11. Use concrete grade rings on top of the liner cone section to bring ring and cover to finish grade.
12. A non-shrinking grout as specified herein shall be applied to areas that cannot be fiber-glassed due to water.

### 3.02 SHIPPING

- A. Do not drop or impact the fiberglass wet well liner. Use of chains or cables in direct contact with the wet well is prohibited.

### 3.03 MAINTENANCE OF SERVICE

- A. The Contractor shall sequence the Work so that wastewater service is maintained to existing customers at all times.

### 3.04 FIELD QUALITY CONTROL

- A. Workmanship: It is imperative that the wetwell liner and appurtenances be built watertight and that the Contractor adhere rigidly to the specifications for materials and workmanship. Upon completion, the wetwell liner will be tested and if any damage on the liner is observed, the fiberglass liner installation will be rejected.
- B. Cleaning
  1. Prior to final acceptance and final inspection of the fiberglass liner installation, flush and clean all parts of the system. Remove all accumulated construction debris, rocks, gravel, sand, silt, and other foreign material from the wetwell.

2. Upon the County's final inspection of the fiberglass liner installation, if any foreign matter is still present in the system, flush and clean the section and portions of the wetwell as required.
3. Testing: Upon installation, cleaning, and visual inspection, the Contractor shall, in the presence of the County, test the entire lined surface in accordance with subsection 2.01, E of this specification section. Any repairs required shall be repaired in accordance with the manufacturer's recommendations at the Contractor's expense. The cost for the performance of this test shall be borne entirely by the Contractor.

END OF SECTION

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**SECTION 15062**  
**DUCTILE IRON PIPE AND FITTINGS**

**PART 1 - GENERAL**

1.01 DESCRIPTION

- A. Scope of Work: Furnish all labor, materials, equipment and incidentals required and install, all ductile iron piping, ductile iron fittings, and appurtenances as shown on the Drawings and as specified herein.
- B. General Design: The equipment and materials specified herein are intended to be standard types of ductile iron pipe and cast or ductile iron fittings for use in transporting wastewater, potable water, and reclaimed water.

1.02 QUALITY ASSURANCE

- A. Qualifications: All of the ductile iron pipe and ductile or cast iron fittings shall be furnished by manufacturers who are fully experienced, reputable, and qualified in the manufacture of the materials to be furnished. The pipe and fittings shall be designed, constructed and installed in accordance with the best practices and methods and shall comply with these specifications as applicable.
- B. Standards:
  - 1. ANSI A 21.50/AWWA C150
  - 2. ANSI A-21.51/AWWA C151
  - 3. ANSI A-21.41/AWWA C104
- C. Factory Tests: The manufacturer shall perform the factory tests described in ANSI A-21.51/AWWA C151.
- D. Quality Control
  - 1. The manufacturer shall establish the necessary quality control and inspection practice to ensure compliance with the referenced standards. All pipe on this Project shall be supplied by a single manufacturer unless otherwise accepted in writing by the County.
  - 2. In addition to the manufacturer's quality control procedures, the County may select an independent testing laboratory to inspect the material at the foundry for compliance with these specifications. The cost of foundry inspection requested by the County will be paid for by the County.

### 1.03 SUBMITTALS

#### A. Materials and Shop Drawings

1. Submit Shop Drawings and piping layouts, including areas within and under buildings and structures. Shop Drawings shall include dimensioning, methods and locations of supports and all other pertinent technical specifications. Show locations of all field cuts. Shop Drawings shall be prepared by the pipe manufacturer. Shop Drawings for piping within and under buildings and structures shall be submitted within 30-days of Execution of Contract.

#### B. Operating Instructions: Submit Operation and Maintenance Manuals in accordance with Section 01001 "General Work Requirements."

#### C. Manufacturer's Certification

1. Submit manufacturer's sworn certification of factory tests and test results.

### 1.04 PRODUCT DELIVERY, STORAGE AND HANDLING

The Contractor shall be responsible for all materials furnished and stored until the date of project completion. The Contractor shall replace, at his expense, all materials found to be defective or damaged in handling or storage. The Contractor shall, if requested by the County, furnish certificates, affidavits of compliance, test reports, samples or check analysis for any of the materials specified herein. All pipe delivered to project site for installation is subject to random testing for compliance with the designated specifications.

#### A. Delivery and Storage: Delivery and storage of the materials shall be in accordance with the manufacturer's recommendations. Stored pipe shall be covered for protection against contamination and UV light. Joint gaskets shall be stored in clean, dark and dry location until immediately before use.

#### B. Handling: Care shall be taken in loading, transporting and unloading to prevent damage to the pipe and fittings and their respective coatings. Pipe or fittings shall not be rolled off the carrier or dropped. Pipe shall be unloaded by lifting with a forklift or crane. All pipe or fittings shall be examined before installation and no piece shall be installed which is found to be defective. Pipe shall be handled to prevent damage to the pipe or coating. Accidental damage to pipe or coating shall be repaired to the satisfaction of the County or be removed from the job. When not being handled, the pipe shall be supported on timber cradles or on level ground, graded to eliminate all rock points and to provide uniform support along the full pipe length. When being transported, the pipe shall be supported at all times in a manner which will not permit distortion or damage to the lining or coating. Any unit of pipe that, in the opinion of the County, is damaged beyond repair by the Contractor shall be removed from the site.



## PART 2 - PRODUCTS

### 2.01 MATERIALS

#### A. Ductile Iron Pipe

1. Standards: ANSI A-21.50, AWWA C150 and ANSI A-21.51, AWWA C151
2. Thickness/Pressure Class:
  - a. Below ground piping: Class 350 (4-inch to 12-inch), Class 250 (16-inch to 24-inch) and Class 200 (30-inch to 64-inch) unless otherwise noted or specified.
  - b. Above ground piping: Flanged, Class 350 (minimum) unless otherwise noted or specified.
3. Joints
  - a. Push-on or Mechanical Joints (below ground piping)
    - (1) Standards: ANSI A21.11, AWWA C111
    - (2) Class: 350-psi working pressure rating
    - (3) Gaskets
      - (a) Potable and Reclaimed Water Service: Styrene Butadiene Rubber (SBR) ring type.
      - (b) Wastewater Service: Neoprene rubber ring type.
  - b. Flanged (above ground or inside below ground vaults)
    - (1) Standards: ANSI A21.15, ANSI B16.1
    - (2) Class: 125-pound factory applied screwed long hub flanges, plain faced without projection.
    - (3) Gaskets
      - (a) Spans less than 10-feet: full-face 1/8-inch thick neoprene rubber
      - (b) Spans greater than 10-feet: Toruseal gaskets as manufactured by American Cast Iron Pipe or acceptable equal.
  - c. Restrained Joints
    - (1) Manufacturers: Lok-Ring system (all sizes) or locking type gasket systems (for 16-inch diameter and smaller) as manufactured by American Ductile Iron Pipe; MEGALUG System as manufactured by EBBA Iron; or acceptable equal.
    - (2) Class: 250-psi minimum design pressure rating.
    - (3) Standard mechanical joint retainer glands shall not be acceptable.
  - d. Joint Accessories
    - (1) Mechanical joint bolts, washers and nuts: Ductile iron or Corten steel.
    - (2) Flanged joint bolts, washers and nuts: 316 stainless steel with bolts and nuts conforming to ASTM A193 Grade B8M.
  - e. Pipe Length (below ground installation): 20-foot maximum nominal length.
4. Pipe Identification
  - a. Each length of pipe shall bear the name or trademark of the manufacturer, the location of the manufacturing plant, and the class or strength classification of the pipe. The markings shall be plainly visible on the pipe barrel. Pipe which is not clearly marked is subject to rejection. The Contractor shall remove all rejected pipe from the project site within five NORMAL WORKING DAYS.

## B. Fittings

1. Ductile iron fittings 4-inch through 24-inch shall be pressure rated at 350-psi minimum, except flanged joint type fittings which shall be rated at 250-psi minimum. All 30-inch and larger fittings shall be pressure rated to 250-psi minimum. All fittings shall conform to either ANSI/AWWA C110/A21.10 and/or C153/A21.53, latest revision, and shall be ductile iron only. All fittings shall be cast and machined allowing the bolt holes to straddle the vertical centerline. All fittings shall be designed to be capable to withstand, without bursting, hydrostatic tests of three times the rated water working pressure. All fittings shall have a date code cast (not printed or labeled) with identification of date, factory, and the factory unit from which it was cast and machined. Fittings shall have the pressure rating, nominal diameter of openings, manufacturer's name, and the country where cast and number of degrees or fraction of the circle distinctly cast on them. Ductile iron fittings shall have the letter "DI" or "Ductile" cast on them.
2. Joints shall be as described for ductile iron pipe for above ground/exposed and buried service.
3. All potable water main fittings shall have NSF 61 certification, and ISO 9001 certification for both the foundry and manufacturer. The NSF 61 certification shall be issued on all coatings and linings, from the said manufacturers that are used for potable water applications.

## 2.02 COATINGS, LININGS AND IDENTIFICATION MARKINGS

### A. Exterior Coatings

1. Below ground/buried or in a casing pipe:
  - a. Type: Asphaltic coating, 1.0-mil DFT in accordance with ANSI/AWWA A21.51/C151.
  - b. Markings: (continuous 3-inch wide strip within top 90 degrees of pipe - min. drying time 30-minutes before backfill).
  - c. Color:
    - (1) Raw Wastewater: Safety Green
    - (2) Reclaimed Water: Purple (Pantone 522C)
    - (3) Potable Water: Safety Blue
2. Above ground/Exposed/In vaults
  - a. Coatings and coating testing for ductile iron pipe and fittings for above ground/exposed applications shall be accordance with Division 9. Primer, intermediate and final coats whether shop or field applied shall be compatible and applied in accordance with the coating system manufacturer's recommendations. Refer to Appendix D "List of Approved Products" for approved coating system suppliers. Asphaltic seal coat applied to the exterior of above ground piping and fittings shall be blasted and completely removed prior to coating per NACE-3/SSPC-SP6 commercial blast cleaning minimum angular anchor profile of 1.5-mils.

- b. Color
    - (1) Raw Wastewater: Safety Green
    - (2) Reclaimed Water: Purple (Pantone 522C)
    - (3) Potable Water: Safety Blue
  - 3. Inside Wetwell
    - a. All piping inside of wastewater wetwell shall be 316 stainless steel.
- B. Interior Lining (Applied by pipe manufacturer)
- 1. Wastewater: Interior coating shall be Protecto 401 (amine cured novalac epoxy containing at least 20% by volume of ceramic quartz pigment) for all pipe and fittings. All ductile iron pipe and fittings shall be delivered to the manufacturer certified applicator without asphalt, cement lining, or any other lining on the interior surface and no coating shall have been applied to the first 6-inches of the exterior of the DIP spigot ends. Minimum surface preparation shall be SSPC-SP 1 Solvent Cleaning method to remove oil and grease followed by NACE-4 / SSPC-SP7 Brush-Off Blast Cleaning. Protecto 401 shall be applied within 12-hours of surface preparation to the interior of the pipe and fittings so as to obtain a continuous and relatively uniform and smooth integral lining with a total minimum dry film thickness of 40-mils for the complete system. No lining shall take place when the substrate or ambient temperature is below 40°F. The lining shall not be used on the face of the flange of fittings or flanged pipe. The system shall be holiday free and holiday testing (minimum 2000 volts) shall be conducted and pinholes shall be repaired prior to shipping.
  - 2. Potable Water and Reclaimed Water: Interior coating shall be fusion-bonded epoxy (FBE) or Cement Mortar lined with asphaltic seal coat.
    - a. FBE for Fittings: Fittings shall be supplied with a FBE coating, both inside and outside for total protection including flanged and buried fittings. The exterior of flanged fittings for above ground assemblies shall adhere to final exterior coating requirements per 3119 2.04 A. The FBE coating system shall meet or exceed ANSI/AWWA C-550 and C116/A21.116 requirements and shall have NSF 61 certification. FBE coating thickness shall be 6 to 8-mils dry film thickness, shall be applied for secure adhesion, shall have a smooth surface and shall be holiday free.
    - b. Cement mortar lining with a seal coat of asphaltic material shall be in accordance with ANSI/AWWA A21.4/C104.
- C. Polyethylene Encasement is required when pipe is within 10-feet of a gas main or as indicated on the Drawings:
- 1. Standard: ANSI A 21.5/AWWA C105, 8-mil minimum thickness.

## 2.03 LOCATION MARKERS AND LOCATION WIRE

### A. Electronic Markers and Locator System (for reclaimed water and wastewater ONLY)

1. Markers: Markers shall consist of a passive device capable of reflecting a specifically designated repulse frequency tuned to the utility (service) being installed. Markers shall be color coded in accordance with American Public Works Association's "Utility Locating and Coordinating Council Standards." Colors shall be: Wastewater and Reclaimed Water - #1404 Green. Markers shall be full range. Markers shall be installed directly above the centerline of the respective pipeline at intervals not to exceed 100-feet, at each fitting (tees, wyes, crosses, reducers, plugs, caps and bends) or change in horizontal direction and at each valve along the pipeline. Markers shall be hand backfilled to 1-foot above the pad and have a finished depth of burial of not less than 2-feet or more than 6-feet. No separate payment shall be made for furnishing and installing the respective frequency and color-coded electronic pad type marker.
2. Locator System: Marker locator set shall be the Scotch Mark EM II Electronic Marker Locator Path Tracing Receiver, or acceptable equal. The Contractor shall furnish 1-locator set for each type of service piping installed on the project (i.e.: reclaimed water, wastewater) to the County. Each unit shall incorporate the following features and accessories:
  - a. Unit(s) shall be tuned to the proper frequency for each type (service) of piping.
  - b. Field strength meter that provides visual indication of the return signal.
  - c. Function switch for selection of operation mode.
  - d. Sensitivity control to adjust the receiver gain.
  - e. Audio speaker for signal response.
  - f. Battery access panel containing condensed operating instructions.
  - g. Auxiliary headset and heads set jack.
  - h. Permanently attached shoulder straps.
  - i. Rugged shockproof and weatherproof storage/carrying case.
3. Manufacturer: System shall be Scotch Mark Locator System, or acceptable equal.

### B. Location Detection Wire

1. Materials: Continuous, insulated 10-gauge copper wire (color to match pipe identification).
2. Installation: Directly above (1-inch maximum) centerline of pipe terminating at top of each valve box collar and be capable of extending 12-inches above top of box (stored inside the 2-inch brass pipe through the valve box collar) in a manner so as not to interfere with valve operation. For direction drilling installations, a minimum of 2 (two) 10-gauge wires shall be pulled along with the pipe.
3. Continuity: Continuity of wire to be tested using Metrotech 810/9860 or acceptable equal.

## PART 3 - EXECUTION

### 3.01 INSTALLATION

- A. Ductile iron pipes shall be installed in accordance with AWWA C600 and AWWA Manual M-42. When a restraining type gasket is used, the bell shall be painted red.
- B. Underground Ductile Iron Pipe and Fittings.
  - 1. Bedding firm, dry and even bearing of suitable material. Blocking under the pipe will not be permitted.
  - 2. Placement
    - a. Alignment: In accordance with lines and grades shown on the Drawings. Deflection of joints shall not exceed 75% of the values recommended by the pipe manufacturer.
    - b. The Contractor shall provide line and grade stakes at a 100-foot maximum spacing and at all line and/or grade change locations. The Contractor shall provide temporary benchmarks at a maximum of 1,000-foot intervals. The minimum pipe cover shall be 30-inches below the finished grade surface or 30-inches below the elevation of the edge of pavement of the road surface whichever is greater.
    - c. All pipe and fittings shall be inspected prior to lowering into trench to insure no cracked, broken or otherwise defective materials are being used. All homing marks shall be checked for the proper length so as to not allow a separation or over homing of connected pipe. Homing marks incorrectly marked greater than 1-inch shall result in rejection of pipe and removal from site. The Contractor shall clean ends of pipe thoroughly and remove foreign matter and dirt from inside of pipe and keep clean during and after installation.
    - d. Proper implements, tools and facilities shall be used for the safe and proper protection of the Work. Pipe shall be lowered into the trench in such a manner as to avoid any physical damage to the pipe. Pipe shall not be dropped or dumped into trenches under any circumstances.
    - e. Trench Dewatering and Drainage Control: Contractor shall prevent water from entering trench during excavation and pipe-laying operations to the extent required to properly grade the bottom of the trench and allow for proper compaction of the backfill. Pipe shall not be laid in water.
    - f. Pipe Laying in Trench: Dirt or other foreign material shall be prevented from entering the pipe or pipe joint during handling or laying operations and any pipe or fitting that has been installed with dirt or foreign material in it shall be removed, cleaned and re-laid. Pigging of pipe may be used to remove foreign materials in lieu of flushing. At times when pipe installation is not in progress, the open ends of the pipe shall be closed by a watertight plug or by other means approved by the County to ensure absolute cleanliness inside the pipe. The pipe shall be installed with the color stripe and pipe text on the top of pipe.

3. Cutting: When required, cutting shall be done by machine, leaving a smooth cut at right angles to the axis of the pipe. Cut ends of the pipe to be used with a push-on bell shall be beveled. Bare metal exposed at ends of the pipe shall be field coated in accordance with pipe manufacturer's recommendations. Cut pipe for wastewater service shall have exposed bare metal ends repaired with Protecto 401 using the coating system manufacturer's field repair kit.

4. Joints

- a. Joint Placement

- (1) Push on joints: Pipe shall be laid with the bell facing upstream. The gasket shall be inserted and the joint surfaces cleaned and lubricated prior to placement of the pipe. After joining the pipe, a metal feeler shall be used to verify that the gasket is correctly located.
    - (2) Mechanical Joints: Pipe and fittings shall be installed in accordance with the "Notes on Method of Installation" under ANSI A21.11/AWWA C111. The gasket shall be inserted and the joint surfaces cleaned and lubricated with soapy water before tightening the bolts to the specified torque.

- C. Thrust Restraint

1. General: Thrust restraint shall be accomplished by the use of mechanical restraining devices unless specifically identified otherwise on the Drawings or herein.
  2. Length of Restrained Joints: In accordance with the lengths listed in the table as shown on the Drawings.

- D. Installation of Pipes on Curves

1. Maximum deflections at pipe joints, fittings and laying radius for the various pipe lengths shall not exceed 75% (percent) of the pipe manufacturer's recommendation.

### 3.02 CLEANING AND FIELD TESTING

- A. General: At the conclusion of the Work, the Contractor shall provide all associated cleaning and field testing as specified in other related sections of these specifications.

END OF SECTION

**SECTION 15064**  
**POLYVINYL CHLORIDE (PVC) PIPE AND FITTINGS**

**PART 1 - GENERAL**

1.01 DESCRIPTION

- A. Scope of Work: Furnish all labor, materials, equipment and incidentals required and install and test all polyvinyl chloride (PVC) piping, fittings and appurtenances as shown on the Drawings and specified herein.
- B. General Design: The equipment and materials specified herein are intended to be standard types of PVC pipe and ductile iron fittings for use in transporting wastewater, reclaimed water, and water.

1.02 QUALITY ASSURANCE

- A. Qualifications: All of the PVC pipe and ductile iron fittings shall be furnished by manufacturers who are fully experienced, reputable, and qualified in the manufacture of the materials to be furnished. The pipe and fittings shall be designed, constructed, installed in accordance with the best practices and methods and shall comply with these specifications as applicable.
- B. Standards:
  - 1. AWWA C900/C905
  - 2. ASTM D1784 / D1785 / D2241 / D2466 / D2564 / D2729 / D2774 / D3034 / D3139 / D3212
  - 3. NSF 14
  - 4. UNI-B-1 through 5
- C. Factory Tests: The manufacturer shall perform the factory tests described in Section 3 - AWWA C900/C905.
- D. Quality Control:
  - 1. The manufacturer shall establish the necessary quality control and inspection practice to ensure compliance with the referenced standards.
  - 2. In addition to the manufacturer's quality control procedures, the County may select an independent testing laboratory to inspect the material at the production facility for compliance with these specifications. The County will pay for the cost of facility inspection requested by the County.

### 1.03 SHOP DRAWINGS AND SUBMITTALS

- A. Submittals shall be submitted to the County/Professional for review and acceptance prior to construction in accordance with the General Conditions and specifications Section 01300 "Submittals."
- B. Materials and Shop Drawings
- C. Manufacturer's Certification
  - 1. Submit sworn certification of factory tests and their results.

### 1.04 PRODUCT DELIVERY, STORAGE AND HANDLING

- A. Delivery and Storage: Delivery and storage of the materials shall be in accordance with the manufacturer's recommendations. PVC pipe shall be covered with black plastic with a minimum thickness of 15-mil. Joint gaskets shall be stored in a clean, dark and dry location until use.
- B. Handling: Care shall be taken in loading, transporting and unloading to prevent damage to the pipe or fittings and their respective coatings. Pipe or fittings shall not be rolled off the carrier or dropped. Pipe shall be unloaded by lifting with a forklift or crane. All pipe or fittings shall be examined before installation and no piece shall be installed which is found to be defective. Pipe shall be handled to prevent damage to the pipe or coating. Accidental damage to pipe or coating shall be repaired to the satisfaction of County or it shall be removed from the job. When not being handled, the pipe shall be supported on timber cradles or on level ground, graded to eliminate all rock points and to provide uniform support along the full pipe length. When being transported, the pipe shall be supported at all times in a manner to prevent distortion or damage to the lining or coating. Any unit of pipe that, in the opinion of the County, is damaged beyond repair by the Contractor shall be removed from the site.
- C. The Contractor shall be responsible for all materials furnished and stored until the date of project completion. The Contractor shall replace, at his expense, all materials found to be defective or damaged in handling or storage. The Contractor shall, if requested by the County, furnish certificates, affidavits of compliance, test reports, samples or check analysis for any of the materials specified herein. All pipe delivered to project site for installation is subject to random testing for compliance with the designated specifications.

## **PART 2 - PRODUCTS**

### 2.01 GENERAL

- A. All material supplied shall be one of the products specified in Appendix D "List of Approved Products" appended to these technical specifications.



## 2.02 MATERIALS

### A. Polyvinyl Chloride (PVC) Pipe

1. Standards: AWWA C900/C905 and ASTM D1784/D3034/F679 (Gravity Sewer)
2. Compounds: Class 12454-A or Class 12454-B
3. PVC Gravity Pipe and Fittings: PVC gravity pipe (6-inch to 15-inch), shall conform to ASTM D3034, maximum SDR 35. PVC gravity pipe (18-inch to 36-inch), shall conform to ASTM F679 and uniform minimum "pipe stiffness" at 5% (percent) deflection shall be 46-psi. The joints shall be integral bell elastomeric gasket joints manufactured in accordance with ASTM D3212 and ASTM F477. Applicable UNI Bell Plastic Pipe Association standard is UNI B.
4. PVC Pressure Pipe and Fittings: All PVC pipe of nominal diameter 4 to 12-inches shall be manufactured in accordance with AWWA Standard C900 and greater than 12-inches shall be manufactured in accordance with AWWA Standard C905. The PVC pipe shall have a minimum working pressure rating of 100-psi and shall have a maximum dimension ratio of 18. Pipe shall be the same outside diameter as ductile iron pipe.
5. Dimension Ratio/Thickness: (unless otherwise shown on the Drawings)
  - a. Raw Wastewater:
    - (1) Pressure Systems: DR 18
    - (2) Gravity Systems: DR 35 (ASTM D3034) or PS 46 (ASTM F679)
  - b. Treated Wastewater: DR 18
  - c. Reclaimed Water: DR 18
  - d. Raw Water: DR 18
  - e. Potable Water: DR 18
  - f. Irrigation Piping: Schedule 40 or SDR 21
6. Joints:
  - a. Push-on integral bell elastomeric gasket joints:
    - (1) Standards: ASTM D3212/D3139/F477 and UNI-B-1
    - (2) Gaskets:
      - (a) Potable and Reclaimed Water Service: Styrene Butadiene Rubber (SBR) rieber type.  
Wastewater Service: Styrene Butadiene Rubber (SBR) rieber type for C900 / C905 pipe. Styrene Butadiene Rubber (SBR) ring type for gravity systems.
      - (b)
        - (3) Pipe Markings: Pipes shall have a manufacturer's home-mark on the spigot. On field cut pipe, the Contractor shall provide home-mark on the spigot in accordance with manufacturer's recommendations.
  - b. Solvent weld (nominal diameter less than 4-inches):
    - (1) Standards: ASTM D2466/D2564
    - (2) Type: Slip Fitting Socket (tapered)
    - (3) Exclusions: Plastic saddle and flange joints will not be used.

- c. Restrained Joints:
    - (1) Restrained joint devices shall be made specifically for PVC pipe and meet or exceed the requirements in ASTM F-1674.
    - (2) Manufacturers: Uni-flange mechanical joint restraints and bell restraints (for all sizes); Meg-a-lug system as manufactured by EBBA Iron (sizes 12-inches or less), or acceptable equal.
    - (3) Design pressure rating equal to or above test pressure as specified herein.
  - d. Pipe Length:
    - (1) Pressure systems: 20-feet maximum nominal length
    - (2) Gravity systems: 13-feet minimum nominal length
- B. Fittings - Pressure Systems (nominal diameter 4-inches and greater):
- 1. Materials: Ductile iron
  - 2. Joints: Mechanical Joint, Minimum 350-psi pressure rating
  - 3. Gaskets:
    - a. Water and Reclaimed Water Service: Styrene Butadiene Rubber (SBR) ring type
    - b. Wastewater Service: Neoprene rubber ring type
  - 4. Exclusions: Standard double bell couplings will not be acceptable where the pipe will slip completely through the coupling.
  - 5. All fittings shall conform to either ANSI/AWWA C110/A21.10 and/or C153/A21.53, latest revision, and shall be ductile iron.
  - 6. All fittings shall have a date code cast (not printed or labeled), with identification of the date, factory and unit at which it was cast and machined. Fittings shall have distinctly cast on them the pressure rating, nominal diameter of openings, manufacturer's name, the country where cast, and deflection angle. Ductile iron fittings shall have the letters "DI" or "Ductile" cast on them.
  - 7. All potable water main fittings shall have NSF certification and ISO 9001 certification for both the foundry and manufacturer. The NSF 61 certification shall be issued on all coatings and linings, from the said manufacturers that are used for potable water applications.
  - 8. All ductile iron fittings shall have exterior coatings, including markings and colors, and interior linings in conformance with Section 15062 "Ductile Iron Pipe and Fittings."
- C. Fittings - Pressure Systems (nominal diameter less than 4-inches)
- 1. Material: Polyvinyl Chloride (PVC)
  - 2. Joints: Slip fitting tapered socket with solvent weld
  - 3. Solvent: Sure Guard 12 or acceptable equal
  - 4. Exclusions: Plastic saddle and flange joint fittings shall not be used

## 2.03 LOCATION MARKERS, LOCATION WIRE AND IDENTIFICATION MARKINGS

### A. Electronic Markers and Locator System (for reclaimed water and wastewater ONLY)

1. Markers: Markers shall consist of a passive device capable of reflecting a specifically designated repulse frequency tuned to the utility (service) being installed. Markers shall be color coded in accordance with the American Public Works Association's "Utility Locating and Coordinating Council Standards." Colors shall be: Wastewater and Reclaimed Water - #1404 Green. Markers shall be full range. Markers shall be installed directly above the centerline of the respective pipeline at intervals not to exceed 100-feet, at each fitting (tees, wyes, crosses, reducers, plugs, caps and bends) or change in horizontal direction and at each valve along the pipeline. Markers shall be hand backfilled to 1-foot above the pad and have a finished depth of burial of not less than 2-feet or more than 6-feet. No separate payment shall be made for furnishing and installing the respective frequency and color-coded electronic pad type marker.
2. Locator System: Marker locator set shall be the 3M Dynatel 1420 or 3M Dynatel 1420E Electronic Marker System Marker Locator, or acceptable equal. The Contractor shall furnish 1 locator set for each type of service piping installed on the Project (i.e.: reclaimed water, wastewater.) to the County. Each unit shall incorporate the following features and accessories:
  - a. Unit(s) shall be tuned to the proper frequency for each type (service) of piping.
  - b. Field strength meter that provides visual indication of the return signal
  - c. Function switch for selection of operation mode
  - d. Sensitivity control to adjust the receiver gain
  - e. Audio speaker for signal response
  - f. Battery access panel containing condensed operating instructions
  - g. Auxiliary headset and heads set jack
  - h. Permanently attached shoulder straps
  - i. Rugged shockproof and weatherproof storage/carrying case
3. Manufacturer: System shall be Scotch Mark Locator System, or acceptable equal.

