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ISSUED: JUNE 26, 2015

INVITATION FOR BIDS

FOR

**HUNTERS CREEK, VISTANA AND ORANGEWOOD WATER SUPPLY FACILITY
FUEL TANK REPLACEMENT**

**PART H
TECHNICAL SPECIFICATIONS**

PART H

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TO
PROJECT MANUAL
ORANGEWOOD, VISTANA, AND HUNTERS CREEK
FUEL TANK REPLACEMENT

OCU Sequence Number 79205
OCU Project Sequence Nos. 1498-12, 1498-13, 1498-14

CPH Project No. O28419
June 2015

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CONDITIONS OF THE CONTRACT**

TO BE PROVIDED BY ORANGE COUNTY PURCHASING

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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 damage. No wheeling, walking, or placing of heavy loads shall be allowed and all portions damaged shall be repaired 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 kind, and quantity of materials and equipment included in the Work to be done under this Contract. Fuel tank sizes have been noted on the project plans.
- 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 and 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 incidental 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 10-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 supply facility and associated back-up generator at each of the respective locations shall remain in service while the work is being completed. The Contractor shall, prior to interrupting any service (fuel tank installation, fuel line installation, 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. Contractor to submit a Construction Assistance Request (CAR) with a minimum 7 day notice on all interaction with O.C. production.
- 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 the proposed work and has 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. Contractor to submit a Construction Assistance Request (C.A.R.) with a minimum 7 day notice on all interaction with O.C. production.
- 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 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. The material or equipment 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, manholes or other piping and buildings within the work area.
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/business 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 open cuts shall be backfilled, compacted, and limerock base spread and compacted immediately after installation. Contractor shall coordinate with the County prior to removing a roadway or travelway 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 fuel tanks, pipe and fittings and appurtenances 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 Work (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 (IF REQUIRED)

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 (IF REQUIRED)

1. Maintain public highway traffic within the limits of the Project for the duration of the construction period, including any temporary suspensions of work. Work shall also include construction and maintenance of any necessary detour facilities; furnishing, installing and maintaining of traffic control and safety devices, control of dust, or any other special requirements for safe and expeditious movement of vehicular and pedestrian traffic.
2. Traffic Control shall be provided at the Contractor's expense by the Contractor's personnel or off-duty uniformed police officer, depending on and as required by the applicable traffic control requirements jurisdictional to the construction or road.
3. The Contractor shall prepare and submit a Maintenance of Traffic plan (MOT) to the County/Professional and to the agency with jurisdiction for MOT (Orange County Public Works, FDOT, local municipalities, etc.) for review and acceptance prior to commencing any work. The Traffic Control Plan shall 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.

- 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. All references to the respective agency in the above referenced standards shall be construed to also include the County for this Work.
4. The cost of any required road permits shall be borne by the Contractor.
 5. The Contractor will notify the public one (1) week in advance of any scheduled work via the use of portable message boards. The message boards shall be located at each approach to the construction area.
 6. Before closing any thoroughfare, the Contractor shall give written notice to, and if necessary, obtain a permit or permits from the duly constituted public authority having jurisdiction over the thoroughfare. Notice shall be given no less than 72-hours in advance of the time when it may be necessary in the process of construction to close such thoroughfare, or as may be otherwise provided in the acceptable Maintenance of Traffic plan.
 7. The Contractor shall sequence and plan construction operations and shall generally conduct his work in such a manner as not to unduly or unnecessarily restrict or impede existing normal traffic through the streets of the local community.
 8. If required by duly constituted public authority, the Contractor shall, at his own expense, construct bridges or other temporary crossing structures over trenches so as not to unduly restrict traffic. Such structures shall be of adequate strength and proper construction and shall be maintained by the Contractor in such a manner as not to constitute an undue traffic hazard.
 9. The Contractor shall make provisions at all "open cut" street crossings to allow a minimum of one lane to be open for vehicular traffic at all times. Lane closing shall be as permitted by the local governing authority and shall be repaired to a smooth, safe driving surface immediately following the installation of pipe or conduit.
 10. The Contractor shall make provisions at cross streets for the free passage of vehicles and pedestrians, either by bridging or otherwise, and shall not obstruct the sidewalks, gutters, or streets, nor prevent in any manner the flow of water in the latter, but shall use all proper and necessary means to permit the free passage of surface water along the gutters.
 11. The Contractor shall immediately cart away all offensive matter; exercising such precaution as may be directed by the County. All material excavated shall be so disposed of as to inconvenience the public and adjacent tenants as little as possible and to prevent injury to trees, sidewalks, fences and adjacent property of all kinds.

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, Florida Department of Environmental Protection (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. Fuel line, ~~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 WORK COVERED BY CONTRACT DOCUMENTS

- A. This Contract is for the replacement of the existing fuel tanks at the Hunters Creek Water Supply Facility (WSF), Vistana WSF and the Orangewood WSF sites as shown on the Drawings and specified herein. The Work consists of furnishing all labor, equipment, and materials for the construction of the facilities consisting of, but not limited to, the following:
1. Removal and replacement of the existing fuel tanks.
 2. Removal and replacement of the fuel supply lines and fuel return lines.
 3. Proper disposal of the existing fuel tanks that are taken out of service.
 4. Contractor to coordinate taking the existing fuel tanks out of service, following proper requirements with FDEP and O.C. Risk Department.
 5. Proper disposal of the existing fuel lines (supply and return).
 6. Installation of new fuel fill stations as noted on the plans.
 7. Installation of new fuel tank management system as noted on the plans and in the specifications.
 8. Electrical work as required for connecting the fuel fill station, the tank management system and other associated electrical work.
 9. Provide first filling of new fuel tanks for testing of the entire system.
 10. Restoration of disturbed areas.

1.02 WORKING HOURS

- A. Working hours for the County Inspector are a 10-hour period between the hours of 7:00 a.m. and 4:00 p.m., Monday through Friday. Any work beyond the 8-hour period is to be requested in writing 48 hours prior and paid for by the Contractor. Any work required on Saturday, Sunday or Holidays shall be requested in writing 48 hours in advance. All requests must be submitted to the County and approved by the County in advance. Under emergency situations, a verbal request may be made with a follow-up written request.
- B. The Contractor shall pay the County for County Inspector time outside of normal Working Hours at a rate of \$51.00/hour. The Contractor agrees that the County shall deduct such charges from the Contract Amount by a deductive Change Order.

1.03 CONTRACTOR'S USE OF PREMISES

- A. The Contractor shall assume full responsibility for the protection and safekeeping of products and materials at the job site. If additional storage or work areas are required, they shall be obtained by the Contractor at no additional cost to the Owner.

1.04 SEQUENCE OF WORK

- A. The Contractor shall establish his work sequence based on the use of crews to facilitate completion of construction and testing within the specified Contract Time.
- B. The sequence of demolition and renovation of existing facilities will be in accordance with the approved plans. The proposed sequence shall be the Orangewood WSF, followed by the Hunters Creek WSF and then the Vistana WSF. Below is a basic outline of project sequence to be used as the basis for Contractor's detailed sequence of construction:
 - 1. Water Supply Facility:
 - a. Provide back-up fuel supply at the site for emergency operation of the existing generator.
 - b. Remove existing fuel tank, piping, and appurtenances.
 - c. Install new fuel tank, piping, appurtenances.
 - d. Install new fuel fill station, piping and appurtenances.
 - e. Install tank monitoring system.
 - f. Install/reconnect electrical as required.
 - g. Test system in presence of Owner
 - h. Remove old tank and fuel lines from site.
 - i. Restore site.

1.05 PUBLIC UTILITY INSTALLATIONS AND STRUCTURES

- A. The Contractor shall give written notice to all governmental utility departments and other owners of public utilities of the location of the proposed construction operations, at least seventy-two hours in advance of breaking ground in any area or on any unit of the Work.
- B. Some of the utility contacts are listed on the plans for the Contractor's convenience.
- C. The maintenance, repair, removal, relocation or rebuilding of the Work, when accomplished by the Contractor as herein provided, shall be done by methods approved by the utility involved.

PART 2 - PRODUCTS (NOT USED)

PART 3 - EXECUTION (NOT USED)

END OF SECTION

SECTION 01025
MEASUREMENT AND PAYMENT

PART 1 - GENERAL

1.01 REQUIREMENTS INCLUDED

- A. This Section specifies administrative and procedural requirements to define pay items and determine payable amounts, and includes but is not limited to:
 - 1. General Provisions
 - 2. Cash Allowances
 - 3. Work Not Paid for Separately
 - 4. Measurement for Payment
 - 5. Partial Payment for Stored Materials and Equipment

1.02 GENERAL PROVISIONS

- A. This specification includes standard descriptions for all bid items. This Contract's specific bid items are listed in the Bid Schedule.
- B. The total Contract Amount shall cover the Work required by the Contract Documents. All costs in connection with the successful completion of the Work, including furnishing all materials, equipment, supplies, and appurtenances; providing all construction, equipment, and tools; and performing all necessary labor and supervision to fully complete the Work, shall be included in the unit and lump sum prices bid. All Work not specifically set forth as a pay item in the Bid Form shall be considered a subsidiary obligation of the Contractor and all costs in connection therewith shall be included in the prices bid.
- C. If used, all estimated quantities stipulated in the Bid Schedule or other Contract Documents are approximate and are to be used only (a) for the purpose of comparing the bids submitted for the Work, and (b) as a basis for determining an initial Contract Amount. The actual amounts of Work completed and materials furnished under unit price items may differ from the estimated quantities. The County does not expressly or by implication represent that the actual quantities involved will correspond exactly to the quantities stated in the Bid Schedule; nor shall the Contractor plead misunderstanding or deception because of such estimate or quantities or of the character, location or other conditions pertaining to the Work. Payment to the Contractor will be made only for the actual quantities of work performed or material furnished in accordance with the Drawings and other Contract Documents, and it is understood that the quantities may be increased or decreased as provided in the General Conditions.
- D. If used, the unit prices listed in the Bid Schedule shall include all services, obligations, responsibilities, labor, materials, devices, equipment, royalties and license fees, supervision, temporary facilities, construction equipment, bonds,

insurance, taxes, clean up, traffic control, control surveys, field offices, close out, overhead and profit and all connections, appurtenances and any other incidental items of any kind or nature, as are necessary to complete the Work in accordance with the Contract Documents.

- E. Except for mobilization/demobilization and project record documents, payment for Work will be based on the percent of completed work of each item in the Schedule of Values, including stored materials, as determined by the County. Progress of work in each item of the Schedule of Values will be determined separately by the County. However, the County will issue a single payment certificate for progress on the Contract.
- F. The Contractor agrees that it will make no claim for damages, anticipated profits, or otherwise because of any difference between the amounts of work actually performed and materials actually furnished and the estimated amounts therefore.
- G. -Where payment by scale weight is specified under certain items, the Contractor shall provide suitable weighing equipment which shall be kept in accurate adjustment at all times and certified. The weighing of all material shall be performed by the Contractor in the presence and under the supervision of the County.
- H. All schedules included in the Contract Documents are given for convenience 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 work to be done under this Contract.
- I. Where pipe 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.

1.03 CASH ALLOWANCES

- A. The Contractor shall include in the Total Bid Amount, all cash allowances stated in the Contract Documents. Items covered by these allowances shall be supplied for such amounts and by such persons as the County may direct.
- B. The Contractor will obtain the County's written acceptance before providing equipment, materials or other Work under a cash allowance. Payments under a cash allowance will be made based on actual costs, excluding costs of general conditions, handling, unloading, storage, installation, testing, etc., which will be considered to be included within the Contract Price. Payments within the limits of any Allowance will exclude overhead and profit and bond and insurance premiums, since those costs will be considered to be included within the Contract Amount. The Contractor shall submit appropriate documentation to validate the actual cost of the item.

- C. The amount of the allowance shall be adjusted accordingly by Change Order to recognize the allowable cost incurred by the Contractor.