### B. Location Detection Wire

1. Materials: Continuous, insulated 10-gauge copper wire (color to match pipe identification).
2. Installation: Directly above (1-inch maximum) centerline of pipe terminating at top of each valve box collar and be capable of extending 18-inches above top of box (stored inside the 2-inch brass pipe through the valve box collar) in a manner so as not to interfere with valve operation. For direction drilling installations, a minimum of 2 (two) 10-gauge wires shall be pulled along with the pipe.

### C. Identification Markings:

1. Pipe furnished in solid color or white with color lettering as indicated below.
  - a. Lettering along top 90° (degrees) of pipe, minimum 3/4-inch in height with appropriate wording appearing 1 or more times every 21-inches along the entire length of the pipeline.

- (1) Raw Wastewater: Safety Green
- (2) Reclaimed Water: Purple (Pantone 522C)
- (3) Potable Water: Safety Blue

## **PART 3 - EXECUTION**

### **3.01 INSTALLATION**

- A. Standards: AWWA C900/C905/UNI-B 3 and 4
- B. Underground Polyvinyl Chloride (PVC) Pipe and Fittings
  - 1. Bedding: Firm, dry and even bearing of suitable material. Blocking under the pipe will not be permitted.
  - 2. Placement/Alignment:
    - a. Installation shall be in accordance with lines and grades shown on the Drawings. For pressure systems, deflection of joints shall not exceed 75% of that recommended by the manufacturer.
    - b. All pipe and fittings shall be inspected prior to lowering into trench to insure no cracked, broken or otherwise defective materials are being used. All homing marks shall be checked for the proper length so as to not allow a separation or over homing of connected pipe. Homing marks incorrectly marked on pipe shall result in rejection of pipe and removal from site. The Contractor shall clean ends of pipe thoroughly and remove foreign matter and dirt from inside of pipe and keep clean during and after installation.
    - c. Proper implements, tools and facilities shall be used for the safe and proper protection of the Work. Pipe shall be lowered into the trench in such a manner as to avoid any physical damage to the pipe. Pipe shall not be dropped or dumped into trenches under any circumstances.
    - d. Trench Dewatering and Drainage Control: Contractor shall prevent water from entering trench during excavation and pipe laying operations to the extent required to properly grade the bottom of the trench and allow for proper compaction of the backfill. Pipe shall not be laid in water.
    - e. Pipe Laying in Trench: Dirt or other foreign material shall be prevented from entering the pipe or pipe joint during handling or laying operations and any pipe or fitting that has been installed with dirt or foreign material in it shall be removed, cleaned and re-laid. Pigging of pipe may be used to remove foreign materials in lieu of flushing. At times when pipe installation is not in progress, the open ends of the pipe shall be closed by a watertight plug or by other means approved by the County to ensure absolute cleanliness inside the pipe. The color stripe and pipe text shall be viewed from the top of pipe when installed. When installing PVC pipe, no additional joints will be installed until the preceding pipe joint has been completed and the pipe carefully embedded and secured in place.

- f. Locating Wire: Locating wire, for electronically locating pipe after it is buried, or installed by trenchless technology shall be attached along the length of and installed with the pipe. This is applicable to all sizes and types of pressure mains. At a minimum, the tracing wire is to be attached to the pipe with nylon wire ties. The wire itself shall be 10-gauge single strand solid core copper wire with non-metallic insulation. The insulation shall be color coded for the type of pipe being installed. Continuous continuity must be maintained in the wire along the entire length of the pipe run. Permanent splices must be made in the length of the wire using wire connectors approved for underground applications as listed in the uniform electric code handbook. The coiled wire shall extend to a minimum of 12-inches above the surface and be connected to a test station box at valve locations.
- g. PVC Pressure Pipe Installation and Training: PVC pipe shall be installed in accordance with standards set forth in the UNI-BELL "Handbook of PVC Pipe", AWWA C605, and AWWA Manual M-23. The pipe shall be laid by inserting the spigot end into the bell flush with the insertion line or as recommended by the manufacturer. At no time shall the bell spigot end be allowed to go past the "insertion line" or "homing mark" for pressure pipe applications and homing mark shall be visible.
- h. Field Cutting: PVC pipe can be cut with a handsaw or power driven abrasive disc making a square cut. The end shall be beveled with a beveling tool, wood rasp or power sander to the same angle as provided on the factory-finished pipe. The insertion line on the spigot shall be remarked to the same dimensions as the factory-marked spigot.
- i. All Contractor pipe crews utilizing PVC pressure pipe shall be trained on an annual basis by Uni-Bell in coordination with the County and attended by the manufacturer's representative of the respective approved Manufacturers in Appendix D "List of Approved Products." The Uni-Bell PVC training session will consist of proper handling, storage, installation, and compaction as well as County requirements regarding PVC pipe and deflection. Every person handling, installing or backfilling PVC pipe shall not be permitted to install County owned and / or maintained pipe without training.
- j. Approved manufacturers representatives (Appendix D "List of Approved Products"), not present at the hosted Uni-Bell training session or individuals of pipe crews not in attendance shall be trained on every project site. On-site project training shall be for each manufacturer of pipe utilized on-site, per crew and per project. Specifically each crewmember shall be trained on every project by every pipe manufactures representative regardless of previous on-site training. Every person handling, installing or backfilling PVC pipe shall not be permitted to install County owned and / or maintained pipe without training.
- k. PVC Gravity Pipe Installation: Gravity sewer pipe shall be installed to the homing mark, no tolerance. Any noticeable separation shall be removed and reinstalled. The homing mark may be disregarded to meet the maximum of 1-inch separation between bell and spigot requirement. Joints:

1. Joint Placement:
  - (1) Push on joints: Pipe shall be laid with the bell ends facing upstream. The gasket shall be inserted and the joint surfaces cleaned and lubricated prior to placement of the pipe. After joining the pipe, a metal feeler shall be used to verify that the gasket is correctly located.
  - (2) Mechanical Joints: Pipe and fittings shall be installed in accordance with the "Notes on Method of Installation" under ANSI A21.11/AWWA C111. The gasket shall be inserted and the joint surfaces cleaned and lubricated with soapy water before tightening the bolts to the specified torque.
- C. Thrust Restraint
  1. Thrust restraint shall be accomplished by the use of mechanical restraining devices unless specifically identified otherwise on the Drawings or herein.
  2. Length of restrained joints shall be in accordance with the lengths listed in the table as shown on the Drawings.
- D. Installation of Pipes on Curves:
  1. No joint deflection or pipe bending is allowed in PVC pipe. The maximum allowable tolerance in the joint due to variances in installation is 0.75° (degrees) (3-inches per joint per 20-foot stick of pipe). No bending tolerance in the pipe barrel shall be acceptable. Alignment change shall be made only with sleeves and fittings.

### 3.02 CLEANING AND FIELD TESTING

- A. At the conclusion of the Work, the Contractor shall provide all associated cleaning and field testing as specified in associated sections of these specifications.

END OF SECTION

**SECTION 15100**  
**ANCILLARY EQUIPMENT**

**PART 1 - GENERAL**

1.01 DESCRIPTION

- A. Scope of Work: Provide all valves and appurtenances, ready for operation, as shown on the Drawings and as specified herein.

1.02 QUALITY ASSURANCE

- A. All valves, appurtenances, and ancillary equipment shall be products of well-established reputable firms who are fully experienced, reputable and qualified in the manufacture of the particular equipment to be furnished. The equipment shall be designed, constructed, and installed in accordance with the best practices and methods and shall comply with these Specifications.

1.03 SHOP DRAWINGS AND SUBMITTALS

- A. Submittals shall be submitted to the County for review and acceptance prior to construction in accordance with the General Conditions and specifications Section 01300 "Submittals."

**PART 2 - PRODUCTS**

2.01 GENERAL

- A. All valves, appurtenances, and ancillary equipment shall be of the sizes shown on the Drawings and specified herein.
- B. All valves and appurtenances shall have the name of the maker and the working pressure for which they are designed cast in raised letters upon some appropriate part of the body.
- C. All valves, appurtenances, and ancillary equipment shall be as specified in Appendix D "List of Approved Products" appended to these technical specifications.

2.02 AIR RELEASE VALVES

- A. For Water Service and Reclaimed Water Service
  - 1. General: Water mains shall be equipped with combination air release valves located as shown on the Drawings. Valves shall be made to remove air at high points where elevation changes exceed 5-feet. Automatic air release valves shall be located at high points for pipe systems greater than 12-inches in diameter.

2. Water and Reclaimed Water Combination Air Release Valves: The valve body shall be 316 stainless steel, 316 stainless steel float, bronze water diffuser Buna-N or Viton seat and stainless steel trim.
3. Fittings from the main to the air release valve shall be threaded and made of brass.

B. For Wastewater Service

1. General: Wastewater force mains shall be equipped with combination air release valves located as shown on the Drawings. Valves shall be made to remove air at high points where elevation change is 2-feet or greater, located in an enclosure as detailed on the Drawings.
2. Wastewater Combination Air Release Valves: The valve body shall be conical in shape and shall be 316 stainless steel with a funnel shape lower body to automatically drain sewage back into the system. All internal parts shall be corrosion resistant 316 stainless steel or non-metallic plastic materials.
3. On flanged connections 316 stainless steel bolts, nuts and washers are to be used along with the proper sized gasket.

C. Air release valves shall be installed in an enclosure.

## 2.03 TAPPING SLEEVES AND VALVES

A. General: Tapping sleeves shall be mechanical joint sleeves.

B. Mechanical Joint Sleeves: Sleeves shall be cast of gray-iron or ductile-iron and have an outlet flange with the dimensions of the Class 125 flanges shown in ANSI B16.1 and properly recessed for tapping valve. Glands shall be gray-iron or ductile iron. Gaskets shall be vulcanized natural or synthetic rubber. Bolts and nuts shall comply with ANSI/AWWA C111/ANSI A21.11. Sleeves shall be capable of withstanding a 200-psi working pressure.

C. Fabricated Mechanical Joint Tapping Sleeves: Sleeves shall be of split mechanical joint design with separate end and side gaskets. Sleeves shall be fabricated of high strength steel, meeting ASTM A283 Grade C or ASTM A-36. Outlet flange shall meet AWWA C-207, Class "D" ANSI 150-pound drilling and be properly recessed for the tapping valve. Bolts and nuts shall be high strength low alloy steel to AWWA C111 (ANSI A21.11). Gasket shall be vulcanized natural or synthetic rubber. Sleeve shall have manufacturer applied fusion-bonded epoxy coating, minimum 12-mil thickness.

D. Tapping Valves: Tapping valves shall be resilient seated gate valves flange by mechanical joint ends. Valves shall be compatible with tapping sleeves as specified above and specifically designed for pressure connection operations.

1. Tapping valves with alignment lip shall be placed vertical where possible for Water and Reclaimed Water.



2. Tapping Valves 16-inch and larger shall be AWWA C515 resilient seated only (16-inch and 24-inch no gearing required) above 24-inch shall be installed vertically with a spur gear actuator. When tapping existing mains, valves 24-inch and above shall be furnished with NPT pipe plugs for flushing the tracks.

#### 2.04 VALVE BOXES FOR BURIED VALVES

- A. Standard 2-piece Cast Iron Valve Box: Required for mains less than 6-feet below finished grade and less than or equal to 12-inches in diameter.
  1. Valve boxes shall be provided with suitable heavy bonnets and shall extend to such elevation at or slightly above the finished grade surface as directed by the County's Representative.
  2. The barrel shall be 2-piece, screw type only, having 5-1/4-inch shaft. The upper section shall have a flange at the bottom having sufficient bearing area to prevent settling and shall be complete with locking cast iron covers. Coat buried cast iron pieces with coal tar epoxy.
- B. Valve Box Assembly: Valve box assemblies with operating nut extension is required for any size main that is 6-feet or greater below finished grade or if mains are greater than 12-inches in diameter.
  1. Valve boxes shall be 1 complete assembled unit composed of the valve box and extension stem that attaches and locks to the 2-inch wrench nut. The extension shall be high strength, corrosion resistant steel construction, and permanently attached to the operating nut.
  2. The operating nut extension insert shall be 1 complete assembled unit with a self-adjusting extension stem system that fits inside a standard valve box that will accommodate variable trench depths 6-feet and greater as shown in the Drawings. All moving parts of the extension stem shall be enclosed in a housing to prevent contact with the soil.
  3. A valve box-centering device designed to eliminate the shifting of the valve box against the operating nut of the valve shall be used. Valve box assembly shall be adjustable to accommodate variable trench depths 6-foot and greater as shown in the Drawings.
- C. The stem assembly shall be of a telescoping design that allows for variable adjustment length. The material shall be at minimum galvanized square steel tubing. The stem assembly shall have a built-in device that prevents the stem assembly from disengaging at its fully extended length. The extension stem must be capable of surviving a torque test to 1,000-foot-pounds without failure.
- D. Valve boxes shall have locking cast iron covers utilizing a 5-sided nut with a special wrench needed to open. Covers shall have "WATER", "SEWER", or "RECLAIMED WATER" cast into the top, as applicable
- E. Concrete Collar: Each valve installed in an unimproved area (outside of pavement, driveways or sidewalks) shall require a 24-inch by 24-inch by 6-inch concrete pad or collar as shown in the Drawings.

- F. Identification Disc: Each 16-inch or larger valve (unless otherwise shown on the Drawings) installed shall be identified by a 3-inch diameter bronze disc anchored in the concrete pad or collar in unimproved areas and/or anchored on a 4-inch by 4-inch by 18-inch long concrete post set flush with the pavement surface in improved areas. The disc shall be stamped with the following information as shown on the Drawings:
  - 1. Size of the valve
  - 2. Type of valve
  - 3. Service
  - 4. Direction and number of turns to open
- G. Valve markers are to be made of schedule 80 PVC and have decal applied containing information as shown on the Drawings. The marker shall be the same color as the pipe being marked.

## 2.05 LINE STOPPING ASSEMBLIES

- A. Sleeves used to line-stop existing mains shall be provided and installed at locations as shown on the Drawings. Line-stopping sleeve shall be steel fusion epoxy coated body with stainless steel straps, bolts, nuts, and washers. Contractor shall determine the outside diameter of the existing main prior to ordering sleeve.
- B. The line-stopping equipment shall consist of a resilient sealing element, which shall be attached to and transported by a plug inserter perpendicularly into the pipe. The linear actuator shall extend and retract the Line-Stopper into and out of the pipe. When retracted from the pipe, the element and inserter shall be contained within the stopper housing.
- C. The hollow cylindrical sealing element shall be molded of natural rubber. The lower interior chamber of the element shall be enlarged into a hemispherical cavity to allow symmetrical deformation into sealing conformity with the bore of the pipe.
- D. The linear actuator shall be hydraulic and shall have a self-contained hand operated pump. The actuator shall exert a force sufficient to perpendicularly deform the cylindrical element into axially symmetrical sealing contact with the bore of the pipe. Design of actuator shall provide adequate stroke and means to continually align the line-stop bullet stopping assemblies in sizes 14-inch through 20-inch with pressure rating to 250-psig.
- E. Equalization of pressure across the sealed element shall not be required to retract the element from the pipe. No equalization fittings shall be required downstream of the line-stopper.
- F. The line-stopping equipment shall be accurately aligned on the 4-inch through 8-inch fittings by locating in the external threads of the fitting nozzle. With sizes 10-inch and 12-inch the location shall be made on the centering groove of the fitting flange.
- G. Line-stopping equipment must be capable of function and acceptance of multiple stopper heads and shall be compatible with existing system fittings.

## 2.06 FIRE HYDRANTS AND VALVE ASSEMBLIES

- A. Fire hydrants shall be 5-1/4-inch minimum valve opening and shall comply with the current AWWA Standard Specifications C502-54 for 150-psi working pressure. Fire hydrants shall be of ample length for 3-1/2-foot depth of bury with necessary extensions to place safety flange the required 3-inches above finished grade. Each hydrant shall be made in at least 2 sections bolted together. All interior working parts of the hydrant shall be removable from the top of the hydrant to allow repairs without removing the hydrant barrel after it has been installed. It shall be provided with 2 (two) 2-1/2-inch hose nozzles and 1 (one) 4-1/2-inch pumper nozzle, all having its specific Fire District Standard hose threads. All nozzles shall have caps attached by chains. Operating nuts shall be AWWA Standard. Drain or weep holes shall be permanently plugged by the manufacturer.
- B. Fire hydrant painting and coating shall meet the requirements of Section 09900 "Painting." Fire hydrants shall be painted silver in accordance with the present Orange County standards. Three (3) operating wrenches shall be furnished for every 10 hydrants installed or relocated.
- C. All hydrant assemblies shall incorporate anchoring hydrant fittings, including M.J. Locked Hydrant Tee with split gland to provide the locking together of the entire assembly. Gate valve shall be as specified in Specification Section 15111 "Plug Valves."
- D. All hydrants shall have a 24-inch to 48-inch square by 6-inch thick reinforced concrete shear pad as shown in the Drawings.
- E. Fire hydrants shall be located in the general location as shown on the Drawings. Final field location of all hydrants shall be as approved by the County. All hydrants shall be located no less than 5 and no more than 10-feet from the edge of pavement of the adjacent roadway and no less than 5-feet from any physical feature which may obstruct access or view of any hydrant unless otherwise approved by the County.

## 2.07 SERVICE SADDLES

- A. Stainless Steel Service Saddles: Shall be epoxy or nylon coated ductile iron body with stainless steel, 18-8 type 304 straps, AWWA tapered threads for 1-inch and 2-inch to be iron pipe threads. Controlled OD saddles to be used on C905 PVC pipe, double straps to be 2-inch minimum width each, single strap to be minimum of 3-inches wide.
- B. PVC Pipe Service Saddle
  1. One-inch and 2-inch services utilize brass body saddle with controlled OD for 12-inches and smaller pipe.
  2. One-inch and 2-inch taps on existing pipes larger than 12-inches shall use controlled OD epoxy or nylon coated ductile iron body with stainless steel 18-8 type 304 straps.
  3. Four-inch or larger services shall be mechanical tapping sleeves.
- C. Ductile Iron Pipe Service Saddle
  1. One-inch services shall be direct tapped.

2. Two-inch service shall use a controlled OD service tapping saddle with stainless steel straps and a ductile iron body that is either nylon or epoxy coated
3. Four-inch or larger services shall be mechanical tapping sleeves.

D. HDPE Pipe Service Saddle

1. One-inch and 2-inch shall utilize controlled O.D. tapping saddle with epoxy or nylon coated stainless steel 18-8 type 304 double straps.
2. Four-inch or larger, shall use wide body tapping sleeves with a broad cross section gasket set in a retaining groove that increases sealing capability as pressure increases.

E. Concrete Pressure Pipe Service Saddle

1. Tapped concrete pressure pipe shall be in accordance with AWWA M-9, using a strap-type saddle made specifically for concrete cylinder pressure pipe.

F. Steel Pipe Service Saddle

1. Welded-on steel sleeves shall be used for all sizes and applications.

## 2.08 CORPORATION STOPS AND CURB STOPS

- A. Corporation Stops: Shall be brass body reduced port type compatible with the polyethylene tubing and threaded in accordance with AWWA C800, AWWA C901, and shall comply with NSF-61.
- B. Curb Stops: Shall be brass body reduced port type compatible with the polyethylene tubing and threaded in accordance with AWWA C800, AWWA C901, and shall comply with NSF-61.

## 2.09 WATER MAIN AND RECLAIMED WATER MAIN SERVICE PIPE

- A. Polyethylene Service Pipe: One-inch and 2-inch service lines shall be polyethylene tubing conforming to AWWA C901 and AWWA C800. Tubing shall be approved for potable water use and bear the seal of the National Sanitation Foundation (NSF). The product shall be rated for a minimum working pressure of 150-psi and a (Dimension Ratio) DR-9 size. The tubing shall be designated copper tube size and the material PE-2406 cell classification minimum PE213323C in accordance with ASTM 3350.
- B. Ductile Iron Service Pipe: Services 4-inch and larger shall be DIP. If the existing main is on the same side of the street as the property to be serviced, the service pipe shall be DIP from the point of connection to the existing main to the meter assembly. If the existing main is on the opposite side of the street as the property to be serviced, at a minimum, the segment of pipe immediately upstream from the meter assembly shall be DIP.
- C. No service pipe shall terminate under a driveway.

## 2.10 PRESSURE GAUGES

- A. Pressure gauges shall be installed on each pump station discharge pipe as indicated on the Drawings.
- B. Pressure gauge shall be direct mounted, diaphragm (type) gauge, stainless steel case, stainless steel sensing element, liquid filled, with a 4-1/2-inch diameter dial and furnished with a clear glass crystal window and 1/4-inch shut-off (isolation) valve. Gauges shall be weatherproof.
- C. The pressure gauge face dial shall be white finished aluminum with jet-black graduations and figures and shall indicate the units of pressure measured in psi. Gauges shall be provided with pressure at normal operation at the mid range of the gauge.
- D. As wastewater flows through the housing, the cylinder shall transmit pressure through the sensing liquid. Gauge outlet in the spool or ring shall be threaded, 1/4-inch, per ANSI B2.1.
- E. Nipples for connecting gauges to piping shall be Schedule 80S, Grade TP 316 seamless stainless steel, conforming to ASTM A 312. Fittings shall conform to ASTM A 403, Class WP316. Threads shall conform to ANSI B2.1. Size of pipe nipple shall match the gauge connection size.

## 2.11 TIE RODS

- A. Steel for tie rods and tie bolts shall conform to the requirements of ASTM Designation A 242, and rods shall be galvanized in conformance with requirements of ASTM Designation A 123.

## 2.12 BACK FLOW PREVENTION

- A. Reduced Pressure Backflow Preventer shall conform to the requirements of ASSE 1013, rated to 180°F and supplied with full port ball valves. The main body and access covers shall be bronze and meet ASTM B 584, the seat ring and all internal polymers shall be NSF Noryl and the seat disc elastomers shall be silicone.
- B. Dual check valves shall be required and shall be accessible for maintenance without removing the relief valve or the entire device from the line.
- C. The bottom of the preventer shall be installed a minimum of 12-inches above grade and not more than 30-inches above grade.

## 2.13 FLANGED COUPLING ADAPTERS

- A. All adapters shall be harnessed with the bolts across the joint (flange to flange or flange to lug) designed for the pipe test pressure.

- B. Adapter Size: Conform in size and bolt hole placement to ANSI standards for steel and/or cast iron flanges 125 or 150-pound standard unless otherwise required for connections.
- C. Exposed Sleeve Type
  - 1. Material: Steel
  - 2. Coating: Enamel
  - 3. Bolting: Carbon steel
  - 4. Acceptable Manufacturers: Dresser Manufacturing Co. - Style 128 for cast iron ductile iron and steel pipes with diameters of 2-inches through 96-inches, or equal.
- D. Buried Sleeve Type
  - 1. Material: Cast iron
  - 2. Bolting: Type 304 stainless steel conforming to ASTM A 193, Grade B8 for bolts, and ATM A 194, Grade 8 for nuts and washers. Bolts and nuts greater than 1-1/8-inches shall be carbon steel, ASTM A 307, Grade B, with cadmium plating, ASTM A 165, Type NS.
  - 3. Acceptable manufacturers: Dresser Manufacturing Co. - Style 127 locking type for cast iron, ductile, iron, asbestos cement and steel pipes with diameters of 3-inches through 12-inches, or equal.
- E. Split Type
  - 1. Material: Malleable or ductile iron.
  - 2. Design: For use with grooved or shouldered end pipe.
  - 3. Coating: Enamel
  - 4. Acceptable Manufacturers: Victaulic Company of America - Style 741 for pipe diameters of 2-inches through 12-inches, Victaulic Company of America - Style 742 for pipe diameters of 14-inches through 16-inches, or equal.

## **PART 3 - EXECUTION**

### **3.01 INSTALLATION**

- A. All ancillary equipment shall be installed in the locations shown, true to alignment and rigidly supported. Any damage to the above items shall be repaired to the satisfaction of the County before installation.
- B. After installation, all ancillary equipment shall be tested as specified for adjacent piping. If any joint or equipment proves to be defective, it shall be repaired and retested to the satisfaction of the County.
- C. Install all floor boxes, brackets, extension rods, guides, the various types of operators and appurtenances as shown on the Drawings that are in masonry floors or walls, and install concrete inserts for hangers and supports as soon as forms are erected and before concrete is poured. Before setting these items, the Contractor shall check all plans and figures, which have a direct bearing on the location and shall be responsible for the proper location of these valves and appurtenances during the Construction of the structures.

D. Notification and Connections to Existing Mains

1. The Contractor shall submit a completed "System Connection" form to the County to schedule the connection. The request shall be made a minimum of 5-working days prior to the proposed tie-in to the existing main for pressure connections and 10-working days prior to the proposed tie-in to the existing main for non-pressure connections. In this request, the Contractor shall provide the following information:
  - a. Points of connection, fittings to be used and method of flushing and disinfection if applicable
  - b. Estimated construction time for said connections
  - c. Identify pressure and non-pressure connections
2. Connections shall only be made on the agreed upon date and time. If the Contractor does not perform the Work in the agreed upon manner or schedule, the Contractor shall be required to reschedule the connection by following the procedure outlined above.

E. Pressure Connections: Sufficient length of main shall be exposed to allow for installation of the tapping sleeve and valve and the operation of the tapping machinery. The main shall be supported on concrete pedestals or bedding rock at sufficient intervals to properly carry its own weight, plus the weight of the tapping sleeve, valve and machinery. Any damage to the main due to improper or insufficient supports will be repaired at the Contractor's expense.