1.04 WORK NOT PAID FOR SEPARATELY

- A. Delivery: Payment for equipment delivery, storage or freight shall be included in the pay items including their installation and no other separate payment will be made therefore.
- B. Bonds: Payment for bonds required by the Contract shall be included in the pay items for the Work covered by the required bonds and no separate payment will be made.
- C. Preparation of Site: Payment for preparation of site shall be included in pay items proposed for the various items of Work and no separate payment will be made therefore. Preparation of site includes setting up construction plant, offices, shops, storage areas, sanitary and other facilities required by the specifications or state law or regulations; providing access to the site; obtaining necessary permits and licenses; payments of fees; general protection, temporary heat and utilities including electrical power; providing shop and working drawings, certificates and schedules; providing required insurance; cleaning up; and all other work regardless of its nature which may not be specifically referred to in a Bid Item but is necessary for the complete construction of the project set forth by the Contract.
- D. Permitting & Permit Fees.
- E. The County reserves the right to delete any item included in the Schedule of Values and decrease the Contract Price by the scheduled amount for the item deleted.

1.05 MEASUREMENT FOR PAYMENT

- A. Methods of Measurement - Generally:
 - 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 and compacted within the limits specified and shown in the Specifications and Drawings. Slope angles and elevations shall be measured using land-surveying equipment. Contractor shall provide supporting documentation (i.e. drawings, delivery tickets, invoices, survey calculations, etc.) to verify actual installed quantities.

B. Lump Sum Contracts/Items - Generally:

1. Quantities provided in the Schedule of Values are for the purpose of estimating the completion status for progress payments. Payment will be made for each individual item on a percentage of completion basis as estimated by the Contractor and approved by the County.
2. Adjustments to costs provided in the accepted Schedule of Values may be made only by Change Order.
3. The County reserves the right to delete any item included in the Schedule of Values and decrease the Contract Price by the scheduled amount for the item deleted.

1.06 MEASUREMENT AND PAYMENT ITEMS

A. ***Only those bid items included in the Bid Schedule are applicable for this Contract.***

The County has standardized the measurement and payment items. Currently, there are approximately 100 measurement and payment items describing approximately 300 bid items. The bid item numbering system comprises five sections that are divided into 23 subsections. The sections and subsections are listed below.

10. General Requirements
 - 10.1 General
11. Site Work
 - 11.1 Miscellaneous
 - 11.2 Road Work
 - 11.3 Install/Replace Fence or Wall
 - 11.4 Bypass Pumping
 - 11.5 Abandon or Remove Pipe/Structure
12. Pressure Pipes
 - 12.1 Pressure Pipe and Fittings and Restrained Joints
 - 12.2 Valves
 - 12.3 Tapping Sleeve and Valve Assembly
 - 12.4 Cut-in Connections to Existing Main
 - 12.5 Piping Appurtenances
 - 12.6 Directional Drill
 - 12.7 Pipe Bursting

- 13. Wastewater Collection System
 - 13.1 Cleaning Sanitary Sewers
 - 13.2 CCTV Sanitary Sewers
 - 13.3 Install/Replace Sanitary Sewer
 - 13.4 Install/Replace Sanitary Manholes
 - 13.5 Sanitary Manhole Rehabilitation
 - 13.6 Sanitary Service Laterals and Cleanouts
 - 13.7 Cured-in-Place Pipe (CIPP) Liner
 - 13.8 Sanitary Sewer Pipe Bursting
- 14. Pump Stations
 - 14.1 Wastewater Duplex Pump Station
 - 14.2 Wastewater Triplex Pump Station

All of the subsections have bid item measurement and payment descriptions. Several bid items in the Project Bid Schedule may be described with the same bid item measurement and payment description in Table A, "Measurement and Payment Items". The bid items in the Project Bid Schedule are related to the Section 01025 measurement and payment items as follows:

- 1. All of the bid items in the Project Bid Schedule have 8 numerical digits.
- 2. Table A, "Measurement and Payment Items" for each of the bid items there are five numerical digits followed by ".xxx".
- 3. The first 5 numerical digits of the bid item in the Project Bid Schedule designate the measurement and payment item found in Table A, "Measurement and Payment Items."

Table A

BID ITEM	Orange County Utilities MEASUREMENT AND PAYMENT ITEMS <small>Pg 1</small>
	10 GENERAL REQUIREMENTS
	10.1 - General
1	Reference ID 10.110 Mobilization, Demobilization, Bonds, and Permits (not to exceed 5% of the total of all bid items except bid items under section 10.1 General)
	<p>a. Measurement: Measurement of various items for Mobilization and Demobilization shall not be made for payment and all items shall be included in the lump sum price. <u>This lump sum price shall not exceed 5% of the total of all bid items except bid items under section 10.1 General.</u></p> <p>b. Payment: Payment of 75 percent of the applicable lump sum price for the item shall be full compensation for the Work consisting of the preparatory Work and operations in mobilizing for beginning Work on the Contract, including, but not limited to, movement of those personnel, equipment, supplies and incidentals to the project site, preparation of submittals, and for the establishment of temporary offices and buildings, safety equipment and first aid supplies, project signs, field surveys, sanitary and other facilities required by these specifications, and State and local laws and regulations. The costs of General Requirements (Section 01001), bonds, permits, and any required insurance, project signs, and any other preconstruction expense necessary for the start of the work, excluding the cost of construction materials, shall also be included. This Work also consist of the general project management of the Work including, but not limited to, field supervision and office management, as well as other incidental cost for management of the Work during the duration of the Contract. This Work also includes maintenance of the field offices for the duration of the Contract.</p> <p>Payment of the remaining 25 percent of the applicable lump sum price for this item also consists of demobilization or the operations normally involved in ending Work on the project including, but not limited to, termination and removal of temporary utility service and field offices; demolition and removal of temporary structures and facilities; restoration of Contractor storage areas; disposal of trash and rubbish, and any other post-construction work necessary for the proper conclusion of the Work.</p>
2	Reference ID 10.120 Preconstruction Audio-Video Documentation
	<p>a. Measurement: Measurement shall be based on the satisfactory submittal of a comprehensive pre-construction video in accordance with the County requirements and specifications (Section 01101).</p> <p>b. Payment: Payment of the applicable Contract lump sum price as stated in the proposal will be full compensation for furnishing all labor, materials, and equipment necessary to create a comprehensive pre-construction video in accordance with the County requirements and specification.</p>

BID ITEM	Orange County Utilities MEASUREMENT AND PAYMENT ITEMS <small>Pg 2</small>
3	Reference ID 10.130 Indemnification
	<p>a. Payment: In consideration of the Contractor's Indemnity Agreement as set out in the Contract Documents, the County specifically agrees to give the Contractor a maximum of \$100.00 and other good and valuable consideration, receipt of which is acknowledged upon signing of the Agreement.</p>
4	Reference ID 10.140 Project Record Documents (a minimum of 1% of the total of all bid items except bid items under section 10.1 General)
	<p>a. Measurement: Measurement for this item shall be based on satisfactory progress of the Contractor to provide Project Record Documents in accordance with the County requirements and specifications (Section 01720). Various items for Project Record Documents shall not be made for individual payment and all items shall be included in the lump sum price. <u>This lump sum price shall be a minimum of 1% of the total of all bid items except bid items under section 10.1 General).</u></p> <p>b. Payment: Payment of the applicable Contract lump sum price as stated in the proposal will be full compensation for furnishing all labor, materials, and equipment necessary to create the Project Record Drawings, including the certified as-built survey, in accordance with the County requirements and specifications. Payment will be made at the lump sum price divided into equal monthly payments based on the Contract Time and acceptance by County of the progressive as-builts drawings and tables.</p>
5	Reference ID 10.150 Project Dewatering
	<p>a. Measurement: Measurement for this item shall be based on satisfactory setup, installation and operation of any dewatering required to complete the work.</p> <p>b. Payment: Payment of the applicable Contract lump sum price as stated in the proposal will be full compensation for furnishing all labor, materials, and equipment necessary to install and operate the dewatering system in accordance with the County requirements and specifications, groundwater treatment and disposal. Payment will be made at the lump sum price divided into three equal parts (for each site). Payment will be based on dewatering installed and operated at each individual site.</p>

BID ITEM	Orange County Utilities MEASUREMENT AND PAYMENT ITEMS <small>Pg 3</small>
	11 SITE WORK
	11.1 – Miscellaneous
6	Reference ID 11.110 Erosion and Sediment Control
	<p>a. Measurement: Measurement shall be based on satisfactory Erosion and Sediment Control in accordance with the County requirements and specifications (Section 01560).</p> <p>b. Payment: Payment of the applicable Contract lump sum price as stated in the proposal will be full compensation for furnishing all labor, materials, and equipment to control and prevent sediment transportation from the Work area to adjacent properties, including installation, maintenance, and removal of temporary erosion and sediment controls.</p>
7	Reference ID 11.120 Unsuitable Materials
	<p>a. Measurement: Unsuitable Material shall be measured in actual cubic yards removed and disposed of in accordance with the County requirements and specifications. Extra volume beyond the limits of construction will not be measured for payment. The Contractor shall provide survey calculations to verify actual removed quantities.</p> <p>b. Payment: Payment will be made at the contract unit price bid per cubic yard as stated in the proposal and shall include all labor, materials and equipment to remove and dispose of unsuitable material including the removal of overburden.</p>
8, 9, 18,26	Reference ID 11.130 New Fuel Tank
	<p>a. Measurement: Fuel Tank installation shall be measured by each satisfactorily furnished, installed and tested fuel tank.</p> <p>b. Payment: Payment will be made at the contract unit price bid per fuel tank as stated in the proposal and shall include all labor, materials, and equipment to construct and install the fuel tank, including coordination and protection of existing utilities, connections to proposed fuel lines, tree protection, concrete pad construction (if necessary), excavation, sheeting, shoring and bracing, backfill, compaction, and grading, all testing, disinfection, painting and touch-up, clean up and restoration. This item also includes all necessary fittings, restraining devices, signage, removal and replacement of fences and gates, and other obstructions disturbed as part of the installation.</p>

BID ITEM	Orange County Utilities MEASUREMENT AND PAYMENT ITEMS <small>Pg 4</small>
10, 19, 27	Reference ID 11.140 New Fuel Lines
	<p>a. Measurement: Fuel Line installation regardless of type and size shall be measured in actual linear feet satisfactorily furnished and laid, as measured along the length of the centerline of the completed pipeline, regardless of the type of joint required, without deduction for the length of valves and fittings. Pipe included within the limits of lump sum pay items will not be measured for payment under this item.</p> <p>b. Payment: Payment will be made at the contract unit price bid per linear feet as stated in the proposal for Water Main w/Fittings and restrained joints and shall include all labor, materials, and equipment to construct the respective pipeline including coordination with existing utilities, protection of existing utilities, tree protection, excavation, sheeting, shoring and bracing, dewatering, groundwater treatment and disposal, backfill, compaction, and grading, all testing, potable water system protection, disinfection, restoration, sod and clean-up. This item also includes all necessary fittings, reducers, bends, tees, wyes, plugs, restraining devices, polyethylene encasement where required, metallic tracer wire, line locator, identification markers, and removal and replacement of fences and gates, mailboxes, trees, shrubs, irrigation sprinklers and other obstructions.</p>
11, 20, 28	Reference ID 11.150 New Tank Ladder
	<p>a. Measurement: Measurement for this item shall be measured by each ladder installed satisfactorily installed.</p> <p>b. Payment: Payment will be made at the contract unit price bid per ladder installed as stated in the proposal and shall include all labor, materials, and equipment required to install including coordination and protection of existing and installed fuel lines, existing utilities, tree protection, painting, restoration and clean-up. This item also includes all necessary fittings, bolts, nuts and appurtenances required to permanently install the ladder.</p>