1. Prior to the tap, the Contractor shall assemble all materials, tools, equipment, labor, and supervision necessary to make the connection.
2. The Contractor shall excavate a dry and safe working area pit of sufficient size to enable the necessary Work.
3. The inside of the tapping sleeve and valve, the outside of the main and the tapping machine shall be cleaned and swabbed or sprayed with 1% liquid chlorine solution prior to beginning installation for water system pressure connections and must comply with AWWA C-651-99 or most current version.
4. After the tapping sleeve has been mounted on the main, the tapping valve shall be bolted to the outlet flange, making a pressure tight connection. Prior to beginning the tapping operation, the sleeve and valve shall be pressure tested under the observation of County personnel to 150-psi for 30-minute duration to ensure that no leakage will occur.
5. For pressure connections 4-inch through 20-inch installation, the minimum diameter cut shall be 1/2-inch less than the nominal diameter of the pipe to be attached. For larger taps, the allowable minimum diameter shall be 2 to 3-inches less than the nominal diameter of the pipe being attached. After the tapping procedure is complete, the Contractor shall submit the coupon to the County.
6. The tapping valve shall be placed horizontally for pressure connections to wastewater force mains. A plug valve shall be attached to the tapping valve after the tapping procedure is complete. The tapping valve shall be left in the open position prior to backfilling.
7. Adequate restrained joint fittings shall be provided to prevent movement of the installation when test pressure is applied.
8. The Contractor shall be responsible for properly backfilling the work area pit after the Work is completed.

F. Non-Pressure Dry Connections

1. For water service connections, no customer shall be without service for more than 6-hours. For wastewater connections, provide bypass operations per Section 01516 "Collection System Bypass." This accommodation to customers may include scheduling after Normal Working Hours.
2. The Contractor shall be ready to proceed by pre-assembling as much material as possible at the site to minimize the length of service interruption.
3. Needed pipe restraints must be installed prior to the initiation of the shutdown.
4. The excavation shall be opened and needed site preparations must be completed before the initiation of the connection work.
5. County shall postpone a service cut-off if the Contractor is not ready to proceed at the scheduled time.
6. Only County personnel shall operate the valves needed to perform the shutdown on the existing system.

3.02 PAINTING

- A. All exterior surfaces of iron body valves shall be clean, dry, and free from rust and grease before coating.
- B. For valves installed underground or in valve vaults, all exterior ferrous parts of valve and actuator shall be coated at the factory with a thermally bonded epoxy coating in accordance with AWWA C550, latest revision.
- C. For aboveground service, the exterior ferrous parts of all valves shall be coated in weatherproof paint. The color of the finish coats shall be in accordance with the Orange County Utilities Standards.

END OF SECTION



## SECTION 15110

### PLUG VALVES

#### PART 1 - GENERAL

##### 1.01 DESCRIPTION

Wastewater force mains shall have plug valves installed as shown on the Drawings. This Section specifies plug valves, manual actuators and associated valve boxes.

##### 1.02 QUALITY ASSURANCE

###### A. References

Reference	Title
ANSI B16.1	Cast Iron Pipe Flanges and Flanged Fittings Class 25, 125, 250, and 800
ASTM A126	Gray Iron Castings for Valves, Flanges, and Pipe Fittings
ASTM A276	Stainless and Heat-Resisting Steel Bars and Shapes
ASTM A436	Austenitic Gray Iron Castings
ASTM A536	Ductile Iron Castings
AWWA C504	Rubber Seated Butterfly Valves

###### B. Proof-of-Design Tests

The Contractor shall furnish the County three (3) certified copies of a report from an independent testing laboratory certifying successful completion of proof-of-design testing conducted in accordance with AWWA C504, Section 5.2, except that where the word "disc" appears in the standard, it is understood to mean "plug." In lieu of testing the valves at an independent testing laboratory, proof-of-design testing may be performed at the valve manufacturer's laboratory, but must be witnessed by a representative of a qualified independent testing laboratory, and all test reports must be certified by the laboratory representative. Proof-of-design testing shall have been performed on at least 3 (three) 6-inch diameter valves, with all 3 (three) test units demonstrating full compliance with the test standards. Failure to satisfactorily complete the test shall be deemed sufficient evidence to reject all valves of the proposed make or manufacturer's model number.

##### 1.03 SHOP DRAWINGS AND SUBMITTALS

- A. Submittals shall be submitted to the County/Professional for review and acceptance prior to construction in accordance with the General Conditions and specifications Section 01300 "Submittals."

- B. **PRODUCT DATA:** The following information shall be provided in accordance with 1.03 of Section 01300 "Submittals."
1. Manufacturer's product data
  2. Proof-of-design test reports specified in paragraph 1.02 B

**PART 2 - PRODUCTS**

2.01 GENERAL

- A. All material supplied shall be one of the products specified in Appendix D "List of Approved Products" appended to these technical specifications.

2.02 MANUFACTURERS

Plug valves meeting the requirements of this Section shall be supplied from the approved manufacturers as listed in Appendix D "List of Approved Products."

2.03 MATERIALS

Materials of construction shall be as follows:

Component	Material
Body	Cast iron, ASTM A126, Class B
Plug	Cast iron, ASTM A126, Class B, or cast iron ASTM A436 (Ni-resist), or ductile iron, ASTM A536
Plug facing	Neoprene
Body seats	
3-inches and larger	Nickel
Packing	Buna V-flex or TFE

2.04 MANUFACTURE

- A. **Plug Valves:** Valves shall be straight-flow non-lubricated resilient plug type suitable for drip tight, bi-directional shutoff at the specified valve design pressure.
1. Plug valves shall be eccentric, ball centric or full port. All valves shall open counter-clockwise.
  2. All buried valves shall be fitted with valve boxes as specified in Paragraph 2.03.B of this Section. One 2-inch square tee-handled valve wrench, made by the valve manufacturer, of suitable length to operate all valves within valve boxes shall be furnished for every 5 valves installed.
  3. Plug valves shall be installed complete with extension stems, buried gear actuators, and 2-inch operating nuts (buried) or operating hand wheels (exposed), as required for normal operation. All valve nuts shall be brought up to 1-foot below the proposed finish grade.

4. Valves shall have the name of the manufacturer and the size of the valve cast or molded onto the valve body. A permanent plate shall be attached to the valve or operator indicating serial number, order number, accessories, operator model and manufacturer.
5. Ball centric/eccentric plug valves shall be of the non-lubricated type. The port area for valves 4-inches to 20-inches shall have a minimum 80% nominal pipe diameter and valves 24-inches and larger shall have a minimum port area of 70% of nominal pipe diameter unless noted on the Drawings as "full port". Plug valves denoted as full port shall have a port area equal to the full area of the nominal pipe diameter.
6. Minimum pressure rating of valves 4-inches to 12-inches shall be 175-psi; valves 14-inches to 72-inches shall be 150-psi. Valve bodies shall be cast iron ASTM A126, Class B and fusion-bonded epoxy coated.
7. Valve ends shall be mechanical joint (buried) or flanged (exposed) as indicated on the Drawings. Valve flange drilling for valves 3-inches and larger shall be per ANSI B16.1, Class 125. Plugs shall be cast iron or ductile iron with neoprene facing and shall be of the single piece design. The plug shall be of the same configuration for all valves and shall require no stiffening member opposite the plug for balance or support. Valve body seats shall have a welded-in overlay of not less than 90% nickel. Packing shall be adjustable and safely replaceable without disassembling the valve. Bushing shall be 316 stainless steel in both upper and lower journals and shall be protected from foreign matter with the use of a grit seal or similar. The valve should be capable of drip tight shut off with flow in either direction at the full pressure of the valve. All exposed nuts, bolts, springs and washers on buried service valves shall be 304 stainless steel. All above- grade valves shall have 316 stainless steel hardware.
8. Actuators: Manual valves shall have lever or gear actuators and tee wrenches, extension stems, and floor stands as indicated on the Drawings. Valves 6-inch and larger shall be equipped with buried service rated gear actuators. Buried valves shall have a 2-inch square operating nut. All gearing shall be enclosed in a steel housing and be suitable for running in a lubricant with seals provided on all shafts to prevent entry of dirt and water into the actuator. Actuator shafts shall be supported on permanently lubricated bronze bearings. Actuators shall clearly indicate valve position and an adjustable stop shall be provided to set closing torque. Exposed nuts, bolts and washers shall be 316 stainless steel. Valve packing adjustment shall be accessible without disassembly of the actuator.
9. Valve Testing: Plug valves shall be tested in accordance with AWWA C504. Each valve shall meet the performance, leakage, and hydrostatic tests described in AWWA C504. The leakage test shall be applied to the face of the plug tending to unseat the valve. The manufacturer shall furnish certified copies of reports covering proof-of-design testing as described in AWWA C504.

#### B. Valve Boxes

1. All valves installed underground shall have cast iron 2-piece valve boxes. Valve boxes shall be provided with suitable heavy bonnets and shall extend to such elevation at or slightly above the finished grade surface as directed by the County. The barrel shall be screw type only, with a 5-1/4-inch shaft. The upper section shall have a flange at the bottom having sufficient bearing area to prevent settling and shall be complete with locking cast iron covers. Covers shall have "SEWER" cast into the top for all wastewater mains which shall be so constructed as to prevent tipping or rattling.

2. A valve box with an operating nut extension is required for any size main that is 6-feet or greater below finished grade. The extension shall be high strength, corrosion resistant steel construction and permanently attached to the operating nut. The operating nut extension insert shall be one complete assembled unit with a self-adjusting extension stem system that fits inside a standard valve box. All moving parts of the extension stem shall be enclosed in a housing to prevent contact with the soil. A valve box-centering device designed to eliminate the shifting of the valve box against the operating nut of the valve shall be used. The valve box assembly shall be adjustable to accommodate variable trench depths 6-foot and greater as shown in the Drawings.
3. The stem assembly shall be of a telescoping design that allows for variable adjustment length. The material shall be galvanized square steel tubing. The stem assembly shall have a built-in device that prevents the stem assembly from disengaging at its fully extended length. The extension stem must be capable of surviving a torque test to 1,000 foot-pounds without failure.
4. The valve boxes shall have locking lids.
5. Extension sections shall be cast or ductile iron only.
6. Valve boxes in non-paved areas shall be installed with a valve collar as shown in the Drawings. The protective concrete collar with a bronze identification disc shall be constructed of Class B concrete as shown on the Drawings.

### **PART 3 - EXECUTION**

#### **3.01 INSTALLING VALVES AND BOXES**

- A. Valves: Valves shall be carefully inspected, opened wide and then tightly closed and the various nuts and bolts shall be tested for tightness. Plug valves shall have the plug shaft installed horizontally with the plug rotating upward to the top of the valve. Any valve that does not operate correctly shall be removed and replaced. Seats shall face in the direction as recommended by the manufacturer.
- B. Valve Boxes: Valve boxes and risers shall be carefully centered over the operating nuts of the valves so as to permit a valve key to be fitted easily to the operating nut. In unpaved areas, valve boxes shall be set to conform to the level of the finished surface and held in position by a concrete collar placed under the support flange as shown on the Drawings. The valve box shall not transmit surface loads to the pipe or valve. Extensions or risers for valve boxes shall be an integral part of the box. No cut sections of ductile iron or PVC pipe shall be used in extending the box to its proper height. Care shall be taken to prevent earth and other material from entering the valve box. Any valve box which is out of alignment or whose top does not conform to the finished ground surface shall be dug out and reset. Before final acceptance of the Work all valve boxes shall be adjusted to finish grade.

END OF SECTION

## SECTION 15111

### GATE VALVES

#### PART 1 - GENERAL

##### 1.01 DESCRIPTION

- A. Scope of Work: Furnish and install gate valves of the type and size and in the locations as shown on the Drawings and/or specified herein.
- B. General Design
  - 1. Resilient seat non-rising stem (NRS) gates valves shall be used for underground service and for aboveground service where shown on the Drawings.
  - 2. Resilient seat Outside Stem and Yoke (OS&Y) gate valves shall be used for aboveground service only where shown on the Drawings.

##### 1.02 QUALITY ASSURANCE

- A. All gate valves of same type and style shall be manufactured by one (1) manufacturer.

##### 1.03 SHOP DRAWINGS AND SUBMITTALS

- A. Submittals shall be submitted to the County/Professional for review and acceptance prior to construction in accordance with the General Conditions and specifications Section 01300 "Submittals."
- B. Shop Drawings and submittals shall be submitted to the County/Professional Engineer for review and acceptance prior to construction for the following:
  - 1. Certified Shop Drawings showing details of construction, dimensions (including laying length), and weight.
  - 2. Descriptive literature, bulletins, and/or catalogs showing all valve parts and describing material of construction by material and specification, e.g., AISI.
  - 3. Valve coatings and linings, if any.
  - 4. A complete bill of materials for all equipment.
  - 5. See individual sections for additional requirements.

##### 1.04 PRODUCT DELIVERY, STORAGE, AND HANDLING

- A. Shipping
  - 1. All parts shall be properly protected so that no damage or deterioration will occur during a prolonged delay from the time of shipment until installation is completed.
  - 2. Factory assembled parts and components shall be dismantled for shipment unless permission is received in writing from the County/Professional Engineer.

3. Finished surfaces of all exposed openings shall be protected by wooden blanks, strongly built and securely bolted thereto.
4. Finished iron or steel surfaces not painted shall be properly protected to prevent rust and corrosion.
5. After hydrostatic or other tests, all entrapped water shall be drained prior to shipment, and proper care shall be taken to protect parts from the entrance of water during shipment, storage, and handling.
6. Each box or package shall be properly marked to show its net weight in addition to its contents.

B. Storage

1. Store valves and accessories in an area on the construction site protected from weather, moisture, or possible damage.
2. Do not store valves or accessories directly on the ground.

C. Handling

1. Handle valves and accessories to prevent damage of any nature.
2. Carefully inspect all materials for:
  - a. Defects in workmanship and materials.
  - b. Removal of debris and foreign material in valve openings and seats.
  - c. Proper functioning of all operating mechanisms.
  - d. Tightness of all nuts and bolts.

#### 1.05 WARRANTY AND GUARANTEES

- A. The manufacturer's warranty period shall be concurrent with the Contractor's for 1-year, unless otherwise specified, commencing at the time of final acceptance by the County.
- B. The Contractor shall be responsible for obtaining certificates for equipment warranty for all equipment which lists for more than \$500.00 (major equipment). The County reserves the right to request warranties for equipment not classified as "major". The Contractor shall still warrant equipment not considered to be "major" in the Contractor's 1-year warranty period even though certificates of warranty may not be required.
- C. In the event that the equipment manufacturer or supplier is unwilling to provide a 1-year warranty commencing at the date of substantial completion, the Contractor shall obtain from the manufacturer a 2-year warranty commencing at the time of equipment delivery to the job site. This 2-year warranty from the manufacturer shall not relieve the Contractor of the 1-year warranty starting at the time of County acceptance of the equipment.
- D. The County shall incur no labor or equipment cost during the guarantee period.
- E. Guarantee shall cover all necessary labor, equipment, and replacement parts resulting from faulty or inadequate design, improper assembly or erection, defective workmanship and materials, leakage, breakage, or other failure of equipment or components furnished by the manufacturer.

## PART 2 - PRODUCTS

### 2.01 GENERAL

- A. All material supplied shall be one of the products specified in Appendix D "List of Approved Products" appended to these technical specifications.

### 2.02 MATERIALS

- A. Gate valves shall be resilient seat gate valves, manufactured to meet or exceed the requirements of AWWA C509/C515, latest revision, and these Specifications. All valves are to be tested in strict accordance with AWWA C509/C515.
- B. Valves shall have an unobstructed waterway equal to or greater than the full nominal diameter of the valve.
- C. The minimum design working water pressure shall be minimum 250-psig.
- D. Gate valves shall be installed vertically per the Drawings and with minimum depth of cover per Table 15111-1.

**Table 15111-1  
Minimum Pipe Cover Required for Valves**

Pipe Diameter (Inches)	Vertical Gate Valve Cover	
	LOCAL Roadway	Non-LOCAL Roadway*
4-inch – 8-inch	30-inch	36-inch
12-inch	36-inch	36-inch
16-inch	44-inch	48-inch
20-inch	-	50-inch
24-inch	-	54-inch
* Additional 12-inches of cover is required for all vertical valves 16-inches and greater located in the pavement		

- E. Valves 16-inches and larger shall be AWWA C515 resilient seated only (16-inches through 24-inches no gearing required).
- F. The valve body, bonnet, and bonnet cover shall be cast iron ASTM A126, Class B for C509 valves and ductile iron ASTM A536 for C515 valves. All ferrous surfaces inside and outside shall have a fusion-bonded epoxy coating in accordance with AWWA C 550.
- G. A 2-inch wrench nut shall be provided for operating the valve. Valves 30-inches and larger shall be provide with spur gear actuators. Side actuated gate valves are not acceptable. All valves shall open left or counter clockwise.
- H. The valves shall have non-rising stems with the stem made of cast, forged, or rolled bronze as specified in AWWA C509. Two (2) stem seals shall be provided and shall be of the O-ring type. The stem nut must be independent of the gate.

- I. The resilient sealing mechanism shall provide zero leakage at test and normal working pressure when installed with the flow from either direction.
- J. Tapping valves shall be placed vertical where possible for Water and Reclaimed Water. When tapping existing mains, valves 24-inches and above shall be furnished with NPT pipe plugs for flushing the tracks.
- K. All materials shall be in accordance with Appendix D "List of Approved Products."

## **PART 3 - EXECUTION**

### **3.01 PREPARATION**

- A. All valves shall be inspected upon delivery in the field to insure proper working order before installation. Valves shall be set and jointed to the pipe in the manner as set forth in the AWWA Standards for the type of connection ends furnished. All buried gate valves shall be connected using restrained joints. All valves and appurtenances shall be installed true to alignment and rigidly supported. Any damage to the above items shall be repaired to the satisfaction of the County before installation.

### **3.02 INSTALLATION**

- A. Install valves and accessories in strict accordance with manufacturer's instruction and recommendations as shown on the Drawings and as directed by the County.
- B. Carefully erect all valves and support them in their respective positions free from distortion and strain.
- C. Bolt holes of flanged valves shall straddle the horizontal and vertical centerlines of the pipe run to which the valves are attached. Clean flanges by wire brushing before installing flanged valves. Clean flange bolts and nuts by wire brushing, lubricate threads with oil and graphite, and tighten nuts uniformly and progressively. Clean threaded joints by wire brushing or swabbing. Apply Teflon joint compound or Teflon tape to pipe threads before installing threaded valves. Joints shall be watertight.
- D. Support all valves connected to pumps and equipment and in piping systems that cannot support valves.
- E. Repair any scratches, marks and other types of surface damage with original coating as supplied by the factory.
- F. Valves shall be carefully inspected, opened wide and then tightly closed and the nuts and bolts shall be tested for tightness. Special care shall be taken to prevent any foreign matter from becoming lodged in the valve seat. Any valve that does not operate correctly shall be removed and replaced.



### 3.03 INSPECTION AND TESTING

- A. Check and adjust all valves and accessories for smooth operation.
- B. Test valves for leakage at the same time that connecting pipelines are tested. See Section 02660 "Potable Water System" for pressure testing requirements. Protect or isolate any parts of valves, operators, or control and instrument systems whose pressure rating is less than the pressure tests.

END OF SECTION

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**APPENDIX A**  
**GEOTECHNICAL ENGINEERING REPORT**

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July 26, 2016

David E. Mahler, P.E.  
Sr. Vice President/Associate  
CPH  
1117 East Robinson Street  
Orlando, Florida 32801

Re: Geotechnical Exploration Report  
Continuing Utilities Engineering Services Contract No. Y14-906B  
Presidents Drive Force Main Replacement  
Orlando, Florida  
BME Project No. 16-053

Dear Mr. Mahler:

Blue Marlin Engineering (BME) submits this Report in fulfillment of the scope of services described in our proposal number 15-098, dated March 24, 2016. This Report describes our understanding of the project and presents our evaluations.

## **EXECUTIVE SUMMARY**

For this Report, the conditions at this site were explored using 3 standard penetration test (SPT) borings and 2 monitor wells. Based on published USGS Topographic Maps, the existing site grades where our borings were performed are on the order of +100 feet NGVD. Groundwater levels were encountered in the borings at an average depth of 5 feet below the existing ground surface (corresponding elevation on the order of +95 feet NGVD). The following generalized subsurface conditions were encountered:

Layer 1: A 12-foot layer of fine to slightly silty Sand (SP, SP-SM)

Layer 2: A 5-foot layer of silty Sand (SM)

Layer 3: A 2(+)-feet layer of Clay with sand (CL)

Following the recommendations provided in this Report, it appears that the proposed development is viable at this site.

[www.BlueMarlinEngineering.com](http://www.BlueMarlinEngineering.com)

Blue Marlin Engineering, LLC \* 102 Drennen Road, Suite B-10 \* Orlando, FL 32806  
Phone: 407-217-4464 \* Fax: (321) 710-2483

## PROJECT INFORMATION

Orange County Utilities is planning a force main replacement project on Presidents Drive, near the intersection of Presidents Drive and Sand Lake Road. The replacement will consist of approximately 800 linear feet of 24" force main pipe. The anticipated depth of the force main pipe will be 10 feet or less.

We understand that dewatering may be conducted to install the new force main pipe that would require a National Pollutant Discharge Elimination System (NPDES) Permit for off-site discharge. Groundwater sampling and analysis was performed for this project.

## PURPOSE

The purpose of our services on this project was to explore the shallow subsurface conditions at the site and to use the information obtained to provide geotechnical engineering recommendations.

## NRCS SOIL SURVEY REVIEW

The United States Department of Agriculture (USDA) Natural Resources Conservation Service (NRCS) Soil Survey for Orange County, Florida was reviewed to obtain near surface soils and groundwater information at the subject site. The Soil Survey indicates that this property is located in Section 28, Township 23 South, and Range 29 East.

Where the project site falls, the site is predominantly covered with Sanibel Muck (42) and Smyrna-Smyrna wet fine sand, 0 to 2 percent slopes (44). A soil survey map is shown on appended drawing A-2 and summarized in Table 1 below.

Table 1: NRCS Soil Survey

Soil Unit Map No.	Soil Name	Depth (inches)	Description	USCS Classification Symbol	Depth to Seasonal High Water Table (feet)
42	Sanibel Muck	0-11 11-15 15-80	Muck Sand, fine sand, mucky fine sand Sand, fine sand	PT SP, SP-SM SP, SP-SM	+1 – 1.0
44	Smyrna-Smyrna wet fine sand, 0 to 2 percent slopes	0-18 18-28 28-80	Fine Sand Sand, fine sand, loamy fine sand Sand, fine sand	SP, SP-SM SM, SP-SM SP, SP-SM	0 – 1.0



The soil units listed above are generally classified as sands with varying amounts of silt (SP, SP-SM, SM). The soils are generally appropriate for support of the proposed construction (excluding the muck). The Sanibel Muck soil series consist of 11 inches of muck followed by the sands (SP, SP-SM) as described above.

The NRCS predicts seasonal high groundwater levels within the site limits to be within one foot from existing site grades. Our field exploration program revealed groundwater conditions similar to those predicted by the NRCS (discussion in the Subsurface Conditions section of this report).

Please note that information contained in the NRCS Soil Survey is very general. It may not, therefore, be reflective of actual soil and groundwater conditions. The information obtained from the soil borings provides a better characterization of actual site subsurface conditions.

## **FIELD TESTS**

The subsurface conditions were explored with a total of 3 soil borings. Borings were completed within the proposed development area. The approximate test locations are shown in the appended Drawing No. 3.

The SPT borings were advanced to depths of 15 to 20 feet below existing site grades. The standard penetration test was used as the investigative tool within these borings.

Penetration tests were performed in substantial accordance with ASTM Procedure D 1586, "Penetration Test and Split-Barrel Sampling of Soils." This test procedure drives a 1.4-inch I.D. split-tube sampler into the soil profile using a 140-pound hammer falling 30 inches. The number of blows required to drive the sampler the second and third 6-inch increments is the soil N-value, in blows per foot, and is an indication of soil strength. The soil samples recovered from the soil borings were classified and stratified by a geotechnical engineer.

The results of the classification and stratification for each boring are shown in the appended Records of Test Boring. It should be noted that soil conditions may vary between the strata interfaces which are shown. The soil boring data reflects information from a specific test location only.

## **SUBSURFACE CONDITIONS**

Subsurface Profile - In general, the borings disclosed reasonably consistent subsurface conditions across the site. The borings performed at this site revealed a subsurface profile that consisted of a series of fine sands with varying amounts of silt through boring termination depths. In boring B-3, the sands were underlain by a clay layer.



We did not encounter a muck layer within our exploration program. It is likely the demucking was performed when Presidents Drive was constructed. Please note that, highly organic soils may still be present within the project site limits.

Standard Penetration Testing (SPT) indicates that the relative density of the upper sands to be loose to medium dense with depth. The clay layer was observed to be very firm.

Our soil classification is based on the material encountered in widely spaced borings. Soils encountered during the construction process may vary significant across the site and from what is shown in our soil borings. If different subsurface conditions are encountered at the time of construction, BME should be contacted immediately to evaluate the conditions encountered.

Groundwater - The groundwater table depth was monitored during drilling operations. However, once the use of driller's mud was introduced, accurate readings can be difficult to obtain. The groundwater levels were encountered at an average depth of 5 feet below the existing ground surface. We estimated seasonal high groundwater tables to be 3 to 3½ feet higher than what we encountered in the soil borings (consistent to what is being predicted by the NRCS Soil Survey).

The seasonal high groundwater level is affected by a number of factors. Factors may include, the drainage characteristics of the soils, the land surface elevations, relief points, and distance to relief points.

Groundwater levels will vary as a result of seasonal and storm events and with changes in subsurface conditions between boring locations. It is possible for groundwater levels to be higher or lower than the levels being reported. In order to better define the groundwater conditions at this site, longer term monitoring in cased holes or piezometers would be required.

## **LABORATORY TESTS**

Selected samples retrieved from the borings were tested for fines content, moisture content, and Atterberg limits. Those results are summarized in Table 2.

Particle Size Analysis - The fines content was determined by a no. 200 sieve particle size analysis. The tests were conducted in general accordance with ASTM D 1140. After preparation of the soil sample as per ASTM standards, the dry sample is thoroughly soaked with a dispersant and vigorously mixed. The soil-liquid mixture is washed on a no. 200 sieve and the retained soil is oven dried. The weight of soil retained on the sieve is used to calculate





the percent by weight passing a no. 200 sieve. The percentage of soil passing the No. 200 sieve aids in evaluating some of the engineering characteristics of the soil.

Plasticity - The term plasticity is applied to silts and clays and indicates an ability to be rolled and molded without breaking apart. The Atterberg limits are designed to determine the plasticity of finer grained soils. From the geotechnical engineering perspective, Atterberg limits of concern are mainly the liquid limit (LL) and plastic limit (PL). These limits are used in the plasticity chart to classify plastic soils.