BID ITEM	Orange County Utilities MEASUREMENT AND PAYMENT ITEMS <small>Pg 5</small>
12, 21, 29	Reference ID 11.160 Electrical Connection to New Fuel Tank
	<p>a. Measurement: Measurement for this item shall be based on satisfactory connection of the electrical service to the new fuel tank, controls, fuel management system and other electrical service necessary for the proper operation of the new fuel tank system for complete, ready for continuous operation.</p> <p>b. Payment: Payment of the applicable Contract lump sum price as stated in the proposal will be full compensation for furnishing all labor, materials, and equipment necessary to complete the electrical connections for the proposed equipment as indicated on the Drawings and in these specifications. Work includes but is not necessarily limited to the following: controllers, motors, control panel, cables, and appurtenances, stand-by generator, fuel tank, fuel tank management system; all coordination with the electric power company, materials, equipment, tools, labor and fees to install an electrical service connection; all work required to construct, complete start-up testing and deliver a complete operational Fuel Tank system without interruption of service.</p>
13	Reference ID 11.170 New Fuel Tank Management System
	<p>a. Measurement: Measurement shall be for each Fuel Tank Management System satisfactorily installed, complete and ready for continuous operation.</p> <p>b. Payment: Payment will be made at the contract unit price bid per Fuel Tank Management System as stated in the proposal and shall include all labor, materials, and equipment to construct and install the system, including coordination and protection of existing utilities and fuel lines, connections to proposed fuel tank and lines, tree protection, all testing, painting and touch-up, clean up and restoration. This item also includes all necessary fittings and appurtenances, and signage as part of the installation.</p>
14, 22, 30	Reference ID 11.180 Fuel New Tank
	<p>a. Measurement: Measurement for this item shall be the first, complete filling of each new fuel tank satisfactorily installed.</p> <p>b. Payment: Payment will be made at the contract unit price bid per fuel tank filled as stated in the proposal and shall include all labor, materials, and equipment required to complete the filling of the fuel tank.</p>

BID ITEM	Orange County Utilities MEASUREMENT AND PAYMENT ITEMS <small>Pg 6</small>
15, 23, 31	Reference ID 11.190 Remove/dispose of Excess Fuel
	<p>a. Measurement: Measurement for this item shall be the draining, containment, removal and proper disposal of the remaining fuel in the existing fuel tanks per FDEP rules and regulations.</p> <p>b. Payment: Payment will be made at the contract unit price bid per fuel tank drained as stated in the proposal and shall include all labor, materials, and equipment required to complete the draining and proper disposal of the fuel.</p>
16, 24, 32	Reference ID 11.200 Remove Existing Pipe
	<p>a. Measurement: Remove Existing Pipe, regardless of size and material, shall be measured in actual linear feet satisfactorily excavated, removed, and salvaged in accordance with the County requirements and specifications (Section 02080). Pipe removal shall be measured along the centerline without deduction for valves and fittings. Also included in this item is the removal and salvage of items including air release valves and vaults, and fire hydrant assemblies.</p> <p>b. Payment: Payment will be made at the contract unit price bid per linear feet as stated in the proposal for Remove Existing Pipe and shall include all labor, materials, and equipment to sheet, shore, and brace; dewater; excavate; completely drain and properly dispose of pipe contents; plug or cap; restoration, sod, clean-up; remove and salvage pipe of all services and sizes designated "to be removed" on the Drawings, backfill and compact. Also included in this item is the removal and salvage of items (as listed in Specification Section 02080) attached to the piping to be removed.</p>

BID ITEM	Orange County Utilities MEASUREMENT AND PAYMENT ITEMS <small>Pg 7</small>
17, 25, 33	Reference ID 11.210 Sod Replacement
	<p>a. Measurement: Sod Replacement shall be measured in actual square yards of sod furnished, laid, fertilized, watered and maintained for all areas as specified on the Drawings.</p> <p>b. Payment: Payment will be made at the contract unit price bid per square yard as stated in the proposal for Sod Replacement and shall include all labor, materials, and equipment necessary to furnish, install, fertilize, water and maintain a healthy stand of grass including any soil amendments or conditioning required to bring the existing soil to within acceptable pH levels as recommended by the sod grower.</p>

PART 2 - PRODUCTS (NOT USED)

PART 3 - EXECUTION (NOT USED)

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 and As-Built Asset Attribute Data shall be accepted by the County.
- C. Progressive As-Built Drawings shall indicate the horizontal and vertical locations of all current constructed improvements with sufficient information and notes to easily determine if the improvements were constructed in conformance with the Contract Documents. The progressive As-Built Asset Attribute Data Tables shall include a Surveyor's certified statement regarding the constructed improvements being within the specified accuracies or if not, indicating the variances as described in specification Section 01050 "Surveying and Field Engineering", Table 01050-1 Minimum Survey Accuracies.

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 and payments as certified and paid for by the County.
 - 1. The initial Application for Payment: The Application for Payment at time of Substantial Completion and the final Application for Payment involve additional requirements.
- B. Payment Application Times: As stated in the General Conditions, Payment applications

are to be submitted monthly on a day of the month to be established by the County at the Pre-Construction conference.

- C. Application Preparation: Complete every entry on the form, including notarization and execution by person authorized to sign legal documents on behalf of the Contractor. Incomplete applications will be returned without action.
 - 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 an extension or continuation sheet, listing Change Order number and dollar amount as for an 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. Submit a stored material log with each application for payment which identifies the type, quantity and value of all stored material, and that tracks when the stored materials are installed and deducts them from stored quantity at that time. Include original invoices for all stored materials that payment is requested.

- E. Waivers of Claims and Mechanics Lien: With each Application for Payment submit waivers of claims and mechanics liens from Subcontractors or Sub-subcontractors and suppliers for the construction period covered by the previous applications.
 - 1. 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, submit final or full waivers.
 - 3. The County reserves the right to designate which entities involved in the Work must submit waivers.
 - 4. Submit final Application for Payment with or preceded by 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.
 - 5. Waiver Forms: Submit waivers of claims and lien on forms and executed in a manner acceptable to the County.

- F. Transmittal: Submit four (4) executed copies of each Application for Payment to the County by means ensuring receipt within 24-hours. One (1) copy shall be complete, including waivers of lien and similar attachments when required.
 - 1. Transmit each copy with a transmittal form listing attachments, and recording appropriate information related to the application in a manner 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 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.

- G. Initial Application for Payment: Administrative actions and submittals that must precede or coincide with submittal of the first 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: Administrative actions and submittals that must precede or coincide with submittal of Monthly Partial Payments include the following:
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 Example (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 liens from all subcontractors and vendors
 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
- I. Substantial Completion Application for Payment: Following issuance of the Certificate of Substantial Completion, submit an Application for Payment. This application shall reflect any Certificates of Partial Substantial Completion issued previously for County 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: 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. Completion of project close-out requirements
 - 3. Completion of items specified for completion after Substantial Completion
 - 4. Assurance that unsettled claims are settled
 - 5. Assurance that work not complete and accepted is now completed
 - 6. Transmittal of required project construction records to the County
 - 7. Proof those taxes, fees and similar obligations have been paid
 - 8. Removal of temporary facilities and services has been completed.
 - 9. Removal of surplus materials, rubbish and similar elements
 - 10. Change of door locks to County's access
 - 11. Execute certification by signature of authorized officer.
 - 12. Prepare Application for Final Payment as required in General Conditions.

1.04 SUBMITTAL PROCEDURES

- A. Submit four (4) copies of each Application for Payment at time stipulated in Agreement.
- B. Submit under transmittal letter.

1.05 SUBSTANTIATING DATA

- A. When the County requires substantiating information, submit data justifying line item amounts in question.
- B. Provide one (1) copy of data with cover letter for each copy of submittal. Show Application number and date, and line item by number and description.

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 following specific 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, and maintain both 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 and confirmed. The method of field staking for the construction of the Work shall be at the option of Contractor. 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. The Contractor shall provide all surveys necessary for the construction of the Work.

B. Engineering Services

- 1. 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.
- 2. Engineering related designs, tests and inspections shall be signed by the licensed Professional Engineer as required by the County.

1.03 QUALIFICATIONS OF THE SURVEYOR

- A. The Surveyor, who is proposed by the Contractor to provide services for the Project, is subject to the approval of the County. Prior to any services being performed, the Contractor shall submit the name and address of any proposed Surveyor and a 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. These submittals shall be provided to the County prior to Notice to Proceed. It is recommended that the Surveyor attend the Pre-Construction meeting. Any Surveyor, who has not previously performed work for the County shall attend the Pre-Construction meeting.

1.04 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. A Professional Engineer shall be of the discipline required for the specific service for the Work.
 - 3. 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.
- B. On request, submit documentation verifying accuracy of survey work.
- C. Surveyor shall certify all elevations and locations included in Table 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 Plan 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.

**Table 01050-1
Minimum Survey Accuracies**

Asset	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
Mains at 100-foot maximum intervals	0.1	0.1	Pipe, Pipe at Valves, Pipe at Bore & Jack Casing
PVC pipe >16-inch at every pipe joint	0.1	0.1	Pipe, Pipe at Valves, Pipe at Bore & Jack Casing
Fittings, Sleeve, Tapping Saddle, and end of the pipe if Plugged or Capped.	0.1	0.1	Fitting
Restrained Pipe	0.1	N/A	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
Hydrants	0.1	N/A	Operating Nut of Hydrant
Valves	0.1	0.1	Operating Nut
Air Release, Blow off, and Backflow Valves	0.1	N/A	Valve Enclosure
Master Meters, Deduct Meters & Wastewater Meters	0.1	N/A	Register
Meter Box	0.1	N/A	Meter Box
Clean out	0.1	N/A	Clean out
Manhole Rim	0.1	0.1	Manhole
Manhole Inverts	N/A	0.01	Pipe Inverts
Pump Station (Public & Private)	0.1	0.01	Wetwell and Pipe Inverts
Production Well or Monitoring Well	0.1	0.1	Well
Grease Interceptor	0.1	0.1	
Oil / Water Separators	0.1	0.1	
Demolished Pipe (abandoned in place or removed)	0.1	0.1	Limits of Abandoned or Removed Pipe
Existing Utilities water, wastewater, reclaimed water, and appurtenant structures **	0.1	0.1	Pipe or Structure
Fuel tanks	0.1	0.1	At slabs
Fuel piping	0.1	N/A	10-foot intervals
* Shall conform to the requirements of the "Chapter 5J-17, 'Minimum Technical Standards', FAC", certified by a SURVEYOR.			
** Existing utilities including but not limited to water, wastewater, reclaimed water, stormwater, fiber optic cable, electric, gas and structures within the limits of construction.			

TABLE 01050-2
Asset Attribute Data Form Examples

Hydrants Worksheet

	A	C	D	E	F	G	H	I
1	ID Number	Plan Sheet #	Easting	Northing	Elevation	Manufacturer	Model #	Comments
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	

Valves Worksheet

	A	C	D	E	F	G	H	I	J
1	ID Number	Plan Sheet #	Easting	Northing	Elevation	Valve Type	Main Type	Valve Size	Valve Manufacture
2	ARV-1	C301	518060.09	1483231.33	81.72	ARV - Combination	Water Main	2	Brand H
3	ARV-1	C303	518083.55	1483280.50	81.15	ARV - Vacuum	Force Main	4	Brand G
4	BFP-1	C303	518086.00	1483282.88	78.21	Backflow Preventer	Reclaimed Water Main	8	Brand F
5	BO-9	C405	518088.83	1483289.43	78.20	Blowoff	Water Main	2	Brand E
6	BFV-1	C405	518088.11	1483295.00	81.95	Butterfly	Water Main	30	Brand D
7	GV-3	C405	518132.54	1483372.75	81.23	Gate	Water Main	16	Brand C
8	LS-W1	C405	576779.36	1539706.97	64.30	Line Stop	Water Main	16	Brand B
9	PV-22	C405	576880.60	1539718.32	64.52	Plug	Force Main	12	Brand A

	J	K	L	M	N	O	P	Q
1	Valve Manufacturer	Valve Model #	# of Turns to Close	Gear Actuator	Gear Ratio	Side Actuator	uator Manufact	Comments
2	Brand H	100XT						
3	Brand G	1000						
4	Brand F	2000 fgs						
5	Brand E	14 turbo						
6	Brand D	230 xls	200	Yes	3 to 1	Yes	Brand C	
7	Brand C	2225846	300	Yes	3 to 1	NO		
8	Brand B	7n6r44						
9	Brand A	Z100	200	Yes	3 to 1	Yes	Brand A	

Manhole Worksheet

	A	C	D	E	F	G	H	I	J	K	L	M	N	O
1	ID Number	Plan Sheet #	Easting	Northing	Rim Elevation	Invert Elv II	Invert Elv IE	Invert Elv E	Invert Elv SE	Invert Elv S	Invert Elv SW	Invert Elv W	Invert Elv IW	Manufacturer
2	MH-1	C-20	517999.15	1483092.24	82.96	76.96		76.96						Brand X
3	MH-2	C-20	517999.15	1483492.24	83.54	75.63				75.58				Brand X

Meter Worksheet

	A	C	D	E	F	G	H
1	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

Microsoft Excel - Example ContractorUploadSheet 2010-0326.xls								
	A	C	D	E	F	G	H	I
1	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	FM-3	C-3	574844.01	1539856.71	52.48	Force Main	Bend 45°	
5	FM-4	C-3	574845.72	1539856.61	52.33	Water Main	Bend 90°	
6	FM-5	C-3	574845.85	1539858.77	51.98	Water Main	Cap	
7	RW-1	C-4	574884.06	1539849.64	51.75	Reclaimed Water Main	Cross	
8	RW-2	C-4	574887.22	1539849.56	48.98	Reclaimed Water Main	Reducer	
9	RW-3	C-4	574904.30	1539849.10	49.39	Reclaimed Water Main	Plug	
10	RW-4	C-4	574907.42	1539849.01	52.32	Reclaimed Water Main	Sleeve	
11	WM-1	C-5	574938.65	1539848.16	54.42	Water Main	Tapping Saddle	
12	WM-2	C-5	572532.38	1539337.10	45.27	Water Main	Tee	
13	WM-3	C-5	572631.00	1539338.00	44.13	Water Main	Wye	
14	WM-4	C-5	572731.00	1539334.00	43.77	Water Main	Tapping Sleeve	

Cleanout Worksheet

Microsoft Excel - Example ContractorUploadSheet 2010-0326.xls						
	A	C	D	E	F	G
1	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	1539598.78	64.84	

Pipes Worksheet

Microsoft Excel - Example ContractorUploadSheet 2010-0326.xls												
	A	C	D	E	F	G	H	I	J	K	L	M
1	ID Number	Plan Sheet #	Easting	Northing	Elevation	Main Type	Type of Shot	Instruction	Material	Pressure Class	Manufacturer	Color
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	517732.848	1482338.1	80.943	Reclaimed Water Main	Restraint Joint Limit	Open Cut	DIP	Class 250	Brand B	
6	WM-1	C-9	573309.068	1539372.9	56.10	Water main	Shot on Pipe	Open Cut	PVC	DR18	Brand C	
7	WM-2	C-9	573308.752	1539375	54.66	Water main	Shot on Pipe	Open Cut	PVC	DR18	Brand C	
8	FMDD-1	C-4	504345.94	1488969.2	114.14	Force Main	Shot on Pipe	Directional Drill	HDPE	DR17	Brand X	
9	FMDD-2	C-4	504360.86	1488970.5	112.74	Force Main	Shot on Pipe	Directional Drill	HDPE	DR17	Brand X	
10	FMDD-3	C-4	504377.19	1488971.2	106.14	Force Main	Shot on Pipe	Directional Drill	HDPE	DR17	Brand X	
11	FM-9	C-4	504480.47	1488982.9	105.24	Force Main	Shot on Pipe	Open Cut	PVC	DR18	Brand C	

Well Worksheet

Microsoft Excel - Example ContractorUploadSheet 2010-0326.xls						
	A	C	D	E	F	G
1	ID Number	Plan Sheet #	Easting	Northing	Elevation	Comments
2	PS-1	C-40	517914.346	1482906.562	83.912	

Easements Worksheet

	A	C	D	E	F	G	H
1	ID Number	Plan Sheet #	Easting	Northing	Elevation	Boundary Corner Type	Comments
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	

Existing OC Utility Crossing

	A	C	D	E	F	G	H	I
1	ID Number	Plan Sheet #	Easting	Northing	Existing Pipe Elevation	Proposed Crossing Elevation	Existing Main Type	Comments
3	Conf-1	C-750	463464.47	1511013.75	100.54	104.88	Water main	
4	Conf-2	C-750	463163.91	1510693.49	98.32	103.57	Storm Main	

Grease Interceptor

	A	C	D	E	F	G	H
1	ID Number	Plan Sheet #	Easting	Northing	Elevation	Volume (Gallons)	Comments
2	GI-1	C-400	508387.3	1487203.18	89.70	1000.00	

For ease of calculating pipe deflections in Table 01050-3, begin by providing a unique asset ID (top of pipe shots and fittings) for each utility and type, numbered sequentially along the pipe run (including changes in direction) from start to finish of the pipe in the Table 01050-2. Then branches and services of the same utility type can be numbered. It is recommended that each utility (water, wastewater or reclaimed water) 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.

**TABLE 01050-3
PIPE DEFLECTION TABLE EXAMPLE**

Project Contractor: Progress Mtg Date: Contract # Dwg Sheet # Utility Type Pipe Manufacturer Pipe size & material PVC Manufacturer Deflection County Allowable Deflection 75% Allowable Angle of Offset Allowable Radius of Curvature Laying Length of Pipe	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'	Radius of Curve**	Average Offset Angle***	Average Offset****	
					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

*Uses law of cosines to determine angle ABC and Ø.
 $\text{angle } ABC = \arccos((AB^2 + BC^2 - AC^2) / (2 * AB * BC))$
 $180 - \text{angle } ABC = \text{angle } \phi$
 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

** Uses law of sines, using the chord length AC and radius R.
 Since $\sin((\phi/2) * (\pi/180)) = (\text{Chord}/2) / R$ and length AC = Chord
 $R = AC / (2 * \sin(\phi * \pi / 360))$
 This calculation assumes an average radius over the bend between three points.

*** 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.

**** Uses average offset angle and laying length of pipe.

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 work. 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 points during Construction. If survey points are disturbed, it is the responsibility of the Contractor's Surveyor to reset the points at the Contractor's expense. Copies of the Surveyor's field notes and/or electronic files for point replacement shall be provided to the County.
 - 1. 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 in complying with these specifications.
 - 2. 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 by the County.

- B. Only a Surveyor licensed in the State of Florida shall be employed for this Work. All control points shall be protected by the Contractor from disturbance. 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 Contractor 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.

- C. 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

- D. 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. Establish replacement points based on the original survey control. Copies of all reference field notes and/or electronic files for point replacement shall be submitted to the County.

3.02 SURVEYING

- A. Locate and protect existing horizontal and vertical control points shown on the construction Drawings prior to starting any work. If the Surveyor performing the Work finds differences that will effect the Work, the Contractor must immediately report the findings to the County. Establish control points, lines and levels by instrumentation and similar appropriate means. The location of these points should minimize the number of sightings necessary to control the Work and the likelihood of the points being disturbed. Preserve and reference all permanent reference points during Construction. If permanent reference points are disturbed, it is the responsibility of the Contractor's Surveyor to reset the points at the Contractor's expense. Copies of the Surveyor's field notes shall be provided to the County.
 - 1. Record locations, with horizontal and vertical data, on project As-Built survey.
 - 2. Make no changes or relocations without prior written notice to the County or without receipt of written approval from the County.
 - 3. Report to the County when any control point is lost or destroyed or requires relocation because of necessary changes in grades or locations.
- B. Cover for water, reclaimed water and force mains shall vary to provide long uniform gradient or slope to pipe to minimize air pockets and air release valves. The locations 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.
- C. To insure a uniform gradient for gravity pipe and pressure pipe, all lines shall be installed using the following control techniques as a minimum:
 - 1. Gravity lines: Continuous control, using laser beam technology,
 - 2. Pressure lines: Control stakes set at 50 ft. intervals using Surveyor's level instrument.

3.03 SURVEY DOCUMENTS

- A. The Tables 01050-2 Asset Attribute Data, 01050-3 Pipe Deflection Table, and 01050-4 Gravity Main Table shall be signed, sealed and dated by the Surveyor with each pay request as specified in Section 01027 "Application for Payment" and the requirements of Section 01720 "Project Record Documents."

END OF SECTION

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SECTION 01065
PERMITS AND FEES

PART 1 - GENERAL

1.01 REQUIREMENTS

A. General

1. Upon Notice of Award, obtain and pay for all appropriate and applicable 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. Strictly adhere to the specific requirements of the governmental unit(s) or agency(cies) having jurisdiction over the Work. Whenever there is a difference in the requirements of a jurisdictional body and the Contract Documents, the more stringent shall apply.
4. A copy of the permits obtained by the County are furnished in Appendix C "Permits Obtained by County" of these specifications.
5. Unless otherwise specified, the cost of work specified in the various sections of Division 1, will not be paid for separately but the cost therefore shall be considered incidental to and included in the bid prices of the various Contract items.

B. Building Permit (Orange County)

1. The County will pay the general building permit fee and any related impact fees or assessments to be paid to Orange County for the issuance of that permit only.
2. The Contractor shall pay all fees associated with obtaining Orange County trade permits and any and all inspection fees for the Orange County Building Department providing inspections for this project. The Contractor shall apply for and obtain the building permits from Orange County and schedule and obtain final approval from the building inspectors.
3. Information on Orange County Building Department fees is included in the Instructions to Bidders in Division 0.
4. The Contractor shall be responsible for scheduling all permit inspections and obtaining inspection approval from Orange County, as required by the building and sub-discipline construction permits.

C. Construction Dewatering Permit

The Contractor shall apply and pay for all fees associated with obtaining Florida Department of Environmental Protection District Office construction dewatering permits, if required. The Contractor shall provide all materials and equipment to comply with the permit requirements at no additional cost to the County.

PART 2 - PRODUCTS (NOT USED)

PART 3 - EXECUTION (NOT USED)

END OF SECTION

SECTION 01070
ABBREVIATIONS AND SYMBOLS

PART 1 - GENERAL

1.01 REQUIREMENTS INCLUDED

- A. Reference to the following standards of any technical society, organization or body shall be construed to mean the latest standard, code or specification or tentative specification adopted and published at the date of advertisement for bids, even though reference has been made to an earlier standard. Such reference is hereby made a part of the Contract the same as if herein repeated in full and in the event of any conflict between any of these specifications, standard codes or tentative specifications and the Contract Documents, the most stringent shall govern.

AA	Aluminum Association
AASHTO	American Association of State Highway and Transportation Officials
ABPA	Acoustical and Board Products Association
ACI	American Concrete Institute
AFBMA	Anti-Friction Bearing Manufacturer's Association
AGA	American Gas Association
AGMA	American Gear Manufacturers Association
AI	The Asphalt Institute
AIA	American Institute of Architects
AIEE	American Institute of Electrical Engineers
AIMA	Acoustical and Insulating Materials Association
AISC	American Institute of Steel Construction
AISI	American Iron and Steel Institute
AMCA	American Moving and Conditioning Association
ANSI	American National Standards Institute
API	American Petroleum Institute
APWA	American Public Works Association
AREA	American Railway Engineering Association
ASA	American Standards Association (now ANSI)
ASCE	American Society of Civil Engineers
ASHRAE	American Society of Heating, Refrigerating, and Air Conditioning Engineers
ASME	American Society of Mechanical Engineers
ASSCBC	American Standard Safety Code for Building Construction
ASTM	American Society for Testing and Materials
AWPA	American Wood Preservers Association
AWBP	American Wood Preservers Board
AWS	American Welding Society
AWWA	American Water Works Association

CRSI	Concrete Reinforcing Steel Institute
CS	Commercial Standard
DOT Spec	Standard Specification for Road and Bridge Construction –
FDOT	Florida Department of Transportation
FAC	Florida Administrative Code
FS	Federal Standard
IEEE	Institute of Electrical and Electronic Engineers
IPCEA	Insulated Power Cable Engineers Association
NACE	National Association of Corrosion Engineers
NASSCO	National Association of Sewer Service Companies
NBFU	National Board of Fire Underwriters
NBS	National Bureau of Standards
NEC	National Electrical Code
NECA	National Electrical Contractor's Association
NEMA	National Electrical Manufacturers Association
NFPA	National Fire Protection Association
NPT	National Pipe Threads
NSF	National Science Foundation
OSHA	U.S. Department of Labor, Occupational Safety and Health Administration
PCA	Portland Cement Association
PCI	Prestressed Concrete Institute
PS	United States Products Standards
SAE	Society of Automotive Engineers
SDI	Steel Decks Institute
SJI	Steel Joists Institute
SMACNA	Sheet Metal and Air Conditioning Contractors National Association
SSPC	Structural Steel Painting Council
UL	Underwriter's Laboratories, Inc.
USASI	United States of American Standards Institute (Now ANSI)