Table 2: Laboratory Data Results

Boring No.	Sample Depth (ft)	Percent Passing No. 200 (%)	Moisture Content	Atterberg Limits	Sample Description
B-1	3-5	4.7	10.4	--	Brown fine sand (SP)
B-1	8-10	7.7	26.6	--	Brown, fine sand with silt (SP-SM)
B-1	13-15	13.0	24	--	Dark brown, silty sand (SM)
B-2	8-10	7.9	18.2	--	Brown, fine sand with silt (SP-SM)
B-2	13-15	10.7	--	--	Dark brown, fine sand with silt (SP-SM)
B-3	3-5	8.2	--	--	Dark brown, fine sand with silt (SP-SM)
B-3	5-7	5.9	--	--	Brown, fine sand with silt (SP-SM)
B-3	8-10	44.3	25.1	PI = 10 LL = 25	Light brown, lean clay with sand (CL)

## GROUNDWATER SAMPLING AND ANALYSIS

Representatives from BME collected groundwater samples on July 13, 2016 from shallow temporary monitor wells. Monitor well number one (MW-1) was constructed following the drilling completion of boring B-1. Monitor Well number two (MW-2) was constructed following the drilling completion of boring B-3. The approximate test locations are shown in the appended Drawing No. 3. The temporary monitor wells were constructed with 2-inch diameter PVC with well screen and casing. The wells were set at a depth of approximately 15 feet below existing site grades. Groundwater sampling procedures were conducted in accordance with the Florida Department of Environmental Protection (FDEP) *Standard Operating Procedures for Field Activities*, DEP-SOP-001/01, FS 2200. Groundwater depth measurements indicated on the field sampling logs are relative to the top of well casings, which stuck up above ground surface. Physical parameters including temperature, pH, conductivity,



dissolved oxygen, and turbidity were monitored while purging during groundwater sampling efforts. Copies of the groundwater field equipment calibration logs and monitoring well sampling log are appended at the end of this report.

The groundwater samples were placed in laboratory prepared glassware and stored on ice in a cooler. The sample cooler and completed chain-of-custody record were delivered to Advanced Analytical Services, Inc. for analysis. The laboratory report and chain-of-custody record is appended at the end of this report.

The groundwater analytical results were compared to Florida’s Freshwater Surface Water Criteria and groundwater cleanup target levels listed in Chapter 62-777, Florida Administrative Code (FAC), and Surface Water Quality Standards for Class I Waters listed in Chapter 62-302, FAC. A summary of the laboratory results is provided on the following table.

Table 3 - Groundwater Analytical Results Summary

Parameter	MW-1 (North Well)	MW-2 (South Well)	Groundwater Cleanup Target Levels (GCTL)
Total Organic Carbon (mg/L)	20	9.4	> 10
TPH (ug/L)	850	760	> 5,000
pH	6.2	5.8	6.0 – 8.5
Mercury (ug/L)	0.0013	0.00049	> 2
Cadmium (ug/L)	0.0005	0.5	> 5
Copper (ug/L)	0.0025	2.5	> 1,000
Lead (ug/L)	1.1	1.1	> 15
Zinc (ug/L)	13	13	> 5,000
Chromium (Hex) (ug/L)	2.5	2.5	> 100
Benzenxe (ug/L)	0.18	0.18	> 1
Napthalene (ug/L)	0.40	0.40	> 14

The TOC for the North Well was 20 mg/L. The standard discharge limit is 10 mg/L. For the South Well the pH was 5.8. pH results should fall in the 6.0 - 8.5 range. All of the metals were below the limits as was the TPH, Benzene, and Napthalene.



## **EVALUATION**

If site preparation is properly performed as recommended in this Report, it is our professional opinion that the planned development is viable at this site. It is important to note that some the soils encountered in our borings had fines content greater than 12% and may not be suitable for use as pipe backfill material.

Pipe trench backfill soils should consist of non-plastic sands with less than about 12% fines content. The fill should not contain any significant amount of organic substances (less than 3% by weight) or other deleterious materials.

## **RECOMMENDATIONS**

The recommendations provided below are based on the project information described in this Report, field test data, our evaluation as stated in this Report, and our past experience with geotechnical engineering in Florida. If project information or design concepts change, we should be advised of these changes in writing, and should be provided with an opportunity to review our recommendations as presented in this Report.

### **Geotechnical Site Preparation**

1. Geotechnical site preparation for the new pipe should consist of excavating and disposing of the encountered soils to the required pipe invert elevation (and for the full width of trench) and bottom of structure elevation.
2. Prior to the placement of any new backfill soils, the exposed subgrade soils should be compacted. The purpose of this will be to detect unstable soils that yield when subjected to compaction and to densify the bedding soil. Remove material that yields excessively during compaction efforts and replace using the procedures described below.
3. Backfill soils should consist of inorganic, non-plastic sand having less than 12% material by weight passing the no. 200 sieve. The moisture content of the fill soils should be within 2% of the optimum moisture content based on ASTM D 1557. All backfill materials should be free of construction debris and organic materials such as roots and vegetation.
4. Backfill compaction efforts should be implemented with a mechanical compactor. The bedding areas should be compacted with several overlapping coverages.
5. Following the compaction of the bedding soils (for all pipes and structures), a density equivalent of at least 95% of the modified Proctor maximum dry density (ASTM D 1557) should be achieved. Compacted areas should be compacted to a depth of at least 12 inches



below the surface. Density tests should be performed on the compacted soils. One in-place density test should be performed for each 300 lineal feet of pipe per run and at each structure.

6. Pipe and structure backfill should commence after the bedding compaction efforts are verified by in place density testing. All backfill fill should be placed in loose lift thicknesses of not more than 12 inches. Each lift should be compacted to at least 98% of the modified Proctor maximum dry density (ASTM D 1557). The filling and compaction operations should continue in 12 inch lifts until the desired elevation is achieved. Density tests should be performed on the compacted backfill soils. One test should be performed for each 300 lineal feet of pipe per run and every one foot of backfill for each structure.
7. The Geotechnical Engineer should be involved during all earthwork activities to verify that procedures and results are as specified and as anticipated.

### **Pavement Subgrade Preparation**

1. Prepare pavement areas in accordance with the specifications stated above.
2. Stabilizing material will likely be necessary for the construction of asphalt pavement subgrades.
3. A minimum separation of 12 inches between the bottom of the pavement subgrade and the anticipated seasonal high groundwater table should be maintained at all times.
4. Compact 12 inch subgrade beneath the base to a minimum of 98% of ASTM D-1557 maximum dry density. We recommend a minimum frequency of one in-place density test for each 300 lineal feet.
5. The project Civil Engineer should provide pavement design based on the appropriate design criteria and the soil and groundwater conditions noted in this Report.

### **Temporary Excavations**

1. The Contractor should be aware that slope height, slope inclination, and excavations depths (including utility trench excavations) should not exceed those specified in local, state, or federal safety regulations (OSHA Health and Safety Standards for Excavations, 29 CFR Part 1926). Construction site safety is the responsibility of the contractor. The contractor should be responsible for OSHA excavations compliance.



## REPORT LIMITATIONS

This consulting Report has been prepared for the exclusive use of the project design team and the owner(s) of this site for the specific application to this project. This Report has been prepared in accordance with generally accepted local geotechnical engineering practices; no other warranty is expressed or implied.

## CLOSURE

If you have questions about information contained in this Report, please contact the undersigned.

Sincerely,

BLUE MARLIN ENGINEERING  
Certificate of Authorization Number 29218



Osciell F. Plaza, P.E.  
President  
Florida Registration No. 73262



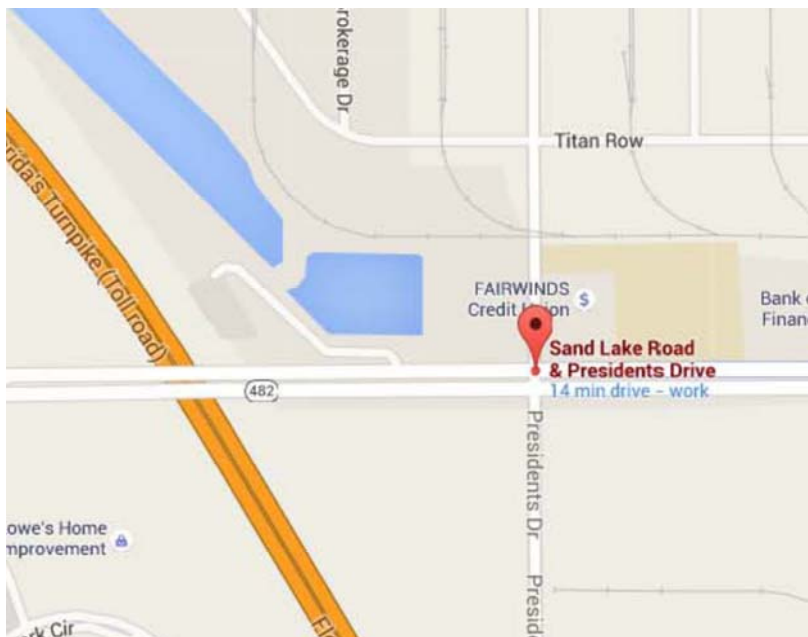
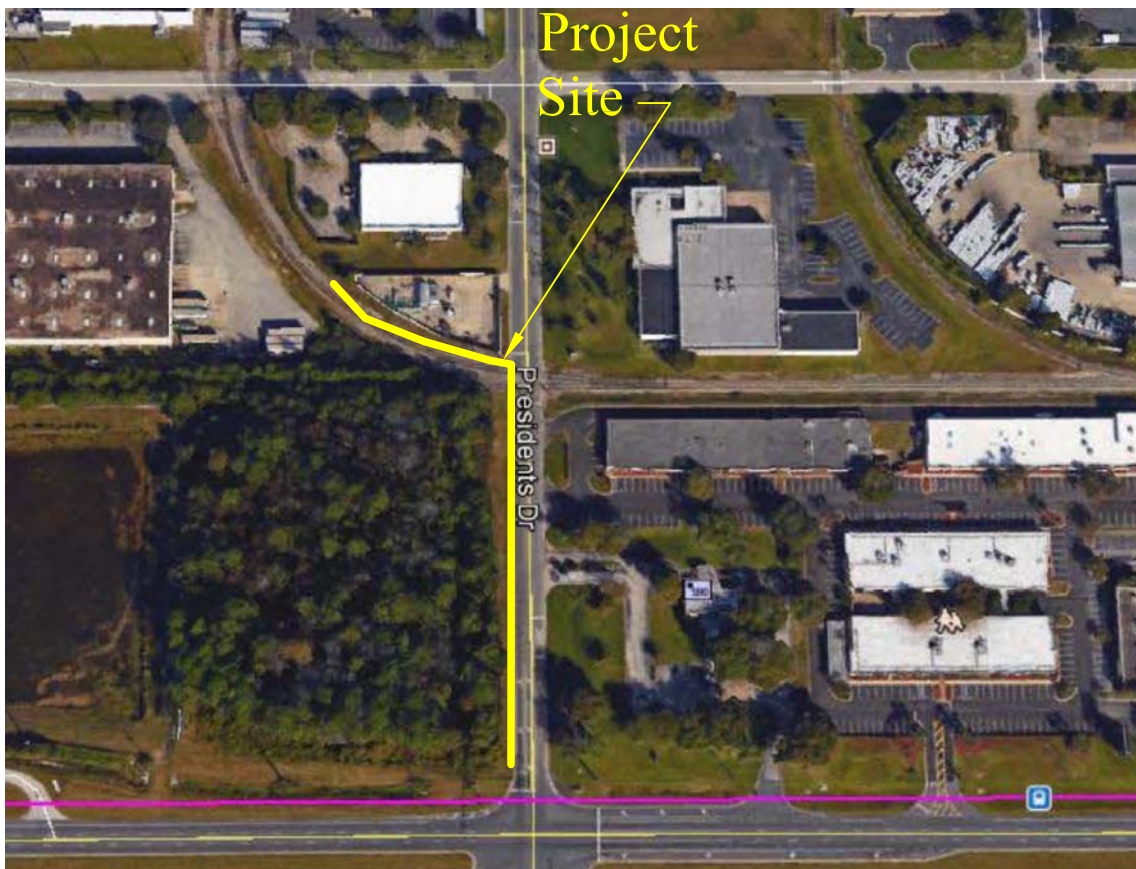
Derek G. Hajjar, P.E.  
Vice President  
Florida Registration No. 57470

Attachments: Drawing No. 1 - Topographic Map (A-1)  
Drawing No. 2 - USDA Soil Survey (A-2)  
Drawing No. 3 - Test Location Plan (A-3)  
Notes Related to Profile and Borings (A-4)  
Key to Symbols (A-5)  
Records of Test Boring (A-6 to A-8)

Advanced Environmental Laboratories Groundwater Analysis (18 Pages)

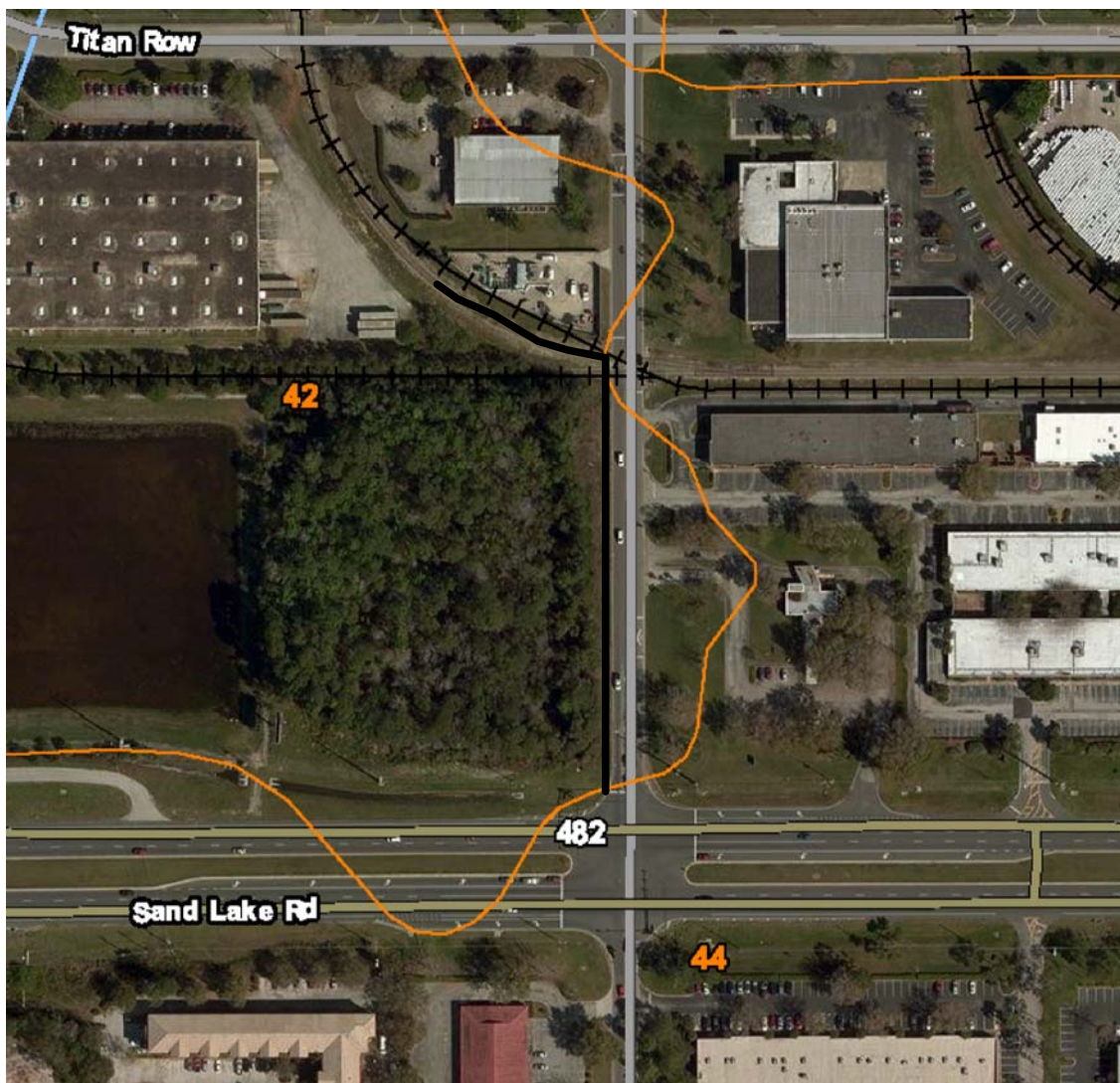
Distribution: 3 Original Copies to Addressee via US Mail.  
Copy to BME Files





Geotechnical  
Engineering &  
Construction Materials  
Testing

<b>DWG TITLE:</b> <i>Vicinity Map</i>		<b>DWN BY:</b> <i>ACJ</i>
<b>PROJ NAME:</b> <i>Presidents Drive Wastewater System Improvements</i>		<b>CKD BY:</b> <i>OFP</i>
<b>PROJ. NO:</b> <i>16-053</i>	<b>DATE:</b> <i>7/19/16</i>	<b>DWG NO:</b> <i>1</i>
		<b>APD BY:</b> <i>---</i>



Orange County, Florida (FL095)		
Map Unit Symbol	Map Unit Name	Acres in AOI
42	Sanibel muck	
44	Smyrna-Smyrna, wet, fine sand, 0 to 2 percent slopes	



Geotechnical  
Engineering &  
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Testing

DWG TITLE:

*Soil Survey Map*

DWN BY: *ACJ*

PROJ NAME:

*Presidents Drive Wastewater System Improvements*

CKD BY: *OFP*

PROJ. NO:

*16-053*

DATE:

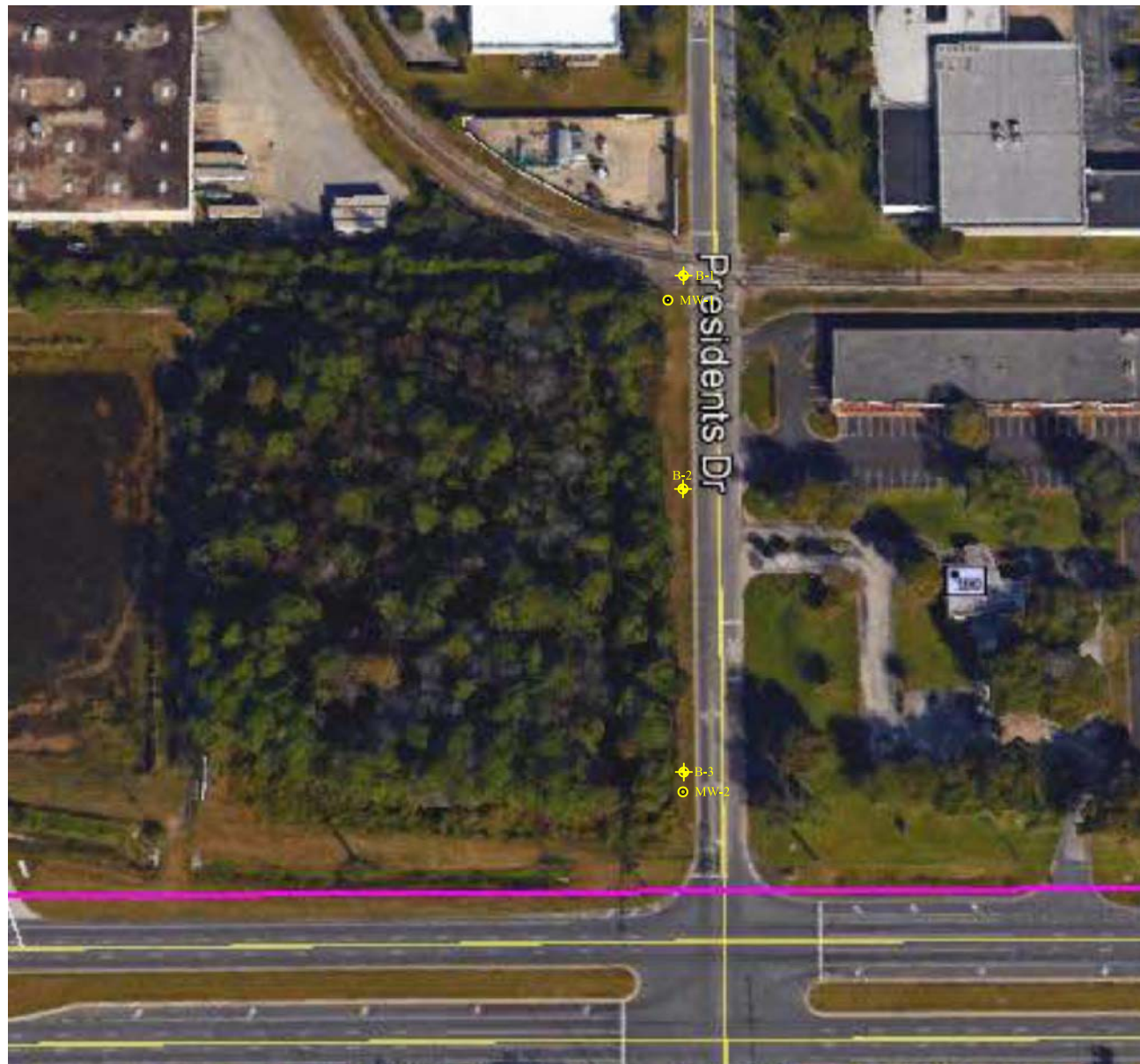
*7/19/16*

DWG NO:

*2*

APD BY

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Legend

- ⊕ - SPT Soil Boring  
B-1
- ⊙ - Monitor Well  
MW-1

Notes:

1. Test locations are shown as approximate.
2. Test location symbols are not to scale.
3. Drawing not to scale.



Geotechnical  
Engineering &  
Construction Materials  
Testing

<b>DWG TITLE:</b>		<i>Test Location Plan</i>		<b>DWN BY:</b> <i>AGJ</i>	
<b>PROJ NAME:</b>		<i>Presidents Drive Wastewater System Improvements</i>		<b>CKD BY:</b> <i>OFJ</i>	
<b>PROJ. NO:</b>	<i>16-053</i>	<b>DATE:</b>	<i>7/19/16</i>	<b>DWG NO:</b>	<i>3</i>
				<b>APD BY</b>	<i>---</i>



**NOTES RELATED TO RECORDS OF TEST BORING AND  
GENERALIZED SUBSURFACE PROFILE  
BLUE MARLIN ENGINEERING**

1. Groundwater level was encountered and recorded (if shown) following the completion of the soil test boring on the date indicated. Fluctuations in groundwater levels are common; consult report text for a discussion.
2. The boring location was identified in the field by offsetting from existing reference marks and using a cloth tape and survey wheel.
3. The borehole was backfilled to site grade following boring completion, and patched with asphalt cold patch mix when pavement was encountered.
4. The Record of Test Boring represents our interpretation of field conditions based on engineering examination of the soil samples.
5. The Record of Test Boring is subject to the limitations, conclusions and recommendations presented in the report text.
6. "Field Test Data" shown on the Record of Test Boring indicated as 11/6 refers to the Standard Penetration Test (SPT) and means 11 hammer blows drove the sampler 6 inches. SPT uses a 140-pound hammer falling 30 inches.
7. The N-value from the SPT is the sum of the hammer blows required to drive the sampler the second and third 6-inch increments.
8. The soil/rock strata interfaces shown on the Record of Test Boring are approximate and may vary from those shown. The soil/rock conditions shown on the Record of Test Boring refer to conditions at the specific location tested; soil/rock conditions may vary between test locations.
9. Relative density for sands/gravels and consistency for silts/clays and limestone are described as follows:

SPT Blows/ Foot	Sands/Gravels Relative Density	SPT Blows/ Foot	Silt/Clay Relative Consistency	SPT Blows/ Foot	Limestone Relative Consistency
0-4	Very loose	0-2	Very Soft	0-20	Very Soft
5-10	Loose	3-4	Soft	21-30	Soft
11-30	Medium Dense	5-8	Firm	31-45	Medium Hard
31-50	Dense	9-15	Stiff	46-60	Moderately Hard
Over 50	Very Dense	16-30	Very Stiff	61-50/2"	Hard
		Over 30	Hard	Over 50/2"	Very Hard

10. Grain size descriptions are as follows:

<u>NAME</u>	<u>SIZE LIMITS</u>
Boulder	12 inches or more
Cobbles	3 to 12 inches
Coarse Gravel	3/4 to 3 inches
Fine Gravel	No. 4 sieve to 3/4 inch
Coarse Sand	No. 10 to No. 4 sieve
Medium Sand	No. 40 to No. 10 sieve
Fine Sand	No. 200 to No. 40 sieve
Fines	Smaller than No. 200 sieve

11. Definitions related to adjectives used in soil/rock descriptions:

<u>PROPORTION</u>	<u>ADJECTIVE</u>	<u>APPROXIMATE ROOT DIAMETER</u>	<u>ADJECTIVE</u>
About 10%	with a trace	Less than 1/32"	Fine roots
About 25%	with some	1/32" to 1/4"	Small roots
About 50%	and	1/4" to 1"	Medium roots
		Greater than 1"	Large roots

# KEY TO SYMBOLS

## Symbol Description

### Strata symbols



Fine Sand (SP)



Fine Sand with Silt (SP-SM)



Silty Fine Sand (SP)



Lean Clay with Sand (CL)

### Misc. Symbols



Water table during  
drilling

### Soil Samplers



Standard penetration test.  
140 lb. hammer dropped 30"

### Notes:

1. Exploratory borings were drilled on 6/28/16 using a rotary drill with wash and mud.
2. The groundwater table depth was monitored during drilling operations. However, once the use of driller's mud was introduced, accurate readings can be difficult to obtain.
3. Boring locations were taped from existing features and elevations extrapolated from published data.
4. These logs are subject to the limitations, conclusions, and recommendations in this report.
5. Results of tests conducted on samples recovered are reported on the logs.

# DRILL HOLE LOG

BORING NO.: B-1

PROJECT: Presidents Drive Wastewater System Improvements  
 CLIENT: CPH  
 LOCATION: Refer to Test Location Plan  
 DRILLER: RD  
 DRILL RIG: BR 2500  
 DEPTH TO WATER > INITIAL  $\nabla$  : 6'

PROJECT NO.: J16-053  
 DATE: 6/28/16  
 \*ELEVATION: +100'NGVD  
 LOGGED BY: BME

ELEVATION/ DEPTH	WELL DETAIL	SOIL SYMBOLS, SAMPLERS AND TEST DATA	USCS	Description	NM	DD	STANDARD PENETRATION TEST			
							DEPTH	N	CURVE	
									10 30 50	
100 0			SP	Brown, fine						
					Hand Augered the top 6 feet					
95 5				SP-SM	Very loose, brown, slightly silty,			6'-8'	2	
					Very loose			8'-10'	3	
90 10										
			SM	Loose, silty, brown			13'-15'	6		
85 15										
			SP	Medium dense, fine, light brown			18'-20'	16		
80 20										
75 25										
70 30										
65 35										

This information pertains only to this boring and should not be interpreted as being indicative of the site.  
 \*Estimated elevation based on published data. Actual surveyed elevations may vary.