B. UNITS OF MEASUREMENT

CU FT	cubic feet
CU IN	cubic inch(es)
CY	cubic yard(s)
DegC	degree(s) Centigrade
DegF	degree(s) Fahrenheit
F	Fahrenheit
FT	feet, foot
G	gram(s)
GA	gage
GAL	gallon(s)
GPH	gallon(s) per hour
GPM	gallon(s) per minute

GPS	gallon(s) per second
HR	hour(s)
IN	inch(es)
IPS	iron pipe size
KG	kilogram(s)
L	liter(s)
LB	pound(s)
LBF-IN	pound (force) inch
LF	linear foot, linear feet
MIN. min.	minute(s), minimum
ml	milliliter
MO	month(s)
OZ	ounce(s)
QT	quart
RH	relative humidity
SF	square foot, square feet
SQ IN	square inch(es)
YD	yard(s)
YR	year(s)

C. TERMINOLOGY

@	at
AB	anchor bolt
ADJ	adjust, adjustable
ADMIN	administration
AFG	above finished grade
AGGR	aggregate
AL	aluminum
ALT	alternate
APPX	appendix
APX	approximate
ART	article
ASPH	asphalt
ASSY	assembly
AUTO	automatic
AUX	auxiliary
AVE	avenue
AVG	average
AWG	American Wire Gauge
BAR	barrier
BCCMP	bituminous coated corrugated metal pipe
BL	base line
BLDG	building
BLKG	blocking
BM	beam

C to C	center to center
CCB	concrete block, masonry
CEM	cement
CIP	cast iron pipe, cast in place
CJ	construction joint
CL	center line, clearance
CM	Construction Manager
CMP	corrugated metal pipe
CO	cleanout
CONC	concrete
CONN	connection
CONST	construction
CONT	continuous
CONTR	contractor
CU, COP	copper
ORR	corridor
CRIT	critical
CTD	coated
CTR	center
CULV	culvert
d	delta
DBL	double
DEM	demolition, demolish
DEPT	department
DET	detail
DIA, D	diameter
DIAG	diagonal
DIM	dimension
DWG	drawing
FEM	female
FUT	future
FV	field verify
FM	force main
FH, HYD	fire hydrant
ID	inside diameter
MAS	masonry
MATL	material
MAX	maximum
MFD	manufactured
MFG	manufacturing
MFR	manufacturer
MH	manhole, metal hallide
MIN	minimum
MISC	miscellaneous
MTL	material

NAT	natural
NATL	national
NOM	nominal
NTS	not to scale
OD	outside diameter
PP	power pole
R	radius
Rd	road
REIN	reinforce
REL A	relief air
REQD	required
REV	revision
RR	railroad
R/W	right-of-way
RWM	reclaimed water main
RY	railway
SAN	sanitary
SCH	schedule
SECT	section
SLV	sleeve
SQ	square
SST	stainless steel
ST	street
STA	station
STD	standard
SURF	surface
SUSP	suspend(ed)
SYM	Symbol, symmetrical
SYS	system
TEMP	Temperature, temporary
TYP	typical
UTIL	utility
W	West
WLD	welded
WM	water main
W/O	without
WT	weight
YD	yard
YR	year
Y W	wye

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 01143

COORDINATION WITH COUNTY'S OPERATIONS

PART 1 – GENERAL

1.1 DESCRIPTION

A. Scope:

1. This Section includes requirements for coordinating with COUNTY's operations during the Work, and includes requirements for tie-ins and shutdowns necessary to complete the Work without impact on COUNTY's operations except as allowed in this Section.
2. CONTRACTOR shall provide labor, materials, tools, equipment, bypass pumps, standby generators, and incidentals shown, specified and required to coordinate with COUNTY's operations during the Work.

B. Coordination:

1. Review installation procedures under other Specification sections and coordinate Work that must be performed with or before the Work specified in this Section.
2. All contacts, requests, changes, communications, and coordination with the County shall be initiated through the County's Resident Project Representative (R.P.R). Any other communication or request that is not initiated through the RPR will be null and void. The RPR will decide if a Construction Assistance Request (C.A.R) is needed. All training, spare parts distribution, and other activities described elsewhere shall always require a C.A.R. with seven (7) days notice.

C. Related Sections:

1. Section 01001, General Work Requirements
2. Section 01310, Progress Schedule
3. Section 01650, Startup and Fuel Tank Testing
4. Section 01720, Project Record Documents

D. Except for shutdowns specified, perform the Work such that COUNTY's facility remains in continuous, permit compliant operation during the Project. Schedule and conduct the Work such that the Work does not impede COUNTY's production or processes, create potential hazards to operating equipment and personnel, reduce the quality of the facility's products or effluent, or cause odors or other nuisances.

E. Work not specifically covered in this Section or in referenced Sections may, in general, be completed at any time during regular working hours in accordance with the General Conditions and Supplementary Conditions, subject to the requirements in this Section.

F. CONTRACTOR has the option of providing additional temporary facilities, including temporary bypass pumping as noted in the project specifications, that can eliminate or mitigate a constraint without additional cost to COUNTY, provided such additional temporary facilities: do not present hazards to the public, personnel, structures, and equipment; that such additional temporary facilities do not adversely

affect COUNTY's ability to comply with Laws and Regulations, permits, and operating requirements; and that requirements of the Contract Documents are fulfilled.

- G. Coordinate shutdowns with COUNTY and ENGINEER. When possible, combine multiple tie-ins into a single shutdown to minimize impacts on COUNTY's operations and processes.
- H. Do not shut off or disconnect existing operating systems. Operation of existing equipment will be by COUNTY unless otherwise specified or indicated. Where necessary for the Work, CONTRACTOR shall seal or bulkhead COUNTY-operated gates and valves to prevent leakage that may affect the Work, COUNTY's operations, or both. Provide temporary fueltight plugs, bulkheads, and line stops as required. After completing the Work, remove seals, plugs, bulkhead, and line stops to satisfaction of the County.

1.2 SUBMITTALS

- A. Action Submittals: Submit the following:
 - 1. Substitute Sequence Submittal: When deviation from specified sequence is proposed, provide submittal explaining in detail the proposed sequence change and its effects, including evidence that COUNTY's operations will not be adversely affected by proposed change. List benefits of proposed sequence change, including benefits to Progress Schedule.
- B. Informational Submittals: Submit the following:
 - 1. Shutdown Planning Submittal:
 - a. For each shutdown, submit an inventory of labor and materials required to perform the shutdown and tie-in tasks, an estimate of time required to accomplish the complete shutdown including time for COUNTY to take down and start up existing equipment, systems, or conduits, and written description of steps required to complete the Work associated with the shutdown. Also include a back-up plan that can be implemented within 8 hours if the work is not completed in the stated time.
 - b. Furnish submittal to County and ENGINEER at least thirty days prior to proposed shutdown start date. Do not start shutdown until obtaining County's acceptance of shutdown planning submittal.
 - 2. Shutdown Notification: After acceptance of shutdown planning submittal and prior to starting the shutdown, provide written notification to COUNTY and ENGINEER of date and time each shutdown is to start. Provide notification at least 7 days in advance of each shutdown. If scheduled shutdown does not occur, Contractor shall revise and resubmit the shutdown notification for new shutdown date(s).

1.3 GENERAL CONSTRAINTS

- A. Specified in the Contract Documents are the sequence and shutdown requirements, where applicable, for COUNTY'S equipment, systems, and conduits that are to be taken out of service temporarily for the Work. New equipment, materials, and systems may be used by COUNTY after the specified field quality controls and testing are successfully completed and the materials or equipment are Substantially Complete.

- B. The following constraints apply to coordination with COUNTY's operations:
1. Operational Access: COUNTY'S personnel shall have access to equipment and areas.
 2. Temporary Partitions and Enclosures: CONTRACTOR shall provide temporary partitions and enclosures necessary to maintain dust-free, heated, and ventilated spaces in areas that are adjacent to the Work and that must be kept operational.
 3. Schedule and perform equipment and system start-ups for Monday through Thursday. Equipment and systems shall not be placed into operation on Friday, Saturday, and Sunday without prior approval of COUNTY.
 4. Dead End Valves or Pipe (IF REQUIRED): Provide blind flanges, fueltight bulkheads, or valve at temporary and permanent terminuses of pipes and conduits, unless otherwise noted. Blind flanges and bulkheads shall be suitable for the service and braced and blocked, as required, or otherwise restrained as directed by ENGINEER or RPR. Temporary valves shall be suitable for their associated service. Where valve is provided at permanent terminus of pipe or conduit, also provide on downstream side of valve a blind flange with drain/flushing connection consisting of a 1-inch tap with corp for every 12 inches in pipe diameter.
 5. Maintain clean and dry work area by pumping and properly disposing of fuels prior to beginning any demolition work. Maintain clean work area throughout entire demolition process, including maintaining any excess fluids from fuel tanks or cleaning process.
 6. Draining and Cleaning of Tanks, Fuel Lines and Appurtenances:
 - a. Unless otherwise specified, CONTRACTOR shall properly drain existing fuel tank, pipelines and appurtenances at beginning of each shutdown. Flush, wash down, and clean tanks, pipelines, conduits, and other work areas per requirements listed in these project specifications.
 - i. County shall operate generator to draw down fuel in existing tank as described in the plans and specifications.
 - ii. Contractor to remove and properly dispose of remaining fuel as required by FDEP or other regulations.
 - b. CONTRACTOR shall coordinate the removal of liquids and solids and properly dispose of them at approved disposal locations. Unless otherwise specified or indicated, contents of pipes, tanks, conduits and appurtenances undergoing modifications shall be properly disposed of per FDEP or other regulations. Discharge of fluids on site is not allowed!
 - i. CONTRACTOR shall dispose of all demolished material, tanks, fuel lines and appurtenances using a licensed disposal hauler and shall submit disposal documentation to the County, as required by these specifications.
 - c. Proper drainage and disposal of all fluids is the responsibility of the Contractor. Uncontrolled spillage of tanks, pipe's or conduit's contents are not allowed.
 - d. Spillage shall be brought to County's attention immediately, both verbally and in writing, and reported in accordance with Laws and Regulations. CONTRACTOR shall immediately clean all spills in accordance with all County and State regulatory requirements. CONTRACTOR shall remove spillage by proper method, such as vacuum truck, acceptable to County, ENGINEER and State regulations.

1.4 SEQUENCE OF WORK

- A. Perform the Work in accordance with the sequencing constraints listed in project specifications 01010 and 01650. All stormwater Best Management Practices and pollution prevention requirements shall be installed prior to any work on the site. General sequence of construction-related tasks and task dependencies are indicated in the specifications listed above.
 - 1. The existing plant must be fully available to the County for operation at all times.
 - 2. Provisions for start-up, as specified in Section 01650, will be required prior to start-up procedures.
 - 3. Start-up periods shall be limited to less than four consecutive days, occurring only Monday thru Thursday.

1.5 TIE-INS

- A. Unless otherwise specified or indicated, CONTRACTOR shall make all necessary connections to existing facilities, including structures, generators, and utilities such as telephone, and electric. In each case, CONTRACTOR shall receive permission from COUNTY or the owning utility prior to undertaking connections. CONTRACTOR shall protect facilities against deleterious substances and damage.

1.6 SHUTDOWNS

- A. General:
 - 1. Terminology: A “shutdown” is when a portion of the normal operation of COUNTY’s facility, whether equipment, systems, piping, electrical, or conduit, has to be temporarily suspended or taken out of service to perform the Work.
 - 2. Work that may interrupt normal operations shall be accomplished at times convenient to COUNTY. See section 01650 for notification to COUNTY prior to any work taking place.
 - 3. Furnish at the Site, in close proximity to the shutdown and tie-in work areas, tools, equipment, spare parts and materials, both temporary and permanent, necessary to successfully complete the shutdown. Complete to the extent possible, prefabrication of piping and other assemblies prior to the associated shutdown. Demonstrate to ENGINEER’s satisfaction that CONTRACTOR has complied with these requirements before commencing the shutdown.
 - 4. If CONTRACTOR’s operations cause an unscheduled interruption of COUNTY’s operations, immediately re-establish satisfactory operation for COUNTY.
 - 5. Unscheduled shutdowns or interruptions of continued safe and satisfactory operation of COUNTY’s facilities that result in fines or penalties by authorities having jurisdiction shall be paid solely by CONTRACTOR if, in ENGINEER’s opinion, CONTRACTOR did not conform to the requirements of the Contract Documents, or was negligent in the Work, or did not exercise proper precautions in conducting the Work.
 - 6. Shutdowns shall be in accordance with this Section. Work requiring service interruptions for tie-ins shall be performed during scheduled shutdowns or with prior approval from the COUNTY.
 - 7. Temporary, short-term shutdowns of smaller piping, conduits, equipment, and systems may not be included in the above requirements. Coordinate requirements for such shutdowns with COUNTY and ENGINEER.

- B. Shutdowns of Electrical Systems: Comply with Laws and Regulations, including the National Electric Code. CONTRACTOR shall lock out and tag circuit breakers and switches operated by COUNTY and shall verify that affected cables and wires are de-energized to ground potential before shutdown Work is started. Upon completion of shutdown Work, remove the locks and tags and notify COUNTY and ENGINEER that facilities are available for use.

PART 2 – PRODUCTS (NOT USED)

PART 3 – EXECUTION (NOT USED)

PART 4 – CONSTRUCTION SCHEDULE

A construction schedule with task dependencies showing a general sequence of work is required prior to construction. Note that Contractor is responsible for developing, providing and maintaining the actual project construction schedule, in accordance with Section 01310 – Progress Schedules. Actual task durations are responsibility of the Contractor. Contractor to provide a schedule to the COUNTY as described in the specifications.

END OF SECTION

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**HUNTERS CREEK, ORANGEWOOD, VISTANA
WTP FUEL TANK REPLACEMENT
CONTRACTOR'S ASSISTANCE REQUEST
FOR ACCESS TO COUNTY FACILITIES**

DATE: _____ **NUMBER:** _____

LOCATION/STRUCTURE: _____

PURPOSE: _____

ADDITIONAL ASSISTANCE REQUESTED: _____

DATE ACCESS NEEDED: _____

DURATION OF WORK: _____

Contractor

O.C.U. Construction

COMMENTS/RESTRICTIONS: _____

PLANT SUPERVISOR

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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.

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. 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 will schedule progress meetings every month and as required by progress of the Work with the first meeting (one) 1-month after the pre-construction meeting. The Contractor will prepare and distribute the meeting minutes within 7 calendar days.
- 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.
- 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
 - a. As-Built Asset Attribute Data Table (see Table 01050-2)
 - b. Pipe Deflection Table (see Table 01050-3)
 - c. ~~Gravity Main Table (see Table 01050-4)~~
 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)

END OF SECTION

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.
- 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.
- 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 14.
 1. Demolition of existing pump station
 2. Bypass pumping
 3. Wetwell structure, liner, top slab, hatch covers and appurtenances
 4. Valve vault structure, hatch covers and appurtenances, drain piping and appurtenances
 5. Wetwell (mechanical): 316 stainless steel piping and appurtenances, pumps and base plates
 6. Valve vault (mechanical): piping, valves, and appurtenances
 7. Yard piping, fittings, valves, and appurtenances (outside of structures)
 8. Site work and access drive
 9. Chain link fence and gates
 10. Masonry walls and gates
 11. Odor control equipment, piping, monitoring equipment, etc
 12. Generator, fuel storage tank and related piping
 13. Electrical control panel, wiring, and connections
 14. 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 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

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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 upon completion of Construction and 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

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SECTION 01590
CONSTRUCTION FIELD OFFICE

PART 1 - GENERAL

1.01 SECTION INCLUDES

- A. Contractor provision of temporary utilities to include electricity, lighting, internet connectivity, heat, ventilation, telephone service, water, and sanitary facilities.
- B. Contractor provision of temporary controls to include barriers, enclosures and fencing, and water control.
- C. Contractor provision of temporary facilities to include access roads, parking, and temporary buildings.
- D. Contractor provision of field offices for the County.
- E. Restrictions on the use of existing adjacent facilities.

1.02 TEMPORARY ELECTRICITY

- A. Provide and pay for power service required for Construction and testing from local utility source.
- B. Provide temporary electric feeder from existing electrical service at location as directed by utility company. Power consumption will not disrupt the County's need for continuous service. Coordinate with the County before making taps or disturbing existing service.
- C. Provide separate metering and pay for cost of energy used until substantial completion. If electric service is turned over to and paid for by the County prior to substantial completion, reimburse the County for energy used up to substantial completion.
- D. Provide power outlets for Construction operations, with branch wiring and distribution boxes located as required. Provide OSHA approved flexible power cords as required.
- E. Contractor-installed permanent convenience receptacles may be used during Construction.

1.03 TEMPORARY LIGHTING

- A. Provide and maintain adequate lighting for Construction operations to achieve a minimum lighting level of one (1) watt/sq ft.
- B. Provide and maintain two (2) foot-candle lighting to exterior staging and storage areas after dark for security purposes.

- C. Provide and maintain 0.25-watt/sq ft H.I.D. lighting to interior Work areas after dark for security purposes.
- D. Provide branch wiring from power source to distribution boxes with lighting conductors, pigtails, and lamps as required.
- E. Maintain lighting and provide routine repairs.
- F. Permanent building lighting may be used during Construction.

1.04 TEMPORARY HEAT AND COOLING

- A. Provide and pay for heating and cooling as required to maintain specified conditions for Construction operations or as required for proper conduct of operations included in the Work.
- B. Prior to operation of permanent equipment for temporary purposes, verify that installation is approved for operation, equipment is lubricated and temporary filters are in place. Provide and pay for operation, maintenance, and regular replacement of filters and worn or consumed parts.
- C. Maintain minimum ambient temperature of 50°F and maximum relative humidity of 50% in areas where Construction is closed in and final finishes are to be placed, unless indicated otherwise in specifications.

1.05 TEMPORARY VENTILATION

- A. Ventilate enclosed areas to assist cure of materials, to dissipate humidity, and to prevent accumulation of dust, fumes, vapors, or gases.

1.06 TEMPORARY WATER SERVICE

- A. Provide, maintain, and pay for suitable quality water service required for Construction operations. Coordinate with the County if water supply is not separately metered. Pay all costs and expenses associated with such use.
- B. Extend branch piping with outlets located so water is available by hoses with threaded connections.

1.07 TEMPORARY SANITARY FACILITIES

- A. Provide and maintain required facilities and enclosures on-site. Maintain daily in clean and sanitary condition. Adjacent County office building toilet facilities are not to be used by Contractor.

1.08 BARRIERS

- A. Provide barriers to prevent unauthorized entry to Construction areas and to protect existing facilities and adjacent properties from damage from Construction operations.

- B. Provide barricades required by governing authorities for public rights-of-way.
- C. Provide protection for plant life designated to remain. Replace damaged plant life.
- D. Protect non-owned vehicular traffic, stored materials, site and structures from damage.

1.09 FENCING

- A. Unless directed otherwise in other sections of the Contract Documents, provide a 6-foot high fence completely around Construction site; provided with hinged vehicular and pedestrian gates with locks. Fencing will be galvanized, 2-inch mesh, chain link with solid top rail. Provide line posts and end posts as needed to maintain stretched and uniform fencing with no sags.
- B. Fencing plan will be approved by the County for each phase of the project. Submit fencing layout diagram prior to the Pre-Construction meeting.
- C. Provide visual fabric barrier at least 6-foot high on all fencing separating parking areas from Construction activities. Submit barrier fabric for approval before starting fencing. Barrier fabric will be capable of retaining physical integrity and color during the entire Construction period.

1.10 ACCESS ROADS

- A. Provide and maintain uninterrupted public access to existing buildings. Construction activities will not interfere with access. If Contractor fails to maintain public access after 2 written notices within a 24-hour period, the County reserves the right to correct such situation and back charge the Contractor.
- B. Construct and maintain temporary roads accessing public thoroughfares to serve Construction area.
- C. Extend and relocate access roads as Work progress requires. Provide detours necessary for unimpeded traffic flow.
- D. Provide and maintain access to fire hydrants, free of obstructions.
- E. Designated existing on-site roads may be used for Construction traffic. Repair or restore any damaged areas caused as a result of Construction activity. Such repair will be to a like-new condition.

1.11 PARKING

- A. Provide temporary surface parking areas to accommodate Construction personnel.
- B. Do not allow Construction vehicle parking on existing pavement unless approved by County.

1.12 FIELD OFFICES (FOR UTILITIES DEPARTMENT) – NOT USED

- A. Promptly after starting Work, the Contractor will provide and maintain 1 field office for the use of the County until Substantial Completion.
- B. The field offices will be an appropriate size required for the use of the County, as well as contain two offices and three desks. The field office structure will be a minimum of 10-foot x 40-foot. The layout of the County's field office will include adequate space to hold project meetings (minimum seating for 15).
- C. Installation of the field offices will meet all local codes and ordinances. The Contractor will as a minimum install the structures on a level, well-drained area. Structures will be designed and installed to resist 130-mph winds or applicable State of Florida code, whichever is more stringent.
- D. The field offices will be provided with structurally sound and safe steps and landings for each door. The doors will have secure locks. Construct appropriate walkway and landings. Construct covers over each door that extends 3-feet from the building and the full width of the landing.
- E. The field offices will be designated as a "No Smoking Area."
- F. The windows will be arranged for cross ventilation with screens.
- G. Provide air conditioning and heating systems with thermostat control.
- H. Provide electric power for the duration of the Work.
- I. The Contractor will provide the following with the field office, at a minimum:
 - 1. Electric lights (fifty (50) foot-candles at desktop height) and power supply outlets.
 - 2. When available, provide high-speed Internet access to all desks for the duration of the Work.
 - 3. Acceptable toilet facilities with appropriate signage that meet all of the local and State health codes and regulations.
 - 4. Fire extinguisher (Halon type, minimum 4 lb. capacity).
 - 5. Water coolers, bottled water and paper cups.
 - 6. Tables for viewing the Project Drawings.
 - 7. Standard office supplies.
 - 8. Weekly janitorial services.

1.13 SPECIFIC REQUIREMENTS FOR THE FIELD OFFICES

Provide the following for the exclusive use of the County: (Unless otherwise noted, the quantity should be sufficient for the duration of the Work.)

- A. Office Furnishings: The furniture will be delivered and placed as directed by the County.
- B. Desks: Flat top, double pedestal, with one box and one file drawer in each pedestal, 60-inches by 30-inches. Total quantity will be three (3).

- C. Chairs: Three (3) office-type chairs, adjustable heights, on rollers, with armrests.
- D. Conference Table and Chairs: One (1) table (3-feet by 8-feet minimum), scratch and stain resistant and 15 meeting-type chairs.
- E. Drawing Table: Two (2) plywood or standard drawing tables, 3-feet by 6-feet, with all required appurtenances and 2 extended height stools suitable for use at the drawing tables.
- F. Printer: One(1) - All in one color inkjet printer capable of printing, scanning and coping Ledger, Legal and Letter sizes. Standard interfaces shall include Hi-Speed USB 2.0, Wireless (802.11b/g/n), Ethernet. Minimum requirements include: 35 page automatic document feeder, printing 20 color copies per minute at 6000 x 1200 dpi resolution, scan resolution 2400 x 2400 dpi, flat bed document glass size Ledger (11" x 17") with standalone copy features, minimum of 250 sheet input capacity cassettes and 2 additional complete set of ink cartridges. Brother MFC-J6710DW or equal. Printers to be retained by the County. All warranties, maintenance, servicing and sufficient appropriate ink/toner cartridges and paper for the duration of the Work.
- G. One (1) each refrigerator, microwave, coffee machine, and toaster oven.
 - 1. Provide Internet connection in each of the four offices in the field trailer. The connection shall be at least 5.0 Mbps of download speed or greater. Provide office with a wireless network 802.11 n with minimum of 8 concurrent users in addition to the network requirements. Wireless network shall allow additional portable computers to gain internet access within the office.
- H. File Cabinets, Storage, Bookcases:
 - 1. Three (3) Lateral Files: HON 600 Series, or equal, 42-inch wide, four-drawer.
 - 2. Two (2) steel vertical, hanging mobile plan stands, with approximately 12-hanging clamps. Provide all required clamps, of sufficient length to hold the Contract Drawings.
 - 3. Storage: Two (2) industrial grade steel cabinets, locking handles, 36-inches wide by 18-inches deep by 72-inches high.
 - 4. Bookcases: Three (3) HON metal bookcases, or equal, 34-1/2-inches wide by 12-5/8-inches deep by 71-inches high, color to be selected by the Engineer.
- I. Miscellaneous Field Supplies:
 - 1. One (1) minimum/maximum digital thermometer, with batteries for the duration of the Work.
 - 2. One (1) rain gauge.