# DRILL HOLE LOG

BORING NO.: B-2

PROJECT: Presidents Drive Wastewater System Improvements  
 CLIENT: CPH  
 LOCATION: Refer to Test Location Plan  
 DRILLER: RD  
 DRILL RIG: BR 2500  
 DEPTH TO WATER > INITIAL  $\nabla$  : 6.5'

PROJECT NO.: J16-053  
 DATE: 6/28/16  
 \*ELEVATION: +100'NGVD  
 LOGGED BY: BME

ELEVATION/ DEPTH	WELL DETAIL	SOIL SYMBOLS, SAMPLERS AND TEST DATA	USCS	Description	NM	DD	STANDARD PENETRATION TEST		
							DEPTH	N	CURVE
								10    30    50	
100			SP	Brown, fine					
95				Hand Augered the top 6 feet					
		$\nabla$	SP-SM	Loose, brown, slightly silty			6'-8'	7	
				Loose			8'-10'	8	
90				Loose			13'-15'	8	
85				Medium dense, dark brown			18'-20'	16	
80									
75									
70									
65									

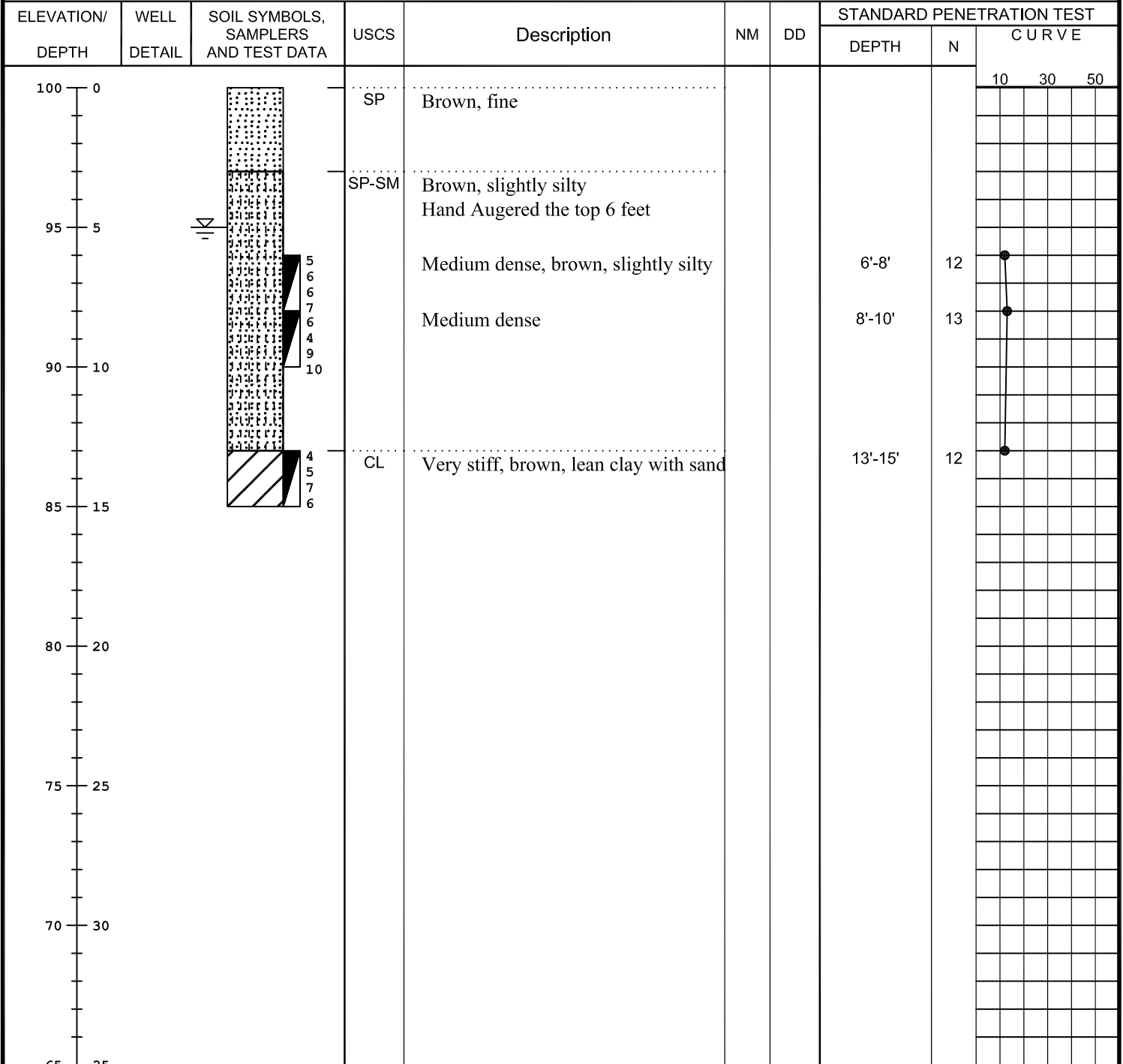
This information pertains only to this boring and should not be interpreted as being indicative of the site.  
 \*Estimated elevation based on published data. Actual surveyed elevations may vary.

# DRILL HOLE LOG

BORING NO.: B-3

PROJECT: Presidents Drive Wastewater System Improvements  
 CLIENT: CPH  
 LOCATION: Refer to Test Location Plan  
 DRILLER: RD  
 DRILL RIG: BR 2500  
 DEPTH TO WATER> INITIAL  $\nabla$  : 5'

PROJECT NO.: J16-053  
 DATE: 6/28/16  
 \*ELEVATION: +100'NGVD  
 LOGGED BY: BME



This information pertains only to this boring and should not be interpreted as being indicative of the site.  
 \*Estimated elevation based on published data. Actual surveyed elevations may vary.

July 25, 2016

Ozzie Plaza  
Blue Marlin Engineering  
102 Drennen Rd, Suite B-10  
Orlando, FL 32806

RE: Workorder: A1604945 Blue Marlin Engineering

Dear Ozzie Plaza:

Enclosed are the analytical results for sample(s) received by the laboratory on Wednesday, July 13, 2016. Results reported herein conform to the most current NELAC standards, where applicable, unless otherwise narrated in the body of the report. The analytical results for the samples contained in this report were submitted for analysis as outlined by the Chain of Custody and results pertain only to these samples.

If you have any questions concerning this report, please feel free to contact me.

Sincerely,

*Brandon O'Hara*

Brandon O'Hara  
BOHara@AELLab.com

Enclosures

### CERTIFICATE OF ANALYSIS

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**SAMPLE SUMMARY**

Workorder: A1604945 Blue Marlin Engineering

Lab ID	Sample ID	Matrix	Date Collected	Date Received
A1604945001	North Well	Water	7/13/2016 15:32	7/13/2016 16:35
A1604945002	South Well	Water	7/13/2016 14:38	7/13/2016 16:35
A1604945003	Blank	Water	7/13/2016 15:32	7/13/2016 16:35

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### ANALYTICAL RESULTS

Workorder: A1604945 Blue Marlin Engineering

Lab ID: **A1604945001** Date Received: 07/13/16 16:35 Matrix: Water  
 Sample ID: **North Well** Date Collected: 07/13/16 15:32

Sample Description: \_\_\_\_\_ Location: \_\_\_\_\_

Parameters	Results	Qual	Units	DF	Adjusted PQL	Adjusted MDL	Analyzed	Lab
<b>METALS</b>								
Analysis Desc: E1631 Analysis,Water			Preparation Method: EPA 1631 E					
			Analytical Method: EPA 1631 E					
Mercury	<b>1.3</b>		<b>ng/L</b>	<b>1</b>	0.50	0.40	7/18/2016 15:27	J^
Analysis Desc: SW846 6010B Analysis,Water			Preparation Method: SW-846 3010A					
			Analytical Method: SW-846 6010					
Cadmium	<b>0.00050</b>	<b>U</b>	<b>mg/L</b>	<b>1</b>	0.00060	0.00050	7/15/2016 14:46	M
Copper	<b>0.0025</b>	<b>U</b>	<b>mg/L</b>	<b>1</b>	0.0080	0.0025	7/15/2016 14:46	M
Lead	<b>0.0011</b>	<b>U</b>	<b>mg/L</b>	<b>1</b>	0.0070	0.0011	7/15/2016 14:46	M
Zinc	<b>0.013</b>		<b>mg/L</b>	<b>1</b>	0.010	0.0050	7/15/2016 14:46	M
<b>SEMIVOLATILES</b>								
Analysis Desc: Flo-Pro Analysis, Water			Preparation Method: FL-PRO					
			Analytical Method: FL-PRO					
TPH	<b>850</b>		<b>ug/L</b>	<b>1</b>	680	600	7/21/2016 19:51	M
o-Terphenyl (S)	<b>102</b>		<b>%</b>	<b>1</b>	82-142		7/21/2016 19:51	
Nonatricontane-C39 (S)	<b>103</b>		<b>%</b>	<b>1</b>	42-193		7/21/2016 19:51	
<b>VOLATILES</b>								
Analysis Desc: 8260B Analysis, Water			Preparation Method: SW-846 5030B					
			Analytical Method: SW-846 8260B					
Benzene	<b>0.18</b>	<b>U</b>	<b>ug/L</b>	<b>1</b>	1.0	0.18	7/20/2016 00:57	M
Naphthalene	<b>0.40</b>	<b>U</b>	<b>ug/L</b>	<b>1</b>	5.0	0.40	7/20/2016 00:57	M
1,2-Dichloroethane-d4 (S)	<b>118</b>		<b>%</b>	<b>1</b>	77-125		7/20/2016 00:57	
Toluene-d8 (S)	<b>104</b>		<b>%</b>	<b>1</b>	80-121		7/20/2016 00:57	
Bromofluorobenzene (S)	<b>112</b>		<b>%</b>	<b>1</b>	80-129		7/20/2016 00:57	
<b>WET CHEMISTRY</b>								
Analysis Desc: Hexavalent Chromium,SM3500-CR D,Water			Analytical Method: SM 3500-CR D					
Hexavalent Chromium	<b>0.0025</b>	<b>U</b>	<b>mg/L</b>	<b>1</b>	0.040	0.0025	7/14/2016 09:55	T
Analysis Desc: .PH,SM4500H+B, Water			Analytical Method: SM 4500H+B					
pH	<b>6.2</b>	<b>Q</b>	<b>SU</b>	<b>1</b>			7/13/2016 17:10	A
Analysis Desc: TOC,SM5310B,Water			Analytical Method: SM 5310B					
Total Organic Carbon	<b>20</b>		<b>mg/L</b>	<b>1</b>	1.0	0.25	7/14/2016 14:42	G

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### ANALYTICAL RESULTS

Workorder: A1604945 Blue Marlin Engineering

Lab ID: **A1604945002** Date Received: 07/13/16 16:35 Matrix: Water  
 Sample ID: **South Well** Date Collected: 07/13/16 14:38

Sample Description: \_\_\_\_\_ Location: \_\_\_\_\_

Parameters	Results	Qual	Units	DF	Adjusted PQL	Adjusted MDL	Analyzed	Lab
<b>METALS</b>								
Analysis Desc: E1631 Analysis,Water			Preparation Method: EPA 1631 E					
			Analytical Method: EPA 1631 E					
Mercury	<b>0.49</b>	<b>I</b>	<b>ng/L</b>	<b>1</b>	0.50	0.40	7/18/2016 15:45	J^
Analysis Desc: SW846 6010B Analysis,Water			Preparation Method: SW-846 3010A					
			Analytical Method: SW-846 6010					
Cadmium	<b>0.00050</b>	<b>U</b>	<b>mg/L</b>	<b>1</b>	0.00060	0.00050	7/15/2016 14:49	M
Copper	<b>0.0025</b>	<b>U</b>	<b>mg/L</b>	<b>1</b>	0.0080	0.0025	7/15/2016 14:49	M
Lead	<b>0.0011</b>	<b>U</b>	<b>mg/L</b>	<b>1</b>	0.0070	0.0011	7/15/2016 14:49	M
Zinc	<b>0.013</b>		<b>mg/L</b>	<b>1</b>	0.010	0.0050	7/15/2016 14:49	M
<b>SEMIVOLATILES</b>								
Analysis Desc: Flo-Pro Analysis, Water			Preparation Method: FL-PRO					
			Analytical Method: FL-PRO					
TPH	<b>760</b>		<b>ug/L</b>	<b>1</b>	680	600	7/21/2016 20:22	M
o-Terphenyl (S)	<b>98</b>		<b>%</b>	<b>1</b>	82-142		7/21/2016 20:22	
Nonatricontane-C39 (S)	<b>93</b>		<b>%</b>	<b>1</b>	42-193		7/21/2016 20:22	
<b>VOLATILES</b>								
Analysis Desc: 8260B Analysis, Water			Preparation Method: SW-846 5030B					
			Analytical Method: SW-846 8260B					
Benzene	<b>0.18</b>	<b>U</b>	<b>ug/L</b>	<b>1</b>	1.0	0.18	7/20/2016 01:26	M
Naphthalene	<b>0.40</b>	<b>U</b>	<b>ug/L</b>	<b>1</b>	5.0	0.40	7/20/2016 01:26	M
1,2-Dichloroethane-d4 (S)	<b>118</b>		<b>%</b>	<b>1</b>	77-125		7/20/2016 01:26	
Toluene-d8 (S)	<b>111</b>		<b>%</b>	<b>1</b>	80-121		7/20/2016 01:26	
Bromofluorobenzene (S)	<b>114</b>		<b>%</b>	<b>1</b>	80-129		7/20/2016 01:26	
<b>WET CHEMISTRY</b>								
Analysis Desc: Hexavalent Chromium,SM3500-CR D,Water			Analytical Method: SM 3500-CR D					
Hexavalent Chromium	<b>0.0025</b>	<b>U</b>	<b>mg/L</b>	<b>1</b>	0.040	0.0025	7/14/2016 09:56	T
Analysis Desc: .PH,SM4500H+B, Water			Analytical Method: SM 4500H+B					
pH	<b>5.8</b>	<b>Q</b>	<b>SU</b>	<b>1</b>			7/13/2016 17:14	A
Analysis Desc: TOC,SM5310B,Water			Analytical Method: SM 5310B					
Total Organic Carbon	<b>9.4</b>		<b>mg/L</b>	<b>1</b>	1.0	0.25	7/14/2016 14:55	G

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### ANALYTICAL RESULTS

Workorder: A1604945 Blue Marlin Engineering

Lab ID: **A1604945003**

Date Received: 07/13/16 16:35 Matrix: Water

Sample ID: **Blank**

Date Collected: 07/13/16 15:32

Sample Description:

Location:

Parameters	Results	Qual	Units	DF	Adjusted PQL	Adjusted MDL	Analyzed	Lab
<b>METALS</b>								
Analysis Desc: E1631 Analysis,Water			Preparation Method: EPA 1631 E					
			Analytical Method: EPA 1631 E					
Mercury	0.40	U	ng/L	1	0.50	0.40	7/18/2016 15:51	J^

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## ANALYTICAL RESULTS QUALIFIERS

Workorder: A1604945 Blue Marlin Engineering

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### PARAMETER QUALIFIERS

- U The compound was analyzed for but not detected.
- I The reported value is between the laboratory method detection limit and the laboratory practical quantitation limit.
- Q Missed Hold Time

### LAB QUALIFIERS

- A DOH Certification #E53076(AEL-A)(FL NELAC Certification)
- G DOH Certification #E82001(AEL-G)(FL NELAC Certification)
- J DOH Certification #E82574(AEL-JAX)(FL NELAC Certification)
- J^ Not Certified
- M DOH Certification #E82535(AEL-M)(FL NELAC Certification)
- T DOH Certification #E84589(AEL-T)(FL NELAC Certification)

### CERTIFICATE OF ANALYSIS

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### QUALITY CONTROL DATA

Workorder: A1604945 Blue Marlin Engineering

QC Batch: WCAg/2554 Analysis Method: SM 5310B  
QC Batch Method: SM 5310B Prepared:  
Associated Lab Samples: A1604945001, A1604945002

METHOD BLANK: 2091598

Parameter	Units	Blank Result	Reporting Limit Qualifiers
WET CHEMISTRY			
Total Organic Carbon	mg/L	0.25	0.25 U

METHOD BLANK: 2091602

Parameter	Units	Blank Result	Reporting Limit Qualifiers
WET CHEMISTRY			
Total Organic Carbon	mg/L	0.25	0.25 U

QC Batch: WCAa/1517 Analysis Method: SM 4500H+B  
QC Batch Method: SM 4500H+B Prepared:  
Associated Lab Samples: A1604945001, A1604945002

QC Batch: DGMm/1260 Analysis Method: SW-846 6010  
QC Batch Method: SW-846 3010A Prepared: 07/15/2016 04:00  
Associated Lab Samples: A1604945001, A1604945002

METHOD BLANK: 2092770

Parameter	Units	Blank Result	Reporting Limit Qualifiers
METALS			
Cadmium	mg/L	0.00050	0.00050 U
Copper	mg/L	0.0025	0.0025 U
Lead	mg/L	0.0011	0.0011 U
Zinc	mg/L	0.0050	0.0050 U

QC Batch: DGMj/1706 Analysis Method: EPA 1631 E  
QC Batch Method: EPA 1631 E Prepared: 07/18/2016 00:00  
Associated Lab Samples: A1604945001, A1604945002, A1604945003

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### QUALITY CONTROL DATA

Workorder: A1604945 Blue Marlin Engineering

METHOD BLANK: 2092924

Parameter	Units	Blank Result	Reporting Limit Qualifiers
<b>METALS</b>			
Mercury	ng/L	0.40	0.40 U

QC Batch: MSVm/1538      Analysis Method: SW-846 8260B  
QC Batch Method: SW-846 5030B      Prepared: 07/19/2016 00:00  
Associated Lab Samples: A1604945001, A1604945002

METHOD BLANK: 2096057

Parameter	Units	Blank Result	Reporting Limit Qualifiers
<b>VOLATILES</b>			
Benzene	ug/L	0.18	0.18 U
Naphthalene	ug/L	0.40	0.40 U
1,2-Dichloroethane-d4 (S)	%	97	77-125
Toluene-d8 (S)	%	96	80-121
Bromofluorobenzene (S)	%	94	80-129

QC Batch: EXTm/1416      Analysis Method: FL-PRO  
QC Batch Method: FL-PRO      Prepared: 07/20/2016 10:00  
Associated Lab Samples: A1604945001, A1604945002

METHOD BLANK: 2096926

Parameter	Units	Blank Result	Reporting Limit Qualifiers
<b>SEMIVOLATILES</b>			
TPH	ug/L	600	600 U
o-Terphenyl (S)	%	104	82-142
Nonatricontane-C39 (S)	%	109	42-193

QC Batch: WCAI/3969      Analysis Method: SM 3500-CR D  
QC Batch Method: SM 3500-CR D      Prepared:  
Associated Lab Samples: A1604945001, A1604945002

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### QUALITY CONTROL DATA

Workorder: A1604945 Blue Marlin Engineering

---

METHOD BLANK: 2097479

Parameter	Units	Blank Result	Reporting Limit Qualifiers
WET CHEMISTRY			
Hexavalent Chromium	mg/L	0.0025	0.0025 U

### QUALITY CONTROL DATA QUALIFIERS

Workorder: A1604945 Blue Marlin Engineering

---

#### QUALITY CONTROL PARAMETER QUALIFIERS

- U The compound was analyzed for but not detected.
- I The reported value is between the laboratory method detection limit and the laboratory practical quantitation limit.
- Q Missed Hold Time

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**QUALITY CONTROL DATA CROSS REFERENCE TABLE**

Workorder: A1604945 Blue Marlin Engineering

Lab ID	Sample ID	Prep Method	Prep Batch	Analysis Method	Analysis Batch
A1604945001	North Well			SM 5310B	WCAg/2554
A1604945002	South Well			SM 5310B	WCAg/2554
A1604945001	North Well			SM 4500H+B	WCAa/1517
A1604945002	South Well			SM 4500H+B	WCAa/1517
A1604945001	North Well	SW-846 3010A	DGMm/1260	SW-846 6010	ICPm/1260
A1604945002	South Well	SW-846 3010A	DGMm/1260	SW-846 6010	ICPm/1260
A1604945001	North Well	EPA 1631 E	DGMj/1706	EPA 1631 E	CVAj/1156
A1604945002	South Well	EPA 1631 E	DGMj/1706	EPA 1631 E	CVAj/1156
A1604945003	Blank	EPA 1631 E	DGMj/1706	EPA 1631 E	CVAj/1156
A1604945001	North Well	SW-846 5030B	MSVm/1538	SW-846 8260B	MSVm/1539
A1604945002	South Well	SW-846 5030B	MSVm/1538	SW-846 8260B	MSVm/1539
A1604945001	North Well	FL-PRO	EXTm/1416	FL-PRO	GCSm/1220
A1604945002	South Well	FL-PRO	EXTm/1416	FL-PRO	GCSm/1220
A1604945001	North Well			SM 3500-CR D	WCAt/3969
A1604945002	South Well			SM 3500-CR D	WCAt/3969

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- Jacksonville: 6681 Southpoint Pkwy. • Jacksonville, FL 32216 • 904.363.9350 • Fax 904.363.9354
- Miramar: 10200 USA Today Way, Miramar, FL 33025 • 954.889.2288 • Fax 954.889.2281
- Tallahassee: 1288 Cedar Center Drive, Tallahassee, FL 32301 • 850.219.6274 • Fax 850.219.6275
- Tampa: 9810 Princess Palm Ave. • Tampa, FL 33619 • 813.630.9616 • Fax 813.630.4327

Client Name: <b>Blue Marlin Engineering</b>		Project Name:																
Address: <b>102 Drenned Rd, Suite B-10</b>		P.O. Number/Project Number:																
Orlando, FL 32806		Project Location: <b>Orlando, FL</b>																
Phone: <b>407-217-4464</b>		FDEP Facility No.:																
FAX: <b>321-710-2483</b>		Project Name and Address:																
Contact: <b>Ozzie Piazza</b>		Special Instructions:																
Sampled By: <b>Henry Towns</b>		<input type="checkbox"/> ADAPT <input type="checkbox"/> EQUIS																
Turn Around Time: <input checked="" type="checkbox"/> STANDARD <input type="checkbox"/> RUSH		BOTTLE SIZE & TYPE																
Page <b>1</b> of <b>1</b>		ANALYSIS REQUIRED																
SAMPLE ID	SAMPLE DESCRIPTION	Grab Comp	SAMPLING DATE	SAMPLING TIME	MATRIX	NO. COUNT	8 oz amber	125 mL P	250 mL Vials	250 mL P	Hexavalent Chromium	250 mL P	Cd, Cu, Pb, Zn	TRPH	8260 Benzene & Naphthalene	3 40-mL Vials	LABORATORY I.D. NUMBER	
	North well	G	7/13/16	1532	GW	10	X	X	X	X	X	X	X	X	X	X		
	South well	G		1438	GW	10	X	X	X	X	X	X	X	X	X	X		02
	Mercury Field Blank	G		1532	DI	1	X											03
A1604945																		

Matrix Code: WW = wastewater SW = surface water GW = ground water DW = drinking water O = oil A = air SO = soil SL = sludge  
 Received on Ice  Yes  No  Temp taken from sample  Temp from blank  
 Device used for measuring Temp by unique identifier (circle IR temp gun used) J: 9A G: LT-1 LT-2 T: 10A (A: 3A M: 3A S: 1V)  
 Preservation Code: I = Ice H=(HCl) S = (H2SO4) N = (HNO3) T = (Sodium Thiosulfate)  
 Where required, pH checked  Temperature when received (in degrees Celsius)

FOR DRINKING WATER USE:	
(When PWS information not otherwise supplied) PWS ID: _____	
Contact Person: _____	Phone: _____
Supplier of Water: _____	
Site-Address: _____	

Refiniquished by:	Date	Time	Received by:	Date	Time
<i>Henry Towns</i>	7/13/16	1635	<i>Cathy Miron</i>	7/13	1635



DEP Form FD 9000-24: GROUNDWATER SAMPLING LOG

Riser 2.28

SITE NAME:		SITE LOCATION: <u>Orlando, FL</u>	
WELL NO: <u>North Well</u>		SAMPLE ID: <u>North Well</u>	
		DATE: <u>7/13/16</u>	

PURGING DATA

WELL DIAMETER (inches): <u>2"</u>	TUBING DIAMETER (inches): <u>0.17"</u>	WELL SCREEN INTERVAL DEPTH: <u>15</u> feet	STATIC DEPTH TO WATER (feet): <u>7.31</u>	PURGE PUMP TYPE OR BAILER: <u>PP</u>
WELL VOLUME PURGE: 1 WELL VOLUME = (TOTAL WELL DEPTH - STATIC DEPTH TO WATER) X WELL CAPACITY (only fill out if applicable) = ( <u>15</u> feet - <u>7.31</u> feet ) X <u>0.16</u> gallons/foot = <u>1.23</u> gallons				
EQUIPMENT VOLUME PURGE: 1 EQUIPMENT VOL. = PUMP VOLUME + (TUBING CAPACITY X TUBING LENGTH) + FLOW CELL VOLUME (only fill out if applicable) <u>N/A</u> = gallons + ( gallons/foot X feet ) + gallons = gallons				

INITIAL PUMP OR TUBING DEPTH IN WELL (feet): <u>8.0</u>	FINAL PUMP OR TUBING DEPTH IN WELL (feet): <u>8.0</u>	PURGING INITIATED AT: <u>1504</u>	PURGING ENDED AT: <u>1532</u>	TOTAL VOLUME PURGED (gallons): <u>2.80</u>							
TIME	VOLUME PURGED (gallons)	CUMUL. VOLUME PURGED (gallons)	PURGE RATE (gpm)	DEPTH TO WATER (feet)	pH (standard units)	TEMP. (°C)	COND. (circle units) μmhos/cm or μS/cm	DISSOLVED OXYGEN (circle units) mg/l or % saturation	TURBIDITY (NTUs)	COLOR (describe)	ODOR (describe)
1517	1.30	1.30	0.10	7.57	6.22	29.1	360	0.40	1.97	clear	none
1522	0.50	1.80	0.10	7.57	6.26	28.9	379	0.45	1.34	"	"
1527	0.50	2.30	0.10	7.57	6.28	28.9	380	0.46	1.04	"	"
1532	0.50	2.80	0.10	7.57	6.29	28.9	386	0.45	0.78	"	"

WELL CAPACITY (Gallons Per Foot): 0.75" = 0.02; 1" = 0.04; 1.25" = 0.06; 2" = 0.16; 3" = 0.37; 4" = 0.65; 5" = 1.02; 6" = 1.47; 12" = 5.88  
 TUBING INSIDE DIA. CAPACITY (Gal./Ft.): 1/8" = 0.0006; 3/16" = 0.0014; 1/4" = 0.0026; 5/16" = 0.004; 3/8" = 0.006; 1/2" = 0.010; 5/8" = 0.016  
 PURGING EQUIPMENT CODES: B = Bailor; BP = Bladder Pump; ESP = Electric Submersible Pump; PP = Peristaltic Pump; O = Other (Specify)

SAMPLING DATA

SAMPLED BY (PRINT) / AFFILIATION: <u>Tech Support</u>	SAMPLER(S) SIGNATURE(S): <u>Henry Towns</u>	SAMPLING INITIATED AT: <u>1532</u>	SAMPLING ENDED AT: <u>1537</u>
PUMP OR TUBING DEPTH IN WELL (feet): <u>8.0</u>	TUBING MATERIAL CODE: <u>HDPE/S</u>	FIELD-FILTERED: <u>Y</u> <u>N</u>	FILTER SIZE: _____ μm
FIELD DECONTAMINATION: PUMP <u>Y</u> <u>N</u>	TUBING <u>Y</u> <u>N</u> (replaced)	DUPLICATE: <u>Y</u> <u>N</u>	

SAMPLE CONTAINER SPECIFICATION				SAMPLE PRESERVATION (including wet ice)			INTENDED ANALYSIS AND/OR METHOD	SAMPLING EQUIPMENT CODE	SAMPLE PUMP FLOW RATE (mL per minute)
SAMPLE ID CODE	# CONTAINERS	MATERIAL CODE	VOLUME	PRESERVATIVE USED	TOTAL VOL ADDED IN FIELD (mL)	FINAL pH			
North Well	1	AG	250mL	H <sub>2</sub> SO <sub>4</sub>	Lab	~2	TRPH	APP	0.10gpm
North Well	1	PE	250mL	HNO <sub>3</sub>	Lab	~2	Cd, Cu, Pb, Zn	APP	0.10gpm
North Well	1	PE	250mL	None	---	6.29	Headvalent Chromium	APP	0.10gpm
North Well	1	PE	125mL	None	---	6.29	pH	APP	0.10gpm
North Well	1	AG	250mL	None	---	6.29	LHs	APP	0.10gpm
North Well	2	CG	40mL	HCL	Lab	~2	TOC	APP	0.10gpm

REMARKS: 91°F Partly Cloudy No Breeze

MATERIAL CODES: AG = Amber Glass; CG = Clear Glass; HDPE = High Density Polyethylene; LDPE = Low Density Polyethylene; PP = Polypropylene; S = Silicone; T = Teflon; O = Other (Specify)

SAMPLING EQUIPMENT CODES: APP = After (Through) Peristaltic Pump; B = Bailor; BP = Bladder Pump; ESP = Electric Submersible Pump; RFPF = Reverse Flow Peristaltic Pump; SM = Straw Method (Tubing Gravity Drain); O = Other (Specify)

NOTES: 1. The above do not constitute all of the information required by Chapter 62-160, F.A.C.  
 2. STABILIZATION CRITERIA FOR RANGE OF VARIATION OF LAST THREE CONSECUTIVE READINGS (SEE FS 2212, SECTION 3)  
 pH: ± 0.2 units Temperature: ± 0.2 °C Specific Conductance: ± 5% Dissolved Oxygen: all readings ≤ 20% saturation (see Table FS 2200-2); optionally, ± 0.2 mg/L or ± 10% (whichever is greater) Turbidity: all readings ≤ 20 NTU; optionally ± 5 NTU or ± 10% (whichever is greater)

North Well 3 AG/CG 40mL none/HCL Lab 6.29/~2 8260 Benzene/nap APP 0.10gpm

62-160.800 F.A.C. Revision Date: March 1, 2014

DEP Form FD 9000-24: GROUNDWATER SAMPLING LOG

Riser 2.45

SITE NAME:	SITE LOCATION: <u>Orlando, FL</u>
WELL NO: <u>South well</u>	SAMPLE ID: <u>South well</u> DATE: <u>7/13/16</u>

**PURGING DATA**

WELL DIAMETER (inches): <u>2"</u>	TUBING DIAMETER (inches): <u>0.17</u>	WELL SCREEN INTERVAL DEPTH: <u>15</u> feet	STATIC DEPTH TO WATER (feet): <u>5.69</u>	PURGE PUMP TYPE OR BAILER: <u>PP</u>
WELL VOLUME PURGE: 1 WELL VOLUME = (TOTAL WELL DEPTH - STATIC DEPTH TO WATER) X WELL CAPACITY (only fill out if applicable) = ( <u>15</u> feet - <u>5.69</u> feet ) X <u>0.10</u> gallons/foot = <u>1.48</u> gallons				
EQUIPMENT VOLUME PURGE: 1 EQUIPMENT VOL. = PUMP VOLUME + (TUBING CAPACITY X TUBING LENGTH) + FLOW CELL VOLUME (only fill out if applicable) <u>N/A</u> = gallons + ( gallons/foot X feet ) + gallons = gallons				
INITIAL PUMP OR TUBING DEPTH IN WELL (feet): <u>6.5</u>	FINAL PUMP OR TUBING DEPTH IN WELL (feet): <u>8.0</u>	PURGING INITIATED AT: <u>1408</u>	PURGING ENDED AT: <u>1438</u>	TOTAL VOLUME PURGED (gallons): <u>3.00</u>

TIME	VOLUME PURGED (gallons)	CUMUL. VOLUME PURGED (gallons)	PURGE RATE (gpm)	DEPTH TO WATER (feet)	pH (standard units)	TEMP. (°C)	COND. (circle units) µmhos/cm or µS/cm	DISSOLVED OXYGEN (circle units) mg/L or % saturation	TURBIDITY (NTUs)	COLOR (describe)	ODOR (describe)
1423	1.50	1.50	0.10	7.73	5.86	30.0	200	0.59	5.36	clear	none
1428	0.50	2.00	0.10	7.74	5.87	29.8	203	0.44	4.73	"	"
1433	0.50	2.50	0.10	7.74	5.85	29.8	204	0.42	4.60	"	"
1438	0.50	3.00	0.10	7.74	5.84	29.8	206	0.43	4.17	"	"

WELL CAPACITY (Gallons Per Foot): 0.75" = 0.02; 1" = 0.04; 1.25" = 0.06; 2" = 0.16; 3" = 0.37; 4" = 0.65; 5" = 1.02; 6" = 1.47; 12" = 5.88  
 TUBING INSIDE DIA. CAPACITY (Gal./Ft.): 1/8" = 0.0006; 3/16" = 0.0014; 1/4" = 0.0026; 5/16" = 0.004; 3/8" = 0.006; 1/2" = 0.010; 5/8" = 0.016

PURGING EQUIPMENT CODES: B = Bailer; BP = Bladder Pump; ESP = Electric Submersible Pump; PP = Peristaltic Pump; O = Other (Specify)

**SAMPLING DATA**

SAMPLED BY (PRINT) / AFFILIATION: <u>Henry Towns / Henry Towns Support</u>	SAMPLER(S) SIGNATURE(S): <u>Henry Towns Henry Towns</u>	SAMPLING INITIATED AT: <u>1438</u>	SAMPLING ENDED AT: <u>1453</u>
PUMP OR TUBING DEPTH IN WELL (feet): <u>8.0</u>	TUBING MATERIAL CODE: <u>HDPE/S</u>	FIELD-FILTERED: Y <input checked="" type="checkbox"/> (N)	FILTER SIZE: <u>    </u> µm
FIELD DECONTAMINATION: PUMP Y <input checked="" type="checkbox"/> (N)	TUBING Y <input checked="" type="checkbox"/> (N) (replaced)	DUPLICATE: Y <input checked="" type="checkbox"/> (N)	

SAMPLE CONTAINER SPECIFICATION				SAMPLE PRESERVATION (including wet ice)			INTENDED ANALYSIS AND/OR METHOD	SAMPLING EQUIPMENT CODE	SAMPLE PUMP FLOW RATE (mL per minute)
SAMPLE ID CODE	# CONTAINERS	MATERIAL CODE	VOLUME	PRESERVATIVE USED	TOTAL VOL ADDED IN FIELD (mL)	FINAL pH			
South well	1	AG	250ml	H <sub>2</sub> SO <sub>4</sub>	Lab	<2	TRPH	APP	0.10 gpm
South well	1	PE	250ml	HNO <sub>3</sub>	Lab	<2	Cd, Cu, Pb, Zn	APP	0.10 gpm
South well	1	PE	250ml	None	---	5.84	Hexavalent Chromium	APP	0.10 gpm
South well	1	PE	125ml	None	---	5.84	pH	APP	0.10 gpm
South well	1	AG	250ml	None	---	5.84	LLHg	APP	0.10 gpm
South well	2	CG	40ml	HCL	Lab	<2	TOC	APP	0.10 gpm

REMARKS: 93°F Partly Cloudy NO Breeze

MATERIAL CODES: AG = Amber Glass; CG = Clear/Glass; HDPE = High Density Polyethylene; LDPE = Low Density Polyethylene; PP = Polypropylene; S = Silicone; T = Teflon; O = Other (Specify)

SAMPLING EQUIPMENT CODES: APP = After (Through) Peristaltic Pump; B = Bailer; BP = Bladder Pump; ESP = Electric Submersible Pump; RFPF = Reverse Flow Peristaltic Pump; SM = Straw Method (Tubing Gravity Drain); O = Other (Specify)

NOTES: 1. The above do not constitute all of the information required by Chapter 62-160, F.A.C.  
 2. STABILIZATION CRITERIA FOR RANGE OF VARIATION OF LAST THREE CONSECUTIVE READINGS (SEE FS 2212, SECTION 3)  
 pH: ± 0.2 units Temperature: ± 0.2 °C Specific Conductance: ± 5% Dissolved Oxygen: all readings ≤ 20% saturation (see Table FS 2200-2); optionally, ± 0.2 mg/L or ± 10% (whichever is greater) Turbidity: all readings ≤ 20 NTU; optionally ± 5 NTU or ± 10% (whichever is greater)

South well 3 AG/CG 40ml None/HCL Lab 5.84/<2 8260 Benzene/Nap APP 0.10 gpm

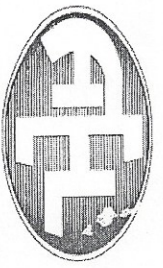
62-160.800 F.A.C. Revision Date: March 1, 2014











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 Miramar: 10200 USA Today Way, Miramar, FL 33025 • 954.889.2288 • Fax 954.889.2281  
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 Tampa: 9610 Princess Palm Ave. • Tampa, FL 33619 • 813.630.9616 • Fax 813.630.4327

Client Name: **Blue Marlin Engineering** Project Name: \_\_\_\_\_  
 Address: **102 Drenned Rd, Suite B-10** P.O. Number/Project Number: \_\_\_\_\_  
 Orlando, FL 32806 Project Location: **Orlando, FL**

Phone: **407-217-4464** FDEP Facility No: \_\_\_\_\_  
 FAX: **321-710-2483** Project Name and Address: \_\_\_\_\_  
 Contact: **Ozzie Plaza**

Sampled By: **Henry Towns**  
 Turn Around Time:  STANDARD  RUSH  
 Special Instructions: \_\_\_\_\_

Page **1** of **1**  ADAPT  EQUIS

SAMPLE ID	SAMPLE DESCRIPTION	Grab Comp	SAMPLING		MATRIX	NO. COUNT	PRESERVATION	ANALYSIS REQUIRED		BOTTLE SIZE & TYPE	LABORATORY I.D. NUMBER	
			DATE	TIME				H	I			
	North Well	G	7/13/16	1532	GW	10		X	X	X	X	01
	South Well	G		1438	GW	10		X	X	X	X	02
	Mercury Field Blank	G		1532	DI	1		X				03

Matrix Code: WW = wastewater SW = surface water GW = ground water DW = drinking water O = oil A = air SO = soil SL = sludge  
 Preservation Code: I = Ice H=(HCl) S = (H2SO4) N = (HNO3) T = (Sodium Thiosulfate)

Received on Ice  Yes  No  Temp taken from sample  Temp from blank  
 Device used for measuring Temp by unique identifier (circle IR temp gun used) J: 9A G: LT-1 LT-2 T: 10A (A: 3A M: 3A S: 1V)

Relinquished by: \_\_\_\_\_ Date \_\_\_\_\_ Time \_\_\_\_\_ Received by: \_\_\_\_\_ Date \_\_\_\_\_ Time \_\_\_\_\_  
 Relinquished by: *Henry Towns* Date *7/13/16* Time *1635* Received by: *Andy McLean* Date *7/13* Time *1035*

**FOR DRINKING WATER USE:** (When PWS information not otherwise supplied) PWS ID: \_\_\_\_\_  
 Contact Person: \_\_\_\_\_ Phone: \_\_\_\_\_  
 Supplier of Water: \_\_\_\_\_  
 Site-Address: \_\_\_\_\_

**A1604952**

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**APPENDIX B**

**ORANGE COUNTY REQUIRED FORMS**

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**APPENDIX B FORMS**

**Pressure Main Sample Collection Submittal Form**

Proposed

**Project:** \_\_\_\_\_

**Contractor:** \_\_\_\_\_

**LOCATION OF SAMPLE**

Address: \_\_\_\_\_ Date: \_\_\_\_\_ Submitted by: \_\_\_\_\_

**PIPE SAMPLE ID NUMBER** \_\_\_\_\_

**GPS NORTHING** \_\_\_\_\_ **EASTING** \_\_\_\_\_

**REASON FOR SAMPLE COLLECTION (e.g. Line Tap, Tie in, Abandonment, etc):**

**SAMPLE TYPE:**  Coupon  Pipe Section  Other (description) \_\_\_\_\_

**SAMPLE SIZE:** \_\_\_\_\_ x \_\_\_\_\_

**PIPE MATERIAL:**  Ductile Iron  Cast Iron  PCCP  Asbestos Cement

**PIPE DIAMETER:** \_\_\_\_\_

**SAMPLE LOCATION ON PIPE (Clock position):** \_\_\_\_\_

**SITE OBSERVATIONS** (Describe any relevant observations (e.g. "Plastic wrap", "gas main in proximity", "areas of softness in AC pipe", etc.)

**DIGITAL PHOTOGRAPHS: (Insert file name)**

Overall Work Site \_\_\_\_\_

Exposed Pipe \_\_\_\_\_

Exterior of Sample \_\_\_\_\_

Edge of Pipe \_\_\_\_\_

**APPENDIX B** **FORMS**

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**Pressure Main Sample Collection Submittal Form**

Proposed

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**APPENDIX B**

**FORMS**

**Pressure Test**

February 11, 2011

<b>Project Name:</b> _____						<input type="checkbox"/> <b>Force Main</b> <input type="checkbox"/> <b>Reclaimed Main</b> <input type="checkbox"/> <b>Water Main</b>		<b>Allowable Loss – 2 Hours</b> $L = \frac{SD(P)}{148,000} \cdot \frac{1}{2}$ 148,000 <i>See Note Below</i>						
<b>Constructed by:</b> _____														
DATE	LINE SEGMENT	STATION		LENGTH	N	D	START		END		LOSS (gal)		Pass /Fail STATUS	
		From	To				Time	PSI	Time	PSI	Allow	Actual		
<b>COUNTY Inspector's Name:</b>						<b>Signature:</b>						<b>Date:</b>		
<b>Tester's Name:</b>						<b>Signature:</b>						<b>Date:</b>		
<b>Comments:</b>														

**Note:** L - Allowable leakage in gallons per hour.  
 S - Length of pipe tested, in feet.  
 D - Nominal diameter of the pipe in inches.  
 P - Average test pressure during leakage test in pounds per square inch gauge.

**APPENDIX B**  
**Pressure Test**

**FORMS**

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February 11, 2011

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**APPENDIX C**  
**FDEP PERMITS**

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# Florida Department of Environmental Protection

Central District  
3319 Maguire Boulevard, Suite 232  
Orlando, Florida 32803-3767

Rick Scott  
Governor

Carlos Lopez-Cantera  
Lt. Governor

Noah Valenstein  
Secretary

August 14, 2017

In the Matter of an  
Application for Permit by:

**PERMITTEE:**

Mr. Jose Hernandez, P.E.  
Chief Engineer  
Orange County Utilities  
9150 Curry Ford Road  
Orlando, FL 32825  
jose.hernandez2@ocfl.net

**PERMIT NUMBER:** 0133232-114-DWC/CG

**COUNTY:** Orange

**PROJECT NAME:** President's Drive  
Wastewater Infrastructure Improvements

**WASTEWATER TREATMENT:** OCUD  
South WRF

**FACILITY ID:** FLA107972

## NOTICE OF PERMIT ISSUANCE

Enclosed is Permit Number 0133232-114-DWC/CG to construct a domestic wastewater collection/transmission system, issued pursuant to Section 403.087(1), Florida Statutes.

The Department's proposed agency action shall become final unless a timely petition for an administrative hearing is filed under Sections 120.569 and 120.57, Florida Statutes, within fourteen days of receipt of notice. The procedures for petitioning for a hearing are set forth below.

A person whose substantial interests are affected by the Department's proposed permitting decision may petition for an administrative proceeding (hearing) under Sections 120.569 and 120.57, Florida Statutes. The petition must contain the information set forth below and must be filed (received by the Clerk) in the Office of General Counsel of the Department at 3900 Commonwealth Boulevard, Mail Station 35, Tallahassee, Florida 32399-3000.

Under Rule 62-110.106(4), Florida Administrative Code, a person may request an extension of the time for filing a petition for an administrative hearing. The request must be filed (received by the Clerk) in the Office of General Counsel before the end of the time period for filing a petition for an administrative hearing.

Petitions by the applicant or any of the persons listed below must be filed within fourteen days of receipt of this written notice. Petitions filed by any persons other than those entitled to written notice under Section 120.60(3), Florida Statutes, must be filed within fourteen days of publication of the notice or within fourteen days of receipt of the written notice, whichever occurs first. Section 120.60(3), Florida Statutes, however, also allows that any person who has asked the Department in writing for notice of agency action may file a petition within fourteen days of receipt of such notice, regardless of the date of publication.

The petitioner shall mail a copy of the petition to the applicant at the address indicated above at the time of filing. The failure of any person to file a petition or request for extension of time within fourteen days of receipt of notice shall constitute a waiver of that person's right to request an administrative determination (hearing) under Sections 120.569 and 120.57, Florida Statutes. Any subsequent intervention (in a proceeding initiated by another party) will be only at the discretion of the presiding officer upon the filing of a motion in compliance with Rule 28-106.205, Florida Administrative Code.

A petition that disputes the material facts on which the Department's action is based must contain the following information, as indicated in Rule 28-106.201, Florida Administrative Code:

- (a) The name and address of each agency affected, each agency's file or identification number, if known, and the county in which the project is located;
- (b) The name, address, any e-mail address, any facsimile number, and telephone number of the petitioner, if the petitioner is not represented by an attorney or a qualified representative; the name, address, and telephone number of the petitioner's representative, if any; which shall be the address for service purposes during the course of the proceeding; and an explanation of how the petitioner's substantial interests will be affected by the determination;
- (c) A statement of when and how the petitioner received notice of the Department's decision;
- (d) A statement of all disputed issues of material fact. If there are none, the petition must so indicate;
- (e) A concise statement of the ultimate facts alleged, including the specific facts the petitioner contends warrant reversal or modification of the Department's proposed action;
- (f) A statement of the specific rules or statutes the petitioner contends require reversal or modification of the Department's proposed action, including an explanation of how the alleged facts relate to the specific rules or statutes; and
- (g) A statement of the relief sought by the petitioner, stating precisely the action petitioner wishes the Department to take with respect to the Department's proposed action.

Because the administrative hearing process is designed to formulate final agency action, the filing of a petition means that the Department's final action may be different from the position taken by it in this notice. Persons whose substantial interests will be affected by any such final decision of the Department have the right to petition to become a party to the proceeding, in accordance with the requirements set forth above.

Mediation under Section 120.573, Florida Statutes, is not available for this proceeding.

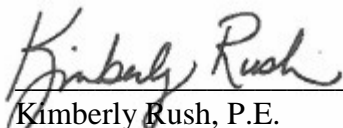
This permit action is final on the date filed with the Clerk of the Department unless a petition (or request for extension of time) is filed in accordance with the above. Upon the timely filing of a petition (or request for an extension of time), this permit will not be effective until further order of the Department.

Any party to the permit has the right to seek judicial review of the permit action under Section 120.68, Florida Statutes, by the filing of a notice of appeal under Rules 9.110 and 9.190, Florida Rules of Appellate Procedure, with the Clerk of the Department in the Office of General Counsel, 3900

Commonwealth Boulevard, Mail Station 35, Tallahassee, Florida, 32399-3000, and by filing a copy of the notice of appeal accompanied by the applicable filing fees with the appropriate district court of appeal. The notice of appeal must be filed within 30 days from the date when this permit action is filed with the Clerk of the Department.

Executed in Orlando, Florida.

STATE OF FLORIDA DEPARTMENT  
OF ENVIRONMENTAL PROTECTION



\_\_\_\_\_  
Kimberly Rush, P.E.  
Permitting and Waste Cleanup  
Program Administrator

**CERTIFICATE OF SERVICE**

The undersigned duly designated deputy clerk hereby certifies that this permit and all copies were sent on the filing date below to the following listed persons:

Copies furnished to:

David E. Mahler, P.E., CPH, Inc., [dmahler@cphcorp.com](mailto:dmahler@cphcorp.com)

Gene Elliott, DEP, [gene.elliott@dep.state.fl.us](mailto:gene.elliott@dep.state.fl.us)

Charles LeGros, DEP, [Charles.LeGros@dep.state.fl.us](mailto:Charles.LeGros@dep.state.fl.us)

**FILING AND ACKNOWLEDGMENT**

FILED, on this date, pursuant to Section 120.52, F. S., with the designated Department Clerk, receipt of which is hereby acknowledged.



\_\_\_\_\_  
Clerk

August 14, 2017

Date



# Florida Department of Environmental Protection

Central District  
3319 Maguire Boulevard, Suite 232  
Orlando, Florida 32803-3767

Rick Scott  
Governor

Carlos Lopez-Cantera  
Lt. Governor

Noah Valenstein  
Secretary

## STATE OF FLORIDA DOMESTIC WASTEWATER COLLECTION/TRANSMISSION INDIVIDUAL PERMIT

### PERMITTEE:

Mr. Jose Hernandez, P.E.  
Chief Engineer  
Orange County Utilities  
9150 Curry Ford Road  
Orlando, FL 32825  
jose.hernandez2@ocfl.net

**PERMIT NUMBER:** 0133232-114-DWC/CG

**ISSUANCE DATE:** August 14, 2017

**EXPIRATION DATE:** August 13, 2022

**COUNTY:** Orange

**PROJECT NAME:** President's Drive  
Wastewater Infrastructure Improvements

**WASTEWATER TREATMENT:** OCU  
South WRF

**FACILITY ID:** FLA107972

This permit is issued under the provisions of Chapter 403, Florida Statutes (F.S.), and Chapters 62-4 and 62-604, Florida Administrative Code (F.A.C.).

The above named permittee is hereby authorized to construct the facilities shown on the application and other documents on file with the Department and made a part hereof and specifically described as follows:

### DESCRIPTION OF PROJECT:

Construction of a sewage collection/transmission system serving a sanitary sewer improvement project with no additional connections or flows at this time.

The sewage collection/transmission system shall consist of: (A) 105 linear feet of 24 inch PVC Force Main, (B) 485 linear feet of 30 inch PVC Force Main, (C) 115 linear feet of 42 inch PVC Force Main, (D) 10 feet of 8 inch PVC Gravity Main, (E) 285 linear feet of 15 inch PVC Gravity Main, (F) 20 linear feet of 30 inch PVC Gravity Main, and (G) associated manholes, fittings, valves and appurtenances.

### LOCATION OF PROJECT:

This project is located along President's Drive in southern Orlando, Orange County.

**IN ACCORDANCE WITH:** The limitations, requirements and other conditions set forth in pages 1 through 3 of this permit.

**PROJECT NAME:** President's Drive Wastewater Infrastructure Improvements

**PERMIT NUMBER:** 0133232-114-DWC/CG

**PERMIT CONDITIONS:**

1. This permit is subject to the general conditions of Rule 62-4.160, F.A.C., as applicable. This rule is available at the Department's Internet site at:  
<http://www.dep.state.fl.us/legal/Rules/shared/62-4/62-4.pdf> [62-4.160]
2. Upon completion of construction of the collection/transmission system project, and before placing the facilities into operation for any purpose other than testing for leaks or testing equipment operation, the permittee shall submit to the Department's Central District Office Form 62-604.300(8)(b), Request for Approval to Place a Domestic Wastewater Collection/Transmission System into Operation. This form is available at the Department's Internet site at:  
<http://www.dep.state.fl.us/water/wastewater/dom/dw-forms.htm> [62-604.700(2)]

**Please submit the entire clearance document package in electronic format to DEP\_CD@dep.state.fl.us, with a copy to gene.elliott@dep.state.fl.us, and Charles.LeGros@dep.state.fl.us.** If the file is very large, you may post it to the Wastewater Electronic Applications folder on the following ftp site at:

<ftp://ftp.dep.state.fl.us/pub/wastewater/>

After posting the document, send an e-mail to DEP\_CD@dep.state.fl.us, with a copy to [gene.elliott@dep.state.fl.us](mailto:gene.elliott@dep.state.fl.us), and Charles.LeGros@dep.state.fl.us, alerting us that it has been posted. Any submitted drawings (should be sized 11" x 17") and the engineer of record's signed seal and dates on the required document must be legible for acceptance.