1.14 REMOVAL OF TEMPORARY UTILITIES, FACILITIES, AND CONTROLS

- A. Remove all temporary utilities, equipment, facilities, and materials prior to submitting Final Application for Payment.
- B. Remove temporary underground installations to minimum depth of 2-feet and re-grade site.
- C. Clean and repair damage caused by installation or use of temporary Work.

- D. Restore any existing facilities used during Construction to original condition, unless otherwise directed in other sections of Contract Documents. Restore existing landscaping, drainage, paving, etc. to an "as-was" condition, unless otherwise directed in other sections of Contract Documents.

PART 2 - PRODUCTS (NOT USED)

PART 3 - EXECUTION (NOT USED)

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

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SECTION 01650
START-UP AND FUEL TANK TESTING

PART 1 - GENERAL

1.01 SCOPE OF WORK

- A. The Contractor will conduct preliminary testing of facilities, products and equipment. If the preliminary field tests disclose any items furnished under this Contract which do not comply with the requirements of the Contract Documents, the Contractor shall make all changes, adjustments and replacements required prior to Start-up Demonstration and Acceptance Testing.
- B. The Contractor shall arrange qualified instruction by the manufacturer's representative for the County's designated operating and maintenance personnel in operation, adjustment and maintenance of products, equipment and systems.
- C. The Contractor shall furnish all labor, fuel, energy, lubrication, water, and all other materials, equipment, tools and instruments necessary for the Start-up Demonstration and Acceptance Testing unless otherwise specified.
- D. The startup and final check out shall demonstrate and ensure to the County the complete system. The Contractor shall provide documentation certifying proper installation, testing and operation of all prescribed equipment and systems.

PART 2 - PRODUCTS (NOT USED)

PART 3 - EXECUTION

3.01 START-UP TESTING AND INSPECTION

The Tank system (tank, piping and monitoring equipment) to be tested in accordance with all applicable regulations, including but not limited to NFPA and FDEP. Tests to be performed in accordance with manufacturers specifications. Coordination for testing and inspections between FDEP and Contractor will be scheduled by Orange County Risk Management (Risk).

- A. The Contractor shall notify Risk at intervals of 30 days, 10 days and 48 hours for all removals and installations. The Contractor shall notify RISK at least 10 working days prior to start-up.
- B. The following shall have been successfully met prior to start-up test:
 - 1. A walk through letter of acceptance received
 - 2. All wire checks conducted
 - 3. FDEP Clearances received

4. FDEP placard for fuel tank
 5. Certified As-Built Survey
 6. The Contractor shall conduct preliminary testing of equipment prior to start-up testing and make all changes, adjustments and replacements required; and
 7. The equipment shall meet the testing requirements of the Contract Documents and a letter or form signed by the County that testing was witnessed and approved.
- C. The intent of the start-up testing is for the Contractor to demonstrate to the County that the Work will function as a complete and operable system under normal as well as emergency operating conditions and the equipment is ready for acceptance.
- D. The Contractor shall furnish all labor, fuel, energy, lubrication, water and all other materials, equipment, tools, and instruments necessary for testing and inspection. All material used shall be listed on the Appendix D "List of Approved Products." All required certification letters, spare parts and supplies shall be provided to the County. Listed below is a partial checklist of requirements to be met.
1. The Contractor shall coordinate startup activities with the County, the manufacturer's representatives and Subcontractors. A factory representative knowledgeable in the mechanical and electrical equipment furnished shall inspect and supervise a start-up of their respective equipment. A minimum of 1 full business day shall be provided for the testing. Additional time may be necessary due to faulty or incomplete Work. Upon satisfactory completion of the equipment testing and inspection, the factory representative(s) shall issue the required manufacturer's warranty certificates.
 2. Initiate start-up of each system in accordance with the operation and maintenance manual. Demonstrate that all of the components of a system are operating under their own controls as designated without overheating or overloading any parts and without objectionable vibration as determined by the County.
 3. Observe the system operation and make adjustments as necessary to optimize the system performance. Coordinate with County for any adjustments desired or operational problems requiring debugging.
 4. All functions of the mechanical and electrical equipment shall be tested and inspected for operation and workmanship. All equipment shall be properly installed and meet the design performance requirements.
 5. Furnish 2 printed copies and 3 electronic copies in Acrobat "pdf" format of the Operation and Maintenance Manual for the equipment to the County.
 6. An equipment start-up report shall be completed.
 7. The Contractor shall bear the entire expense of rectifying Work installed.
 8. The Contractor shall furnish the County with a written certification signed by the Manufacturer's representative that the equipment has been properly installed and lubricated, is in accurate alignment, is free from undue stress imposed by piping or mounting bolts, and has been operated under full load conditions and that satisfactory operation has been obtained.
- E. Re-testing

If the start-up testing does not meet the requirements, the deficiencies shall be corrected and the testing procedure will be rescheduled again.

F. FDEP fuel tank placard

Risk will coordinate with the Contractor and will submit all required documentation to FDEP on behalf of Orange County (OC). Fees for the Registration will be paid by OC upon delivery of the tank. Placard will be sent directly to OC upon receipt of payment by FDEP.

G. Acceptance

1. The fuel tank and appurtenances shall be accepted based on the equipment functioning as a complete and operable system under normal as well as emergency operating conditions, the approved construction documents have been met and any deficiencies that were observed and noted have been corrected.
2. The Contractor shall ensure all fuel, lubrication, and all other materials for operation are replenished. No fuel can be placed in the Tank system until FDEP has approved the installation.

END OF SECTION

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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

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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, to enable future location, identification and modification of the Work without lengthy and expensive site measurement, investigation or examination.
- B. These standards and procedures are for integration of digital engineering CAD drawings and attribute data into the database environments, while maintaining the integrity and positional accuracy of the data. The requirement for digital submittal of approved construction plans is to provide the County GIS with a parcel and utility base for field maintenance and operations.
- C. The location of the constructed improvements as depicted in the Contract Drawings is required. To insure the Work was constructed in conformance with the Contract Drawings, the following survey documents are required to be prepared and certified by the Surveyor:
 - 1. As-Built Asset Attribute Data Table (see Table 01050-2)
 - 2. Pipe Deflection Table (see Table 01050-3)
 - 3. As-built plans depicting fuel line locations, including size and depth of line.
 - 4. ~~Boundary Survey and Survey Map Report for pump stations and easements with constructed improvements.~~
 - 5. All electrical raceways installed (above and below ground).

1.02 DEFINITIONS

Except where specific definitions are used within a specific section, the following terms, phrases, words and their derivation shall have the meaning given herein when consistent with the context in which they are used. Words used in the present tense include the future tense, words in the plural number include the singular number and words in the singular number include the plural number.

- A. As-Built Drawings: Drawings prepared by the Contractor's Surveyor shall depict the actual location of installed utilities for the completed Work in a full size hard copy and an electronic AutoCAD file (dwg) format.
- B. Record Documents: All documents as required in subsections 1.04 and 2.02 in this specification section.

- C. 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.
- D. Surveyor: Contractor's Surveyor that is licensed by the State of Florida as a Professional Surveyor and Mapper pursuant to Chapter 472, F.S.
- E. Survey Map Report: As a minimum the Survey Map Report shall identify any corners that had to be reset, measurements and computations made, pump station and easement boundary issues, locations of constructed improvements outside boundaries, and accuracies obtained.

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. Progressive As-Built Drawings
 - 7. Current Surveyor's tables for the As-Built Assets Attribute Data, Pipe Deflection Data, and Gravity Main Data
- B. Maintain the documents in an organized, clean, dry, legible condition and completely protected from deterioration and from 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 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.
- D. In the event of overlapping changes, use different colors for entries of the overlapping changes.
- E. 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.
- F. Make entries in the pertinent other documents while coordinating with the County for validity.
- G. 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 Table 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) hard copy sets and three (3) digital media sets of the final Record Documents and shall include all of the documents described below under this subsection 2.02.
- B. The following documents shall be signed and sealed by the Surveyor:
 - 1. As-Built Asset Attribute Data Table (see Specification Section 01050 "Surveying and Field Engineering," Table 01050-2 for an example)
 - 2. Boundary Survey of pump station and Survey Map Report
 - 3. Boundary Survey and Survey Map Report for the location of constructed pipes ~~within any easements and right-of-way~~. As a minimum the Survey Map Report shall identify or describe the locations where the pipe centerline was constructed ~~within 3-feet of the easement or right-of-way boundary, where the pipe was constructed outside the easement or right-of-way boundary~~, any corners that had to be reset, measurements and computations made, ~~pump station boundary issues~~, and accuracies obtained. Survey map report shall be dated after the Work ~~within the right-of-ways or easements~~ have been completed.
 - 4. Gravity Main Table (see Specification Section 01050 "Surveying and Field Engineering", Table 01050-4 for an example)
 - 5. 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.
- C. Digital sets of the final Record Documents including but not limited to:
 - 1. Scanned digital copies of the final As-Built Drawings
 - 2. Electronic Survey documents electronically sealed by the Surveyor
 - 3. Final Record Documents information
 - 4. Digital As-Built Drawing in the Engineer's current version of AutoCAD file (dwg) format for the Contract Drawings, updated to match the final Record Drawing information
- D. Pump station site Boundary Survey and Map Report.
- E. New Boundary Survey to re-establish easement corners, right-of-way monuments, or pump station site corners with monuments if destroyed by the Work.
- F. Scanned Documents: Scan the Survey Documents and other Record Documents reflecting changes from the Bid Documents.
- G. The scanned "As-Built" Drawing sets shall be 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. Review all Record Documents to ensure a complete record of the Project.

- H. Provide an encompassing digital AutoCAD file that includes all the information of the As-Built Drawings 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 and Surveyor shall electronically seal the data in a comma-delineated ASCII format (txt).

PART 3 - EXECUTION

3.01 PRE-CONSTRUCTION MEETING

- A. Pre-construction Meeting: It is recommended that the Surveyor attend the Pre-construction meeting. At the pre-construction meeting the Contractor shall be provided with a blank electronic version of the spreadsheet for the tables: Asset Attribute Data and Pipe Deflection. 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 progressive Record Documents described below:
1. Construction Contract, As-Built Drawings, Specifications, General Conditions, Supplemental Conditions, Bid Proposal, Instruction to Bidders, Addenda, and all other Contract Documents.
 2. 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.
 3. Change orders, verbal orders, and other modifications to Contract.
 4. Written instructions by the County as well as correspondence related to Requests for Information (RFIs).
 5. Accepted Shop Drawings, samples, product data, substitution and "or-equal" requests.
 6. Field test records, inspection certificates, manufacturer certificates and construction photographs.
 7. As-Built Asset Attribute Data Table: 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.
 8. 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.

9. 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.

3.03 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.

3.04 STORAGE AND PRESERVATION

- A. Store Record Documents and samples at a protected location in the project field office apart from documents used for construction.
 1. Provide files and racks for storage of documents
 2. Provide locked cabinet or secure space for storage of samples
- B. File documents and samples in accordance with CSI format with section numbers matching those in the Contract Documents.
- C. In the event of loss of recorded data, use means necessary to again secure the data to the County's approval.
 1. Such means shall include, if necessary in the opinion of the County, removal and replacement of concealing materials.
 2. In such cases, provide replacements of the concealing materials to the standards originally required by the Contract Documents.