For further clarification contact:  
Gene Elliott, (407) 897-4151  
3319 Maguire Blvd, Suite 232  
Orlando, Florida 32803-3767

3. The new or modified collection/transmission facilities shall not be placed into service until the Department clears the project for use. [62-604.700(3)]
4. Permit revisions shall only be made in accordance with Rule 62-4.050(4)(s), F.A.C. Request for revisions shall be made to the Department in writing and shall include the appropriate fee. Revisions not covered under Rule 62-4.050(4)(s), F.A.C., shall require a new permit. [62-604.600(8)]

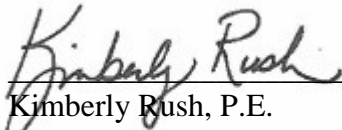
**PROJECT NAME:** President's Drive Wastewater Infrastructure Improvements

**PERMIT NUMBER:** 0133232-114-DWC/CG

5. Abnormal events shall be reported to the Department's Central District Office in accordance with Rule 62-604.550, F.A.C. For unauthorized spills of wastewater in excess of 1000 gallons per incident, or where information indicates that public health or the environment may be endangered, oral reports shall be provided to the STATE WATCH OFFICE TOLL FREE NUMBER, (800) 320-0519, as soon as practical, but no later than 24 hours from the time the permittee or other designee becomes aware of the circumstances. Unauthorized releases or spills less than 1000 gallons per incident are to be reported orally to the Department's Central District Office within 24 hours from the time the permittee, or other designee becomes aware of the circumstances. [62-604.550]

Executed in Orlando, Florida

STATE OF FLORIDA DEPARTMENT  
OF ENVIRONMENTAL PROTECTION



\_\_\_\_\_  
Kimberly Rush, P.E.  
Permitting and Waste Cleanup  
Program Administrator

DATE: August 14, 2017

**APPENDIX D**

**ORANGE COUNTY UTILITIES STANDARDS AND CONSTRUCTION  
SPECIFICATIONS MANUAL, APPENDIX D – LIST OF APPROVED PRODUCTS**

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Cat.	Desc	Manufacturer	Water		Reclaimed Water		Wastewater	
			Model #	Comments	Model #	Comments	Model #	Comments
Air Release	ARV Enclosure	<b>All ARV above ground enclosures shall be vented with tamper proof locking device</b>						
		Water Plus Polyethylene Enclosure	131632 H30-B	Blue 44" Tall	131632 H30-P	Pantone 44"	131632 H30-G	Green 44" Tall
			171730 H40-B	Blue 30" Tall	171730 H40-P	Pantone 30"	171730 H40-G	Green 30" Tall
		Hot Box Vent Guard Fiberglass Enclosure	AVG2036 Encl	Blue 36" Tall	AVG2036 Encl	Pantone 36" Tall	AVG2036 Encl	Green 36" Tall
			GP3232 Base		GP3232 Base		GP3232 Base	
			AVG2041 Encl	Blue 41" Tall	AVG2041 Encl	Pantone 41" Tall	AVG2041 Encl	Green 41" Tall
		GP3232 Base		GP3232 Base		GP3232 Base		
	Safety-Guard/Hydro Guard	15100 Encl	Blue 34" Tall	15100 Encl	Pantone 34" Tall	15100 Encl	Green 34" Tall	
	Air Release Valves	<b>Air Release Valves shall be Combination Type, 316 SS</b>						
		ARI	D-040SS	Combination	D-040SS	Combination	D-020 (SS)	Combination
H-TEC		NA	NA	NA	NA	986 (316SS)	Combination	
Vent-O-Mat		Series RBX DN50	2"	Series RBX DN50	2"	RGX series		
ARV Vault	<b>Air Release Valve Frame and Cover</b>							
	US Foundry	NA	NA	NA	NA	USF 7665-HH-HJ		
Blow Off	Auto Blow Off	<b>Automatic Blow Off Valve</b>						
		Hydro Guard	HG-1 Standard Unit	Automatic	NA	NA	NA	NA
	Blow Off Valve	<b>Blow Off Valve - Fits standard 5-1/4 inch Valve Box</b>						
		Kupferle Foundry Co	Truflo Series TF #550		Truflo Series TF #550		NA	NA
	Water Plus Corp	The Hydrant Plus Series VB 2000B		The Hydrant Plus Series VB 2000B		NA	NA	
Casing Seals / Spacers	Casing End Seals	<b>Casing End Seals. Annular space between pipe and steel casing shall be brick and mortar with end seals to secure ends.</b>						
		Advance Products	Model AC and AW		Model AC and AW		Model AC and AW	
		BWM Company	Model WR and PO		Model WR and PO		Model WR and PO	
		Cascade Water Works	Model CCES		Model CCES		Model CCES	
		CCI Pipeline	Model ESW and ESC		Model ESW and ESC		Model ESW and ESC	
		Pipeline Seal & Insulator, Inc (PSI)	Model C and W		Model C and W		Model C and W	
		Power Seal	Model 4810ES		Model 4810ES		Model 4810ES	

Cat.	Desc	Manufacturer	Water		Reclaimed Water		Wastewater	
			Model #	Comments	Model #	Comments	Model #	Comments
Casing Seals / Spacers	Casing spacer	<b>Casing spacers shall be a min. 8-inches wide for pipe 12" Dia or less or min. 12-inches wide for pipe 16 or greater , shall have a minimum 14 gauge 304 stainless steel shell/band, minimum 10 gauge 304 reinforced risers; minimum thickness of 0.090 EPDM or PVC interior liners, glass reinforces polymer or ultra high molecular weight polyethylene and 304 stainless bolts, nuts and washers.</b>						
		Advance Products	SSI8 / SSI12		SSI8 / SSI12		SSI8 / SSI12	
		BWM Company	BWM-SS-8 / SS-12		BWM-SS-8 / SS-12		BWM-SS-8 / SS-12	
		Cascade Water Works	Series CCS 8" / 12"		Series CCS 8" / 12"		Series CCS 8" / 12"	
		CCI Pipeline	Model CCS8 / CSS12		Model CCS8 / CSS12		Model CCS8 / CSS12	
		Pipeline Seal & Insulator, Inc (PSI)	Series S8G-2 / S12G-2		Series S8G-2 / S12G-2		Series S8G-2 / S12G-2	
Coatings	Exterior Coatings for Exposed Metal Assets	<b>Coatings: Aerial pipe, hydrants, above ground piping, fittings, valves and Appurtenances - System 1 Zinc / Urethane / Fluoropolymer application and color code per Section 3119 Coatings &amp; Linings. Coating shall not be in contact with Potable water unless NSF 61 approved.</b>						
		Carboline	Carbozinc 621	3.0 - 8.0 mils	Carbozinc 621	3.0 - 8.0 mils	Carbozinc 621	3.0 - 8.0 mils
			Carbothane 133 HB	3.0 -5.0 mils	Carbothane 133 HB	3.0 -5.0 mils	Carbothane 133 HB	3.0 -5.0 mils
			Carboxane 950	2.0 - 3.0 mils	Carboxane 950	2.0 - 3.0 mils	Carboxane 950	2.0 - 3.0 mils
		Tnemec	Zinc Series 90-97	2.5 - 3.5 mils	Zinc Series 90-97	2.5 - 3.5 mils	Zinc Series 90-97	2.5 - 3.5 mils
			Typoxy Series 27WB	4.0 -14.0 mils	Typoxy Series 27WB	4.0 -14.0 mils	Typoxy Series 27WB	4.0 -14.0 mils
			EnduraShield Series73	2.0 - 3.0 mils	EnduraShield Series73	2.0 - 3.0 mils	EnduraShield Series73	2.0 - 3.0 mils
	Hydroflon Series 700		2.0 - 3.0 mils	Hydroflon Series 700	2.0 - 3.0 mils	Hydroflon Series 700	2.0 - 3.0 mils	
	Exterior Coatings for Exposed Metal Assets	<b>Coatings: Aerial pipe, hydrants, above ground piping, fittings, valves and Appurtenances - System 2 Zinc / Epoxy / Urethane application and color code per Section 3119 Coatings &amp; Linings. Coating shall not be in contact with Potable water unless NSF 61 approved.</b>						
		Carboline	Carbozinc 621	3.0 - 8.0 mils	Carbozinc 621	3.0 - 8.0 mils	Carbozinc 621	3.0 - 8.0 mils
			Carboguard 60	4.0 -6.0 mils	Carboguard 60	4.0 -6.0 mils	Carboguard 60	4.0 -6.0 mils
			Carboxane 950	2.0 - 3.0 mils	Carboxane 950	2.0 - 3.0 mils	Carboxane 950	2.0 - 3.0 mils
		Tnemec	Zinc Series 90-97	2.5 - 3.5 mils	Zinc Series 90-97	2.5 - 3.5 mils	Zinc Series 90-97	2.5 - 3.5 mils
			Typoxy Series 27WB	4.0 -14.0 mils	Typoxy Series 27WB	4.0 -14.0 mils	Typoxy Series 27WB	4.0 -14.0 mils
Hi-Build Epoxoline II			4.0 - 10.0 mils	Hi-Build Epoxoline II	4.0 - 10.0 mils	Hi-Build Epoxoline II	4.0 - 10.0 mils	
Series N69			Series N69		Series N69			
PPG / Ameron	EnduraShield Series73	2.0 - 3.0 mils	EnduraShield Series73	2.0 - 3.0 mils	EnduraShield Series73	2.0 - 3.0 mils		
	Amercoat 68HS	Min 3.0 mils	Amercoat 68HS	Min 3.0 mils	Amercoat 68HS	Min 3.0 mils		
	Amercoat 385	4.0 - 6.0 mils	Amercoat 385	4.0 - 6.0 mils	Amercoat 385	4.0 - 6.0 mils		
	Amercoat 450H	2.0 - 3.0 mils	Amercoat 450H	2.0 - 3.0 mils	Amercoat 450H	2.0 - 3.0 mils		

APPENDIX D

LIST OF APPROVED PRODUCTS - TRANSMISSION SYSTEMS

FEBRUARY 11, 2011

Cat.	Desc	Manufacturer	Water		Reclaimed Water		Wastewater	
			Model #	Comments	Model #	Comments	Model #	Comments
Fittings	Fittings	<b>Ductile Iron Fittings C153 SSB / C110 FLG: (Water &amp; Reclaimed Water fittings shall cement lined or holiday free fusion bonded epoxy lined) (Wastewater fittings interior shall be Protecto 401 and holiday free)</b>						
		American	30" & up	FBE / Cement	30" & up	FBE / Cement	30" & up	Protecto 401
		Sigma		FBE / Cement		FBE / Cement		Protecto 401
		Star		FBE / Cement		FBE / Cement		Protecto 401
		Tyler Union & Clow		FBE / Cement		FBE / Cement		Protecto 401
Flow Meter	Flow Meter	<b>Flow Meters With Replaceable Sensors</b>						
		EMCO	NA	NA	NA	NA	Unimag 4411E	
Hydrants	Hydrants	<b>Hydrants Shall open left, 1-1/2 Pentagon operating nut, NST hose &amp; pumper thread, rotate 360 degrees, closed drains, epoxy on shoe in &amp; out and 304 SS nuts &amp; bolts below ground.</b>						
		American Flow Control	B-84-B (6 inch)		NA	NA	NA	NA
		Clow	Medallion 2545		NA	NA	NA	NA
		Mueller	Super Centurion 250		NA	NA	NA	NA
Joint Restraints	Ductile iron pipe MJ Restraints	<b>Mechanical Joint Wedge-action Restraining Gland, Epoxy Coated Restrain ductile iron pipe to mechanical joint fittings, pipe and appurtenances.</b>						
		EBAA Iron Inc	Megalug Series 1100		Megalug Series 1100		Megalug Series 1100	
		Ford / Uni-Flange	UFR-1400		UFR-1400		UFR-1400	
		Sigma	OneLok Series SLD/SLDE		OneLok Series SLD/SLDE		OneLok Series SLD/SLDE	
		Smith Blair	Cam Lok Series 111		Cam Lok Series 111		Cam Lok Series 111	
		Star	Star Grip Series 3000		Star Grip Series 3000		Star Grip Series 3000	
		Tyler Union	TufGrip Series TLD		TufGrip Series TLD		TufGrip Series TLD	
	DIP Bell Joint Restraints (4" - 12") (New & Existing)	<b>Bell Joint Restraints for Ductile Iron Pipe (4"-12") (New &amp; Existing) - All restraints split serrated on bell and spigot ends. Pipe 16" and greater shall have restraint gaskets or locking bells. (Wastewater only for restraint of existing DIP FM)</b>						
		EBAA Iron Inc	Tru-Dual Series 1500TD		Tru-Dual Series 1500TD		Tru-Dual Series 1500TD	
		Ford / Uni-Flange	Uni-Flange Series 1390C		Uni-Flange Series 1390C		Uni-Flange Series 1390C	
		Sigma	PV-Lok Series PWP-C		PV-Lok Series PWP-C		PV-Lok Series PWP-C	
		Smith Blair	Bell-Lock Series 165		Bell-Lock Series 165		Bell-Lock Series 165	
		Star	StarGrip Series 3100S		StarGrip Series 3100S		StarGrip Series 3100S	
DIP Bell Joint Restraints (16" & Greater)	<b>Ductile Iron Pipe Bell Joint Restraints for Ductile Iron Pipe (16" &amp; Greater) - All restraints shall have a split back-up ring for the bell and a serrated or wedge action gland for the spigot end. New installation for water &amp; reclaimed water piping 16" and greater shall have restraint gaskets or locking bells.</b>							
	EBAA Iron Inc	Series 1100HD	Existing Only	Series 1100HD	Existing Only	Series 1100HD	Existing Only	
	Sigma	Series SSLDH	Existing Only	Series SSLDH	Existing Only	Series SSLDH	Existing Only	
	Star	Series 3100S	Existing Only	Series 3100S	Existing Only	Series 3100S	Existing Only	

APPENDIX D

LIST OF APPROVED PRODUCTS - TRANSMISSION SYSTEMS

FEBRUARY 11, 2011

Cat.	Desc	Manufacturer	Water		Reclaimed Water		Wastewater	
			Model #	Comments	Model #	Comments	Model #	Comments
Joint Restraints	Ductile iron pipe Bell Joint Restraint Gaskets and Locking Bell (4" & Above)	<b>Bell Joint Restraint Gaskets and Locking Bell (4" &amp; Above) Stainless Steel locking wedges built into the gasket-rubber. ANSI/AWWA C111/A21.11 Standard for Rubber-Gasket Joints for Ductile Iron Pressure Pipe. Ductile Iron Bell Joint Restraint for Push-On Pipe- Locking bell joint system that prevents joint separation and allows for joint deflection. Bells shall be painted red to verify restrained gasket.</b>						
		American	Fast Grip Gasket	Gasket	Fast Grip Gasket	Gasket	NA	NA
			Flex-Ring Joint	Bell Lock	Flex-Ring Joint	Bell Lock	NA	NA
			Lok-Ring Joint	Bell Lock	Lok-Ring Joint	Bell Lock	NA	NA
		Griffin	Talon RJ Gasket	Gasket	Talon RJ Gasket	Gasket	NA	NA
			Snap-Lok	Bell Lock	Snap-Lok	Bell Lock	NA	NA
			Sure Stop 350 Gasket	Gasket	Sure Stop 350 Gasket	Gasket	NA	NA
		McWane Inc. DI Pipe Group	Thrust-Lock	Bell Lock	Thrust-Lock	Bell Lock	NA	NA
			TR-Flex	Bell Lock	TR-Flex	Bell Lock	NA	NA
			Super-Lock	Bell Lock	Super-Lock	Bell Lock	NA	NA
			Field Lok 350 Gasket	Gasket	Field Lok 350 Gasket	Gasket	NA	NA
		US Pipe	Field Lok Gasket	Gasket	Field Lok Gasket	Gasket	NA	NA
			TR-Flex	Bell Lock	TR-Flex	Bell Lock	NA	NA
			HP Lok Restraint Joint	Bell Lock	HP Lok Restraint Joint	Bell Lock	NA	NA
	<b>SS to DIP Transition Restraint -Flanged stainless steel pipe from Wetwell to Valve box restrained joint transition (epoxy coated, SS hardware) Flg x PE RJ.</b>							
	SS to DIP Transition Restraint	EBAA Iron Inc	NA	NA	NA	NA	Megaflange 2100	
		Sigma	NA	NA	NA	NA	SigmaFlange with One Lock SLDE	
		Smith Blair	NA	NA	NA	NA	911 Flange - Lock Restrained FCA	
	PVC Pipe MJ Restraints	<b>Mechanical Joint Wedge-action Restraining Gland, Epoxy Coated Restrain PVC pipe to mechanical joint fittings, and appurtenances.</b>						
		EBAA Iron Inc	Mega-lug Series 2000PV		Mega-lug Series 2000PV		Mega-lug Series 2000PV	
			NA	NA	NA	NA	Megalug Series 2200 (42"-48")	
		Ford / Uni-Flange	UFR 1500 Series		UFR 1500 Series		UFR 1500 Series	
		Sigma	One Lok Series SLC/SLCE		One Lok Series SLC/SLCE		One Lok Series SLC/SLCE	
		Smith Blair	Cam Lok Series 120		Cam Lok Series 120		Cam Lok Series 120	
		Star	Star Grip Series 4000		Star Grip Series 4000		Star Grip Series 4000	
		Tyler Union	TufGrip Series TLP		TufGrip Series TLP		TufGrip Series TLP	
	PVC Bell Joint Restraints (4" - 12") (New & Existing)	<b>PVC Bell Joint Restraints: PVC pipe Split Serrated on Bell End and Spigot End. (4" - 12") (New &amp; Existing)</b>						
		EBAA Iron Inc	Tru-Dual Series 1500TD		Tru-Dual Series 1500TD		Tru-Dual Series 1500TD	
		Ford / Uni-Flange	Uni-Flange Series 1390		Uni-Flange Series 1390		Uni-Flange Series 1390	
		Sigma	PV-Lok Series PWP		PV-Lok Series PWP		PV-Lok Series PWP	
		Smith Blair	Bell-Lock Series 165		Bell-Lock Series 165		Bell-Lock Series 165	
		Star	Series 1100C		Series 1100C		Series 1100C	
		Tyler Union	TufGrip 300C		TufGrip 300C		TufGrip 300C	

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LIST OF APPROVED PRODUCTS - TRANSMISSION SYSTEMS

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Cat.	Desc	Manufacturer	Water		Reclaimed Water		Wastewater	
			Model #	Comments	Model #	Comments	Model #	Comments
Joint Restraints	PVC Bell Joint Restraints (16" & Greater)	<b>PVC Bell Joint Restraints: (16" &amp; Greater) PVC pipe Split Serrated on Bell End and Spigot End. Water &amp; Reclaimed Water Existing pipe only. Wastewater shall be new and existing pipe.</b>						
		Ford / Uni-Flange	Series 1390	Existing Only	Series 1390	Existing Only	Series 1390	
		JCM	Sur-Grip Series 621	Existing Only	Sur-Grip Series 621	Existing Only	Sur-Grip Series 621	
		Sigma	PV-Lok PWP	Existing Only	PV-Lok PWP	Existing Only	PV-Lok PWP	
		Smith Blair	Bell-Lock Series 165	Existing Only	Bell-Lock Series 165	Existing Only	Bell-Lock Series 165	
		Star	Series 1100C	Existing Only	Series 1100C	Existing Only	Series 1100C	
Pipe	PVC C900 DR 18 Bell & Spigot (4" - 12")	<b>C900 Bell &amp; Spigot PVC Pipe: 4 to 12-inch - AWWA C-900, Minimum DR18 for Water, Reclaimed and Wastewater. DR14 for Fire Lines. Manufacturers shall be members in good standing with Uni-Bell to maintain approval status.</b>						
		Certaanteed 4" to 12"	Certa-Lok C900/RJ	Blue	Certa-Lok C900/RJ	Pantone Purple	Certa-Lok C900/RJ	Green
		Diamond Plastics Corp	C-900	Blue	C-900	Pantone Purple	Diamond C900	Green
		Ipex Inc	C-900 Blue Brute	Blue	C-900	Pantone Purple	C900 Blue Brute	Green
		JM Eagle	C-900	Blue	C-900	Pantone Purple	C-900	Green
		National Pipe & Plastics Inc	C-900 Dura- Blue	Blue	C-900	Pantone Purple	C-900 Pipe	Green
		North American Pipe Corp (NAPCO)	C-900	Blue	C-900	Pantone Purple	C-900	Green
		Sanderson Pipe Corp	C-900	Blue	C-900	Pantone Purple	C-900	Green
	PVC C905 DR 18 Bell & Spigot 16" and Larger	<b>C905 Bell &amp; Spigot PVC Pipe 16" and Larger: AWWA C-905, Minimum DR18 for all Force Mains up to 24". Minimum DR21/DR25 for 30" and greater. Manufacturers shall be members in good standing with Uni-Bell to maintain approval status.</b>						
		Certaanteed 16"	NA	NA	NA	NA	Certa-Lok C905/RJ	NA
		Diamond Plastics Corp	NA	NA	NA	NA	Trans-21 DR18	Green
		Ipex Inc	NA	NA	NA	NA	IPEX Centurion	Green
		JM Eagle	NA	NA	NA	NA	C905 Big Blue	Green
		National Pipe & Plastics Inc	NA	NA	NA	NA	C905	Green
HDPE C906 DR11	<b>HDPE Pipe DR11 AWWA C906 shall be Ductile Iron Pipe Size, PE 3408/3608/4710 DIPS manufactured in accordance with ASTM F-714 and listed with NSF. Pipe shall be marked in accordance with either AWWA C901,AWWA C906. Compression type connections are not acceptable in new installations. Pipe joints shall be butt fusion or electro-fusion with flange or adapter. All HDPE shall be color coded to the Utility. Color identifications are in accordance with the APWA/ULCC Uniform Color Code. Manufacturers shall be members in good standing with PPI to maintain approval status.</b>							
	JM Eagle	HDPE	DR11 Blue	HDPE	DR11 Pantone	HDPE	DR11Green	
	Performance Pipe(Chevron)	Driscoplex 4000	DR11 Blue	Driscoplex 4000	DR11 Pantone	Driscoplex 4300	DR11 Green	
	PolyPipe, Inc.	EHMW Poly Pipe	DR11 Blue	EHMW	DR11 Pantone	EHMW	DR11Green	

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Cat.	Desc	Manufacturer	Water		Reclaimed Water		Wastewater	
			Model #	Comments	Model #	Comments	Model #	Comments
Pipe	Ductile Iron Pipe	<b>Ductile iron/Cast iron: (4" to 12" = Class 350, 16" to 24" - Class 250, 30" to 64" = Class 200). Water and Reclaimed water shall be cement lined. Wastewater Piping shall be Protecto 401 and Holiday Free. Exterior coatings as specified. Wastewater DIP piping shall be for pump station piping only. Manufacturers shall be members in good standing with DIPRA to maintain approval status.</b>						
		American	Cement Lined	Blue	Cement Lined	Pantone Purple	Protecto 401	Pump Station
		Griffin	Cement Lined	Blue	Cement Lined	Pantone Purple	Protecto 401	Pump Station
		McWane Inc. DI Pipe Group	Cement Lined	Blue	Cement Lined	Pantone Purple	Protecto 401	Pump Station
		US Pipe	Cement Lined	Blue	Cement Lined	Pantone Purple	Protecto 401	Pump Station
Sample	Sample Station	<b>Sample Stations - Bacteriological Sample Station with built in flush system, all internal piping to be 2", brass and includes lockable green enclosures.</b>						
		Safety-Guard	SG-BSS-05 pedestal #77	green enclosure	NA	NA	NA	NA
		Water Plus Corp	Model 5000	green	NA	NA	NA	NA
Services	Brass Service Saddles	<b>Brass Service Saddles for 1" &amp; 2" water &amp; reclaimed water services on 4" through 12" Mains - Service saddles can be hinge or bolt controlled OD saddles to be used on C-900 and existing IPS OD PVC pipe.</b>						
		Ford	Series S-70, S-90	4"-12"	Series S-70, S-90	4"-12"	NA	NA
		AY McDonald	Model 3891 / 3895,3801 / 3805	4"-12"	Model 3891 / 3895,3801 / 3805	4"-12"	NA	NA
		Mueller	Series S-13000/H-13000	4"-12"	Series S-13000/H-13000	4"-12"	NA	NA
	Services	Service Saddles	<b>Service Saddles for 1" (CC) &amp; 2" (Iron pipe threads) Water &amp; Reclaimed Water services on mains greater than 12". Service saddles for 2" taps (iron pipe threads) on 4" mains and greater for Waste Water. : Epoxy or nylon coated stainless steel 18-8-type 304 double straps, controlled O.D. saddles to be used on C-900 / C905 or DI for all 1-in and -2in taps on pipes over 12in.</b>					
Ford			Series FC202	16" & greater	Series FC202	16" & greater	Series FC202	4" & greater
JCM			Series 406	16" & greater	Series 406	16" & greater	Series 406	4" & greater
Mueller			DR2S	16" & greater	DR2S	16" & greater	DR2S	4" & greater
Romac			Series 202NS	16" & greater	Series 202NS	16" & greater	Series 202NS	4" & greater
Smith Blair			Series 317	16" & greater	Series 317	16" & greater	Series 317	4" & greater
Services	Service Saddles for HDPE	<b>Service Saddles for 1" (CC) &amp; 2" (Iron Pipe threads) Water and Reclaimed Water Services: Epoxy or nylon coated stainless steel 18-8-type 304 double straps, controlled O.D. saddles to be used on HDPE for all 1-in and -2in taps. Taps to HDPE pipe shall be approved on a case by case basis.</b>						
		Ford	Series FCP202		Series FCP202		Series FCP202	
		Romac	Series 202N-H		Series 202N-H		Series 202N-H	
		Smith Blair	Series 317-1 for HDPE		Series 317-1 for HDPE		Series 317-1 for HDPE	
Corporation	Stops Ball Type	<b>Corporation Stops Ball Type (1-inch with AWWA taper C threads only/pack joint outlet for CTS) 2" Corporation Stop Ball Type shall be 2" MIP X FIP threads.</b>						
		Ford	FB1000, FB1700-7		FB1000, FB1700-7		FB1700-7	2" ARV
		AY McDonald	4701B-22, 3149B2		4701B-22, 3149B2		3149B2	2" ARV
		Mueller	P25008, B-20046		P25008, B-20046		B-20046	2" ARV

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Cat.	Desc	Manufacturer	Water		Reclaimed Water		Wastewater	
			Model #	Comments	Model #	Comments	Model #	Comments
Services	Curb Stops	<b>Curb Stops - Straight Valves: Ball type compression 2" cts O.D. tubing by 2" FIP</b>						
		Ford	B41-777W		B41-777W		NA	NA
		AY McDonald	6102W-22		6102W-22		NA	NA
		Mueller	P25172		P25172		NA	NA
	Curb Stops	<b>Curb Stops - Straight Valves: ball type compression x compression</b>						
		Ford	B44-444W		B44-444W		NA	NA
		AY McDonald	6100W-22		6100W-22		NA	NA
		Mueller	P25146		P25146		NA	NA
	PE tubing	<b>Polyethylene tubing: AWWA C901. UV protection (SDR-9) 1-inch and 2-inch only. PE 3408 / PE 4710</b>						
		Charter Plastics	Blue Ice		Lav Ice		NA	NA
		Endot	Endopure Blue		Endocore Lavender		NA	NA
		JM Eagle	Pure-Core		NA	NA	NA	NA
Line Stops	<b>Line Stops</b>							
	JCM							
	Romac							
	Smith Blair							
Tapping Sleeves and Valves	Tapping Sleeves	<b>Tapping Sleeves: (Mechanical joint for taps on cast iron, ductile iron, PVC &amp; AC pipe, including size on size) with stainless steel nuts and bolts.</b>						
		American Flow Control	Series 2800		Series 2800		Series 2800	
			Series 1004		Series 1004		Series 1004	
		Clow	Series F-5205	DIP/PVC	Series F-5205	DIP/PVC	Series F-5205	DIP/PVC
			Series F-5207	A/C Pipe	Series F-5207	A/C Pipe	Series F-5207	A/C Pipe
		JCM	Series 414	FBE	Series 414	FBE	Series 414	FBE
		Mueller	Series H-615	DIP/PVC	Series H-615	DIP/PVC	Series H-615	DIP/PVC
			Series H-619	A/C Pipe	Series H-619	A/C Pipe	Series H-619	A/C Pipe
Smith Blair	Style 623	FBE	Style 623	FBE	Style 623	FBE		
Tapping Valves: 12" and smaller	<b>Tapping Valves: 12" and smaller - Tapping Valves shall be furnished with an alignment lip and installed in the vertical position for Water and Reclaim Water. Wastewater shall be installed horizontally and abandoned in the open position. Tapping valves shall be resilient seated only and meet the requirements of AWWA C509 or C515</b>							
	American Flow Control	Series 2500	Alignment Lip	Series 2500	Alignment Lip	Series 2500	Alignment Lip	
	Clow	Series F-6114	Alignment Lip	Series F-6114	Alignment Lip	Series F-6114	Alignment Lip	
	Mueller	Series T2360 (4"-12")	Alignment Lip	Series T2360 (4"-12")	Alignment Lip	Series T2360 (4"-12")	Alignment Lip	

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Cat.	Desc	Manufacturer	Water		Reclaimed Water		Wastewater	
			Model #	Comments	Model #	Comments	Model #	Comments
Tapping Sleeves and Valves	Tapping Valves: 16" and Larger	<b>Tapping Valves: 16" and Larger - Tapping valves shall be furnished with an alignment lip and be installed in the vertical position for Water and Reclaimed Water. No tapping valve shall be installed horizontally for Water and Reclaim Water unless approved by the engineer. Tapping Valves 16" and larger AWWA C515 resilient seated only (16" and 24" no gearing required) above 24" shall be installed vertically with a spur gear actuator unless noted by the engineer. All tapping valves above 24" shall be furnished with NPT pipe plugs for flushing the tracks when valves are installed horizontally. Tapping valves for Wastewater shall be installed horizontally and abandoned in open position.</b>						
		American Flow Control	Series 2500	Alignment Lip & flushing port	Series 2500	Alignment Lip & flushing port	Series 2500	Alignment Lip & flushing port
		Clow	Series F-6114	Alignment Lip & flushing port	Series F-6114	Alignment Lip & flushing port	Series F-6114	Alignment Lip & flushing port
		Mueller	Series T2361 (14"&up)	Alignment Lip & flushing port	Series T2361 (14"&up)	Alignment Lip & flushing port	Series T2361 (14"&up)	Alignment Lip & flushing port
Valves	Butterfly Valve 42" and Above	<b>Butterfly Valves 42"and above. AWWA C504. Actuators input torques based on 150 psi valve pressure and 16 fps velocity with a maximum input of 80 ft-lb on 2" nuts and shall withstand 250 ft-lbs. Valve seats shall be leak-tight in both directions at 150 psi.</b>						
		Clow	Style #1450		Style #1450		NA	NA
		Dezurik	BAW		BAW		NA	NA
		Mueller / Pratt	LINSEAL III / Groundhog		LINSEAL III / Groundhog		NA	NA
	Check Valves	<b>Valves (Check) 4-inch and Larger (8 mil epoxy lined)</b>						
		American Flow Control	NA		NA		Series 600 or 50 line	
		Clow / M&H / Kennedy	NA		NA		106	
	Gate Valves 4" - 12"	<b>Gate Valves 12" and smaller - resilient seated only AWWA C509 or C515. Valve seat shall be leak-tight in both directions at 150 psi.</b>						
		American Flow Control	Series 2500		Series 2500		NA	NA
		Clow	Series F-6100		Series F-6100		NA	NA
Mueller		Series A-2360		Series A-2360		NA	NA	
Gate Valves (Vertical) 16" and Up	<b>Gate Valves 16" and larger (Vertical Installation) AWWA C515 resilient seated only (16" and 24" no gearing required) above 24" shall be installed vertically with a gear actuator unless noted by the engineer. Valve seat shall be leak-tight in both directions at 150 psi.</b>							
	American Flow Control	Series 2500		Series 2500		NA	NA	
	Clow	Series F-6100		Series F-6100				
	Mueller	Series A-2361		Series A-2361		NA	NA	



Cat.	Desc	Manufacturer	Water		Reclaimed Water		Wastewater			
			Model #	Comments	Model #	Comments	Model #	Comments		
Valves	Plug Valves	<b>Plug Valves - Bi-directional, MJ &amp; Flanged (min. 8mil fusion bonded epoxy with stainless steel bolts), gear operator to be sized for rated pressure of the valve. Valves 4"-20" shall be 80% Full Port and valves 24" and greater shall be minimum of 70% full port. Valve shall be factory tested to minimum 100 PSI in both directions.</b>								
		Clow	NA	NA	NA	NA	F-5412 FLG	4" & up		
			NA	NA	NA	NA	F-5413 MJ	4" & up		
		Dezurik	NA	NA	NA	NA	Series PEF or PEC	4" & up		
		Millikan / Pratt	NA	NA	NA	NA	Eccentric / Ballcentric	4" & up		
			NA	NA	NA	NA	5600 or 5800 (FLG)	4" & up		
Val-Matic	NA	NA	NA	NA	5700 or 5900 (MJ)	4" & up				
Valve Boxes	Valve Boxes with Locking Lids (Cast Iron)	<b>Two piece standard screw type Heavy Duty Valve Boxes with Locking Lids (Cast Iron) and type of service cast in heavy duty traffic lid (H2O loading) ASTM A48</b>								
		Bingham/Taylor	Series 4905	Box	NA	NA	Series 4905	Box		
			4905-X	Extension	NA	NA	4905-X	Extension		
			4904-L	Blue Water Locking Lid	NA	NA	4904-L	Green Sewer locking Lid		
		Sigma	Series VB 261X-267X	Box	VB-25031LK-VB-2612	Box	Series VB 261X-267X	Box		
			VB 6302	Extension	VB-6302	Extension	VB 6302	Extension		
			VB 4650W	Blue Water Locking Lid	VB2503LK	Purple Square Locking Lid	VB 4650S	Green Sewer locking Lid		
		Star	Series VB-0002	Box	NA	NA	Series VB-0002	Box		
			VBEX 12-24S	Extension	NA	NA	VBEX 12-24S	Extension		
			VBLIDLOCK	Blue Water Locking Lid	NA	NA	VBLIDLOCK	Green Sewer locking Lid		
		Tyler Union	Series 6850	Box	NA	NA	Series 6850	Box		
			58, 59, 60	Extension	NA	NA	58, 59, 60	Extension		
			Locking Lid	Blue Water Locking Lid	NA	NA	Locking Lid	Green Sewer locking Lid		
		Valve Box	Valve Box	<b>For mains equal to, or greater than, 16" diameter or equal to greater than 6' feet deep</b>						
				American Flow Control	# 2A - 9A Retrofit Valve Box Insert	Fit inside std valve boxes	NA		2A - 9A Retrofit Valve Box Insert	Green Sewer locking Lid
				Mueller Company	MVB050C thru MVB130C with Extension Stem	Blue Water Locking Lid	MVB050CR thru MVB130CR with Extension Stem	Purple Square Locking Reclaim Lid	MVB050C thru MVB130C with Extension Stem	Green Sewer locking Lid
				MVB875 Guide Plate		MVB875 Guide Plate		MVB875 Guide Plate		

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Cat.	Desc	Manufacturer	Water		Reclaimed Water		Wastewater		
			Model #	Comments	Model #	Comments	Model #	Comments	
Coatings	Anti-Graffiti Paint	<b>Block Walls-Anti-Graffiti Paint per Section 3119 Coatings &amp; Linings</b>							
		American Building Restoration Products	NA	NA	NA	NA	Polyshield Graffiti Preventer for Unpainted Masonry Type B	Super Bio Strip or Strip it all	
		Tnemec / Chemprobe	NA	NA	NA	NA	626 DUR A PEL	680 Mark A Way	
		Professional Products of Kansas, Inc	NA	NA	NA	NA	Professional Water Seal & Anti-Graffiti (PWS-15 Super Strength)	Professional Phase II Cleaner	
	Coatings for Existing Manholes	<b>Rehabilitation corrosion protection system per Section 3119 Coatings &amp; Linings. Interior coating for force main connections to existing concrete manholes only. New precast structures and existing pump stations shall be lined.</b>							
		CCI Spectrum, Inc	NA	NA	NA	NA	Spectrashield	min of 500 mils	
		Kerneos Aluminate Technologies	NA	NA	NA	NA	Sewpercoat	1" (1000mil)	
		Raven Lining System	NA	NA	NA	NA	Raven 155 Primer Raven 405	min 8 mils min 125 mils	
		Sauereisen	NA	NA	NA	NA	210 Series Topcoat Glaze 210G	min 125 mils min 20 mils	
		Tnemec	NA	NA	NA	NA	Series 434 Topcoat Glaze 435	min 125 mils 15-20 mils	
PVC Pipe and fittings	Pipe SDR 35 Gravity Mains	<b>PVC Pipe for Gravity SDR26/SDR 35 (Green in color) ASTM-D034. Manufacturers shall be members in good standing with Uni-Bell to maintain approval status.</b>							
		Certainteed	NA	NA	NA	NA	Gravity Sewer Pipe		
		Diamond Plastics Corp	NA	NA	NA	NA	Sani-21 SDR-35		
		JM Eagle	NA	NA	NA	NA	Gravity Sewer		
		National Pipe & Plastics, Inc.	NA	NA	NA	NA	Ever-Green Sewer Pipe		
		North American Pipe Corp (NAPCO)	NA	NA	NA	NA	Gravity Sewer		
		Sanderson Pipe Corp	NA	NA	NA	NA	Gravity Sewer		
	Locate Balls	<b>Locating Marker Systems - Wastewater Locator balls placed at all sanitary sewer cleanouts</b>							
		3M	NA	NA	NA	NA	3M™ EMS 4" Extended Range 5' Ball Marker 1404-XR		
	Fittings SDR 35	<b>Fittings, Adapters and Plugs - Gravity PVC ASTM-D3034, Min SDR26/ SDR 35</b>							
		GPK Products, Inc.	NA	NA	NA	NA	SDR26/SDR35 Gasketed sewer fittings		
		Harrington Corporation (HARCO)	NA	NA	NA	NA	SDR26/SDR35 Gasketed sewer fittings		
		Multi Fittings Corp.	NA	NA	NA	NA	SDR26/SDR 35 Trench Tough Sewer Fittings		
JM Eagle		NA	NA	NA	NA	SDR26/SDR35 Gasketed sewer fittings			
Plastic Trends Inc		NA	NA	NA	NA	SDR26/SDR35 Gasketed sewer fittings			
TIGRE USA, Inc.		NA	NA	NA	NA	SDR26/SDR35 Gasketed sewer fittings			

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Cat.	Desc	Manufacturer	Water		Reclaimed Water		Wastewater	
			Model #	Comments	Model #	Comments	Model #	Comments
PVC Pipe a	Flexible Pipe Connectors	<b>Flexible Pipe Connectors and Transitions</b>						
		Fernco	NA	NA	NA	NA	1002, 1051, 1056 Series	
		Indiana Seal	NA	NA	NA	NA	102, 151, 156 Series	
		Mission Rubber	NA	NA	NA	NA	MR02, MR51, MR 56 Series	
Precast Concrete Structures	MH Lids	<b>Frame and Cover</b>						
		USF Fabrication Inc.	NA	NA	NA	NA	USF 225-AS	
	Adj Ring	<b>Top Adjusting Rings - HDPE with heavy duty loading (H-20)</b>						
		Ladtech, Inc	NA	NA	NA	NA	24R, 24S with Rope Sealant CS2455	
	Hatches	<b>Wet Well and Valve Vault Access Frames and Covers (Include the term "Confined Space" etched or cast into the cover with recessed lock &amp; hasp. Frames and covers per manufacturers specifications.</b>						
		Halliday Products	NA	NA	NA	NA	S1R or S2R Series	
		USF Fabrication Inc.	NA	NA	NA	NA	APS or APD Series	
	Precast Concrete Structures	<b>Precast Manhole and Wetwell Structures ASTM C478. Precast concrete shall be batched with concrete dyed crystalline waterproofing admixture with corrosion protection. Concrete without admixture or without color tint /tracer shall be rejected.</b>						
		Allied Precast	NA	NA	NA	NA	Dyed Admix	
		Atlantic Concrete Products, Inc.	NA	NA	NA	NA	Dyed Admix	
		Delzotto Products, Inc.	NA	NA	NA	NA	Dyed Admix	
		Dura Stress Underground Inc.	NA	NA	NA	NA	Dyed Admix	
		Hanson Pipe & Product	NA	NA	NA	NA	Dyed Admix	
		Mack Concrete	NA	NA	NA	NA	Dyed Admix	
		Oldcastle Precast	NA	NA	NA	NA	Dyed Admix	
	Standard Precast Inc.	NA	NA	NA	NA	Dyed Admix		
	Concrete Admix	<b>Crystalline Waterproofing Concrete Admix with color dye shall be added to all concrete structures (precast and cast-in-place) to provide waterproofing and corrosion resistance. Concrete without admixture or without color tint / tracer shall be rejected. % concentration of admix with colored dye added to the mix shall be based on weight of cement.</b>						
Kryton International		NA	NA	NA	NA	KIM K-301R (with red dye)	2%	
Xypex Chemical Corp		NA	NA	NA	NA	Xypex Admix C-1000Red (with red dye)	3.0 - 3.5%	
Liners	<b>Interior Liner for New or existing Precast Manhole and Precast Wetwell Structures per Section 3119 Coatings &amp; Linings</b>							
	AFE	NA	NA	NA	NA	Fiberglass Liner		
	AGRU Liner	NA	NA	NA	NA	HDPE Liner (Min 2 mm for Manhole / Min 5 mm for Pump Station)		
	Containment Solutions Inc. (Flowtite)	NA	NA	NA	NA	Fiberglass Liner		
	GSE Studliner	NA	NA	NA	NA	HDPE Liner (Min 2 mm for Manhole / Min 5 mm for Pump Station)		
	GU Liner	NA	NA	NA	NA	Reinforced Plastic Liner		
		L & F Manufacturing	NA	NA	NA	NA	Fiberglass Liner	

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Cat.	Desc	Manufacturer	Water		Reclaimed Water		Wastewater		
			Model #	Comments	Model #	Comments	Model #	Comments	
Precast Concrete Structures	Heat Shrink Seal	<b>Heat Shrink Seal - Precast structures shall be primed with manufacturer approved primer prior to application of heat shrunk encapsulation.</b>							
		Canusa-CPS	NA	NA	NA	NA	Wrapid Seal with WrapidSeal Primer (Canusa G Primer )		
		Pipeline Seal & Insulator, Inc (PSI)	NA	NA	NA	NA	Riser Wrap with Polyken 1027 or 1039 primer		
	Joining Material	<b>Joining Material Min. 2" width for all products to ensure squeeze out with manufacturer approved primer.</b>							
		Henry Company	NA	NA	NA	NA	Ram-Nek	with Primer	
		Martin Asphalt Company	NA	NA	NA	NA	Evergrip 990	with Primer	
		Trelleborg Pipe Seals	NA	NA	NA	NA	NPC – Bidco C-56	with Primer	
	Pipe Seals Gravity	<b>Resilient Connector Pipe Seals, Manhole - Gravity less than 12-inch and less than 15-ft deep</b>							
		Atlantic Concrete	NA	NA	NA	NA	A-Lok (cast-in-place)		
		Hail Mary Rubber	NA	NA	NA	NA	Star Seal (cast-in-place)		
		IPS	NA	NA	NA	NA	Wedge Style		
		NPC	NA	NA	NA	NA	Kor-N-Seal Model WS		
		Press seal gasket	NA	NA	NA	NA	PSX Direct Drive		
	Pipe Seals Gravity	<b>Cast in Place Pipe Seals, Manhole - Gravity Greater Than or Equal to 12-inch and all pipe sizes greater than 15-ft deep</b>							
		Atlantic Concrete	NA	NA	NA	NA	A-Lok	cast in place	
		Hail Mary Rubber	NA	NA	NA	NA	Star Seal	cast in place	
	FM Pipe Seals	<b>Modular Pipe Seals for Wet Well and Valve Box penetrations and all forcemain connections to existing and new precast concrete structures. EPDM Rubber with 316 SS Hardware</b>							
		CCI Pipeline Systems	NA	NA	NA	NA	Wrap-It Link WL-SS Series		
		Pipeline Seal & Insulator, Inc / Link Seal	NA	NA	NA	NA	Link-Seal S-316 Modular Seal		
		Proco Products, Inc	NA	NA	NA	NA	PenSeal ES-PS Series		

APPENDIX D

LIST OF APPROVED PRODUCTS - PUMP STATION SYSTEMS

FEBRUARY 11, 2011

Cat.	Desc	Manufacturer	Water		Reclaimed Water		Wastewater	
			Model #	Comments	Model #	Comments	Model #	Comments
Generator	Gen	<b>Generator Systems, Fixed Shall be UL 2200 Certified.</b>						
		Caterpillar	NA	NA	NA	NA	CAT Diesel Generator Set	
		Cummins Power Generation	NA	NA	NA	NA	Diesel Generator Set	
	Fuel Tanks	<b>Generator Fuel Tanks. Shall be UL2085 certified.</b>						
		Convault	NA	NA	NA	NA	CVT-3SF or CVT-3FF	
		Phoenix	NA	NA	NA	NA	Envirovault	
	GR	<b>Generator Receptacle (GR)</b>						
		Cooper Crouse-Hinds	NA	NA	NA	NA	AR2042 (230V, 200A, 3P, 4W) With AJA1 Angle Adaptor	
		Cooper Crouse-Hinds	NA	NA	NA	NA	AR2042-S22 (460V, 200A, 3P, 4W) With AJA1 Angle Adaptor	
		Pyle National	NA	NA	NA	NA	JRE-4100 (230V, 100A, 3P, 4W)	
ATS	<b>Generator Transfer Switch</b>							
	Russelectric	NA	NA	NA	NA	RMTD Series with model 2000 controller	NEMA 12/3R 316SS Enclosure	
Odor Control Units	Biotrickling Filters	<b>Biotrickling filters</b>						
		BioAir	NA	NA	NA	NA		
		Biorem	NA	NA	NA	NA	Biosorbens BTF	
		Envirogen	NA	NA	NA	NA	BTF	
		Siemens	NA	NA	NA	NA	Zabocs BTF	
	Carbon Adsorption Units	<b>Carbon Adsorption Units</b>						
		Calgon	NA	NA	NA	NA		
		Pure Air Filtration	NA	NA	NA	NA		
		Siemens	NA	NA	NA	NA		
	Pressure Gauges	<b>Pressure Gauges shall have Diaphragm Seals. Oil filled.</b>						
Ashcroft		NA	NA	NA	NA	10 1008SL 02L 60#	Gauge Diaphragm Seal	
		25 200SS 02T XYTSE						
Terice		NA	NA	NA	NA	D83LFSS4002LA100 - Gauge M51001SSSS - Diaphragm Seal D99100 Fill and Mount Charge		
	Winter Gauges	NA	NA	NA	NA	PFQ770 0-60 PSI D70950 top D70954 Bottom		
Pumps	<b>Submersible Pumps</b>							
	ABS	NA	NA	NA	NA			
	Flygt	NA	NA	NA	NA			

APPENDIX D

LIST OF APPROVED PRODUCTS - PUMP STATION SYSTEMS

FEBRUARY 11, 2011

Cat.	Desc	Manufacturer	Water		Reclaimed Water		Wastewater	
			Model #	Comments	Model #	Comments	Model #	Comments
Pumps	Floats	<b>Float Regulator (FR) - Duplex and Triplex Pump Stations</b>						
		Atlantic Scientific	NA	NA	NA	NA	Roto-Float	
Pumps	Radar	<b>Radar - Pulse Burst Radar Transmitter. Input 24 VDC and Output 4-20 mA</b>						
		Magnetrol	NA	NA	NA	NA	R82-520A-011	
Pump Station Main Ser	Main Srvc Disconnect	<b>Main Service Disconnect Breaker</b>						
		Square D	NA	NA	NA	NA	H or J Frame 3 Pole 600 Volt (HGL or JGL determined by amperage)	
	Surge Protector Device	<b>Surge Protector - UL 1449, 3rd Edition listed and labeled, minimum 10 year warranty, NEMA LS-1 and IEEE C62, 41/45 tested with NEMA 4X enclosure, internal fusing, voltage and phase to match service. Rated 80,000 amps per mode for Duplex &amp; Triplex stations and 150,000 Amperes per mode for Master Stations. All devices shall be provided with a NEMA 4X Plastic enclosure which is approved in lieu of stainless steel.</b>						
		Current Technology (Power & Systems)	NA	NA	NA	NA	XN-80, TG-150 or CurrentGuard 150 Plus Series	
	Joslyn AKA (Total Protection Solutions)	NA	NA	NA	NA	TSS-ST 160 Series, ST 300 Series or JSP-300 Series		
	Surge Suppressors, Inc	NA	NA	NA	NA	LSE Series or SHL Series		
Sub Panel	Sub Panel	<b>Sub-Panel Enclosure - NEMA 12/3R Enclosure 316SS, white polyester Powder coated finish inside and out, With 3 Point Pad lockable Handle, and Door Stop</b>						
		Hoffman	NA	NA	NA	NA		
		Schaefer	NA	NA	NA	NA		
		Universal enclosure systems	NA	NA	NA	NA		
Pump Station Control Panel	Control Panel	<b>Control Panel Supplier</b>						
		ECS	NA	NA	NA	NA		
		Sta-Con Inc	NA	NA	NA	NA		
	Enclosure	<b>Enclosure - NEMA 12/3R Enclosure 316SS, white polyester Powder coated finish inside and out, With 3 Point Pad lockable Handle, and Door Stop</b>						
		Hoffman	NA	NA	NA	NA		
		Schaefer	NA	NA	NA	NA		
		Universal enclosure systems	NA	NA	NA	NA		
	Mnts	<b>Mounting Channel for Enclosures</b>						
		Unistrut Stainless Steel	NA	NA	NA	NA	1" 5/8 x 1" 5/8 316 SS	
	Seal-off	<b>Explosion-Proof Sealoff</b>						
	Cooper Crouse-Hinds	NA	NA	NA	NA	EYSR - 2 Inch Min.		
FL	Flasher (FL)							
		MPE	NA	NA	NA	NA	025-120-105	
		SSAC	NA	NA	NA	NA	FS-126	

APPENDIX D

LIST OF APPROVED PRODUCTS - PUMP STATION SYSTEMS

FEBRUARY 11, 2011

Cat.	Desc	Manufacturer	Water		Reclaimed Water		Wastewater	
			Model #	Comments	Model #	Comments	Model #	Comments
Pump Station Control Panel		<b>Alarm Light / With Base and Globe (AL)</b>						
	AL	American Electric	NA	NA	NA	NA	F32552	
		Red Dot Globe	NA	NA	NA	NA	VGLR-01	
		Red Dot Base					VA-01	
		<b>Alarm Horn (AH)</b>						
	AH	Wheelock	NA	NA	NA	NA	3IT-115-R	
		<b>Fuses (F)</b>						
	Fuse	Bussmann	NA	NA	NA	NA	FNQ-R or KTK-R	
		<b>Hand-Auto-Off Selector (HOA)</b>						
	HOA	Square D	NA	NA	NA	NA	9001-SKS43B	
		<b>Horn Silence Button (HSS)</b>						
	HSS	Square D	NA	NA	NA	NA	9001-SKR1RH5	
		<b>Mechanical Interlock</b>						
	Inter-lock	Square D	NA	NA	NA	NA	S29354	
		<b>Control Panel Main Circuit Breaker (MCB) With S29450 Circuit Breaker Auxiliary Switch</b>						
	Breakers	Square D	NA	NA	NA	NA	H or J Frame 3 Pole 600 Volt (HGL or JGL determined by amperage)	
		<b>Emergency Circuit Breaker (ECB) With S29450 Circuit Breaker Auxiliary Switch</b>						
		Square D	NA	NA	NA	NA	H or J Frame 3 Pole 600 Volt (HGL or JGL determined by amperage)	
		<b>Motor Circuit Breaker (MB)</b>						
		Square D	NA	NA	NA	NA	H or J Frame 3 Pole 600 Volt (HGL or JGL determined by amperage)	
		<b>Control Circuit Breaker/ GFCI Receptacle Breaker/ SCADA Breaker</b>						
	Square D	NA	NA	NA	NA	QOU120		
	<b>Motor Starter (MS)</b>							
MS	Square D	NA	NA	NA	NA	Type S Class 8536		
	<b>Overload Heater(OL)</b>							
OL	Square D	NA	NA	NA	NA	Part number will vary with size needed		
	<b>Overload Reset</b>							
OR	Square D	NA	NA	NA	NA	9066-RA1		
	<b>Control Circuit Transformer (XMFR)</b>							
Transformer	Square D	NA	NA	NA	NA	9070TF75D23	120/24 Volt .075 KVA	
	<b>Main Circuit Transformer (MCT)</b>							
	Square D	NA	NA	NA	NA	9070T2000D1	480/120 2KVA	
	<b>Supplemental Protector Breaker - 3 pole, 1-amp for Phase Monitor</b>							
SPB	Square D	NA	NA	NA	NA	MG24532		

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LIST OF APPROVED PRODUCTS - PUMP STATION SYSTEMS

FEBRUARY 11, 2011

Cat.	Desc	Manufacturer	Water		Reclaimed Water		Wastewater	
			Model #	Comments	Model #	Comments	Model #	Comments
Pump Station Control Panel	PM	<b>Phase Monitor (PM)</b>						
		MPE 240 V.	NA	NA	NA	NA	001-230-118-OVG5	
		MPE 480 V.	NA	NA	NA	NA	002-480-123-OVG5	
	Pump Alternator	<b>Pump Automatic Alternator (PAA)</b>						
		Diversified Duplex	NA	NA	NA	NA	ARA-120-ACA	
		Diversified Triplex	NA	NA	NA	NA	ARA-120-AME	
		MPE Duplex	NA	NA	NA	NA	008-120-13SP	
		MPE Triplex	NA	NA	NA	NA	009-120-23P	
	MPE Triplex Socket	NA	NA	NA	NA	SD-12-PC		
	Alt. Test Switch	<b>Alt. Test Switch</b>						
		Carling Technologies	NA	NA	NA	NA	6GG5E-78	
		Honeywell	NA	NA	NA	NA	2TL1-50	
	Relay	<b>Relay</b>						
		Potter Brumfield 24 Volt	NA	NA	NA	NA	KRPA-11AN-24	
		Potter Brumfield 120 Volt	NA	NA	NA	NA	KRPA-11AN-120	
		Square D 24 Volt	NA	NA	NA	NA	8501KP12P14V14	
	Square D 120Volt	NA	NA	NA	NA	8501KP12P14V20		
	Relay Base	<b>Relay Base</b>						
		IEDC 8 Pin Relay Base 600 Volt	NA	NA	NA	NA	SR2P-06	
	Duplex Receptacle / GFCI	<b>Duplex Receptacle/GFCI (DR) Upgraded to 20 Amp</b>						
		Hubbell	NA	NA	NA	NA	GFTR20BK	
		Pass & Seymour	NA	NA	NA	NA	2095TRBK	
	ETM	<b>Elapse Time Meter (ETM)</b>						
		Reddington	NA	NA	NA	NA	711-0160	
	Grounding	<b>Grounding System</b>						
		Marathon	NA	NA	NA	NA	Neutral Isolation Block 1421570	
		Panduit	NA	NA	NA	NA	Ground Lug LAM2A 1/0 - 014 -6Y	
	Square D	NA	NA	NA	NA	Ground Buss PK7GTA		
TS	<b>Terminal Strip (TS)</b>							
	Marathon	NA	NA	NA	NA	Series 200		
	Square D	NA	NA	NA	NA	9080GR6		
TS	<b>Terminal Strip End Blocks and End Clamps</b>							
	Square D	NA	NA	NA	NA	9080GM6B & 9080GH10		



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FEBRUARY 11, 2011

Cat.	Desc	Manufacturer	Water		Reclaimed Water		Wastewater	
			Model #	Comments	Model #	Comments	Model #	Comments
Pump Station Control Pane	PL	<b>Pilot Light (PL) 24 Volt with 1819 Bulb</b>						
		Dialight	NA	NA	NA	NA	803-1710	
		Lighting Components & Design	NA	NA	NA	NA	Littlelight 930507X	
	RL	<b>Run Indicator Light (RL) 120 Volt</b>						
		Dialight	NA	NA	NA	NA	803-1710	
		Lighting Components & Design	NA	NA	NA	NA	Littlelites 930507X With 120MB Bulb	
	MT	<b>Moisture and Temperature Failure Light (MT) 120 Volt with 120MB Bulb</b>						
		Dialight	NA	NA	NA	NA	803-1710	
		Lighting Components & Design	NA	NA	NA	NA	Littlelites 930507X	
Sluice Gate	<b>Sluice Gate for Wet Well with Motorized Operator</b>							
	BNW	NA	NA	NA	NA	Model 77 - 316 SS		
	Fontaine	NA	NA	NA	NA	Model 20 - 316 SS		
VFD	<b>Variable Frequency Drives</b>							
	Square D	NA	NA	NA	NA			