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. The manufacturer or supplier is to provide a five-year warranty commencing at 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 02050
DEMOLITION OF EXISTING STRUCTURES

PART 1 - GENERAL

1.01 DESCRIPTION

A. Scope of Work

1. This Section specifies the labor, materials, equipment, and incidentals required for the demolition, relocation, and/or disposal of all structures, building materials, equipment, fuel tanks, fuel lines and accessories to be removed as shown on the Drawings and as specified herein.
2. There may be existing and active stormwater, wastewater, water, and other facilities on site as indicated on the Drawings. It is essential that these facilities, when encountered, remain intact and in service during the proposed demolition. Consequently, the Contractor shall be responsible for the protection of these facilities and shall diligently direct all his activities toward maintaining continuous operation of the existing facilities and minimizing operational inconvenience.
3. Demolition generally includes:
 - a. Complete demolition and removal of fuel tanks, fuel lines, piping, and mechanical and electrical equipment related to the Work as shown on the Drawings and specified herein.
 - b. Complete demolition and removal of all above and below ground structures, concrete slabs and foundations, and underground utilities (fuel lines, sleeves, electrical, etc.) as shown on the Drawings and specified herein.
 - c. All material, equipment, rubble, debris, and other products of the demolition shall become the property of the Contractor for his disposal off-site in accordance with all applicable laws and ordinances at the Contractor's expense. The sale of salvageable materials by the Contractor shall only be conducted off-site. The sale of removed items on the site is prohibited by the County.
4. The Contractor shall examine the various Drawings, visit the site, determine the extent of the Work, the extent of work affected therein, and all conditions under which he is required to perform the various operations.
5. The Contractor shall fill and compact all voids left by the removal of pipe, structures, etc. with materials described herein to a grade that will provide for positive drainage of the disturbed area to drain run-off in direction consistent with the surrounding area. The Contractor shall provide all fill materials to the site as needed. Compaction of fill shall match the compaction of adjacent undisturbed material.

1.02 QUALITY ASSURANCE

- A. Permits and Licenses: Contractor shall obtain 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.

- B. Notices: Contractor shall issue written notices of planned demolition 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. Utility Services: Contractor shall notify utility companies or local authorities furnishing gas, water, electrical, telephone, or sewer service to remove any equipment in the structures to be demolished and to remove, disconnect, cap, or plug their services to facilitate demolition.
- D. Contractor shall notify Risk, in writing, at intervals of 30 days, 10 days and 48 hours for all removals or demolition work.

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 to the County for their approval, 2 copies of proposed methods and operations of demolition or relocation of the structures specified below prior to the start of Work. Include in the schedule the coordination of shut-off, capping, and continuation of utility service as required.
- C. Provide a detailed sequence of demolition and removal work to ensure the uninterrupted progress of the County's operations.
- D. Before commencing demolition work, all structure relocation, bypassing, capping, or modifications necessary will be completed. Actual work will not begin until the County has inspected and approved the prerequisite work and authorized commencement of the demolition work.
- E. The above procedure must be followed for each individual demolition operation.

1.04 SITE CONDITIONS

- A. Prior to demolition, the Contractor shall obtain written verification from the utility owner(s) that the existing utilities, including stormwater, wastewater, and/or water facilities, are not operational and are ready for demolition.
- B. The County assumes no responsibility for the actual condition of the structures to be demolished or relocated.
- C. Conditions existing at the time of inspection for bidding purposes will be maintained by the County insofar as practicable. However, variations within each site may occur prior to the start of demolition work.
- D. No additional payment will be made for pumping or other difficulties encountered due to water.

- E. Certain information regarding the reputed presence, size, character and location of existing underground structures, pipes and conduit has been shown on the Drawings. There is no certainty of the accuracy of this information, and the location of underground structures shown may be inaccurate and other obstructions than those shown may be encountered. The Contractor hereby distinctly agrees that the County is not responsible for the correctness or sufficiency of the information given; that in no event is this information to be considered as a part of the Contract; that he shall have no claim for delay or extra compensation on account of incorrectness of information regarding obstructions either revealed or not revealed by the Drawings; and that he shall have no claim for relief from any obligation or responsibility under this Contract in case the location, size, or character of any pipe or other underground structure is not as indicated on the Drawings, or in case any pipe or other underground structure is encountered that is not shown on the Drawings.

1.05 RESTRICTIONS

- A. No building, fuel tank, fuel lines or structure, or any part thereof, shall be demolished until an application has been filed by the Contractor with the Building Department Inspector and a permit issued if a permit is required. The fee for this permit shall be the Contractor's responsibility. Demolition shall be in accordance with applicable provisions of the Building Code of the State of Florida.
- B. No explosives shall be used at any time during the demolition. No burning of combustible material will be allowed.
- C. Contractor shall notify (Risk) prior to beginning any demolition work.

1.06 DISPOSAL OF MATERIAL

- A. All salvageable or useable material or equipment to be retained by the County shall be shown on Drawings, and shall be moved to a designated area by Contractor for pick up by County. The Contractor shall promptly remove all other materials from the site as indicated or shown on the Drawings.
- B. All materials not retained by the County shall become the Contractor's property and shall be removed off-site. Risk must be provided with either a disposal manifest or a Release of Liability form (available from Risk) for tanks being removed from site(s).
- C. The on-site storage of removed items is prohibited by the County. Off-site sale of salvageable material by the Contractor is acceptable.

1.07 TRAFFIC AND ACCESS

- A. Conduct work to ensure minimum interference with on-site and off-site roads, streets, sidewalks, and occupied or used facilities.

- B. Special attention is directed towards maintaining safe and convenient access to the existing facilities remaining in operation by plant personnel and plant associated vehicles, including trucks and delivery vehicles.
- C. Do not close or obstruct streets, sidewalks, or other occupied or used facilities without permission from the County. Provide alternate routes around closed or obstructed traffic in access ways.

1.08 PROTECTION

- A. Conduct operations to minimize damage by falling debris or other causes to adjacent buildings, structures, roadways, other facilities, and persons. Provide interior and exterior shoring, bracing, or support to prevent movement or settlement or collapse of structures to be demolished and adjacent facilities to remain.

1.09 DAMAGE

- A. Promptly repair damage caused to adjacent facilities by demolition operations as directed by the County at no cost to the County.

1.10 UTILITIES

- A. Maintain existing utilities as directed by the County to remain in service and protect against damage during demolition operations.
- B. Do not interrupt existing utilities serving occupied or operational facilities, except when authorized by County. Provide temporary services during interruptions to existing utilities as acceptable to the County.
- C. The Contractor shall cooperate with the County to shut off utilities serving structures of the existing facilities as required by demolition operations.
- D. The Contractor shall be solely responsible for making all necessary arrangements and for performing any necessary work involved in connection with the interruption of all public and private utilities or services.
- E. All utilities being abandoned shall be terminated at the service mains in conformance with the requirement of the utility companies or the municipality owning or controlling them.

1.11 EXTERMINATION

- A. If required, before starting demolition, the Contractor shall employ a certified rodent and vermin exterminator and treat the facilities in accordance with governing health laws and regulations. Any rodents, insects, or other vermin appearing before or during the demolition shall be killed or otherwise prevented from leaving the immediate vicinity of the demolition work.

1.12 POLLUTION CONTROL

- A. For pollution control, use water sprinkling, temporary enclosures, and other suitable methods as necessary to limit the amount of dust rising and scattering in the air to the lowest level of air pollution practical for the conditions of work. The Contractor shall comply with the governing regulations.
- B. Clean adjacent structures and improvements of all dust and debris caused by demolition operations as directed by the County. Return areas to conditions existing prior to the start of Work.

PART 2 - PRODUCTS (NOT USED)

PART 3 - EXECUTION

3.01 SEQUENCE OF WORK

- A. The sequence of demolition and relocation of existing facilities shall be in accordance with the approved critical path schedule as specified in paragraph 1.03 above.

3.02 REMOVAL OF EXISTING EQUIPMENT, PIPING, AND APPURTENANCES

- A. Equipment to be retained by the County will be designated for retention by the County prior to bidding as specified in Paragraph 1.06 above. Subject to the constraints of maintaining existing facilities in operation as shown on the Drawings, all other equipment (fuel tank, fuel lines, etc.), buried and non-buried valving and piping, and appurtenances shall be removed from the site.

3.03 DEMOLITION PROCEDURES

The Contractor shall adhere to the following demolition procedures as referenced on the Drawings. Contractor to perform all exploratories as needed prior to demolition.

- A. **TO BE DEMOLISHED:** Demolition shall be the breaking up, cutting, filling of any holes resulting, final grading of the area, performing any other operations required, and the removal from the site of all structures and equipment (structures, substructures, floor slabs, equipment, tanks, pipes, fittings, electrical systems, light poles, wiring, underground conduits and wiring, isolated slabs, and sidewalks) as indicated on the Drawings. All pieces of concrete, metal, and any other demolished material shall be removed to a depth of at least 5-feet below existing grade. Broken pieces of concrete may be size reduced by an on-site crusher, but in any event must be removed from the project site.

Before commencing structural demolition, remove all mechanical, electrical, piping, and miscellaneous appurtenances. Completely remove the structure by thoroughly breaking up concrete into pieces no more than 2-feet across the largest dimension.

- B. TO BE REMOVED: Where indicated on the Drawings, the structures and equipment shall be completely removed from the site with all associated connecting piping or electrical service. The item shall be taken whole or in parts to be salvaged or disposed of by the Contractor.
- C. TO BE ABANDONED: Where indicated on the Drawings, the structures and equipment shall be left in place, drained, and the contents properly disposed. The upper 4-feet of the structure shall be cut and removed, including the cover slab and access port, frame, and cover. All structures to be abandoned with bottom slabs shall be drilled (2 holes minimum, 2.0-inch diameter each) or hole punched to prevent flotation and filled with common fill.
- D. PIPING TO BE REMOVED: Where indicated on the Drawings, pipe (and conduit) shall be drained and the contents properly disposed. The pipe (or conduit) shall then be completely removed from the site, including fittings, valves, and other in-line devices. Connections to existing piping to remain shall be plugged by mechanical means (M.J. plugs, tie-rods, or thrust blocks). Piping shall be removed in accordance with Specification Section 02080 "Abandonment, Removal and Salvage or Disposal of Existing Pipe."
- E. PIPING TO BE ABANDONED: Where indicated on the Drawings, piping (or conduit) shall be left in place. All such piping shall be drained and the contents properly disposed. The pipe (or conduit) shall then be filled with grout (flowable fill) and each end of the pipe (or conduit) shall be plugged using a concrete plug in a manner acceptable to the County. Piping shall be abandoned in accordance with Specification Section 02080 "Abandonment, Removal and Salvage or Disposal of Existing Pipe."
- F. TO BE PROTECTED: Where indicated on the Drawings, the utility service, fence, structure, tree, or device so designated shall be temporarily protected during the prosecution of the demolition work as specified in Division 1.
- G. TO REMAIN: Where indicated on the Drawings, the designated facilities shall remain intact and in service during the prosecution of the demolition work.

3.04 DEWATERING OF EXISTING PROCESS UNITS AND DISPOSAL OF RESIDUE

The Contractor shall notify the County prior to beginning the dewatering work on any existing process units which contain wastewater, grit, or sludge. The Contractor, at his own expense, shall remove the entire contents of each structure and dispose off site. The proper transport and disposal of all residues shall remain the responsibility of the Contractor.

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 fuel tanks, 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. All removal of existing fuel tanks and fuel lines shall be performed by a licensed petroleum 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 fuel tanks and piping is removed and disposed, salvaged, or abandoned as designated in the Drawings and as specified herein.
 - 2. Asbestos Pipe
 - a. If asbestos is discovered at the facility, the Contractor is to copy RISK on all reports/abatement.
 - b. All removal or abandonment of pipe material containing asbestos shall be performed by a licensed asbestos abatement Contractor or Subcontractor.

- c. 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.
- d. The asbestos abatement Contractor shall perform Work in accordance with all applicable standards referenced in paragraph 1.02.C of this section.
- e. 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. Fuel tanks
 - b. Fuel Lines
 - c. Electrical Equipment
 - d. Fuel Management System
 - e. Fuel Fill Station
 - f. All appurtenances for installation of Work
 - g. Caps and plugs
 - h. Credentials of licensed asbestos abatement Contractor including current certification.
 - i. Credential of licensed petroleum Contractor including current certification.

PART 2 - PRODUCTS (NOT USED)

PART 3 - EXECUTION

3.01 REMOVAL, ABANDONMENT, SALVAGE, AND DISPOSAL

- A. General: Existing fuel tanks and 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. Fuel tanks designated to be removed shall be completely drained, cleaned and properly disposed per FDEP rules and regulations.

3. 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.
4. Asbestos: Pipe material containing asbestos shall be removed and disposed by a licensed asbestos abatement Contractor or Subcontractor.
5. 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 shall be determined by the County during the bid process.

D. Abandonment (if approved by County)

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. Synthetic Bales: clean.
- 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. Synthetic 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 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~~elevation which is 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 (if required)
 - 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 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 03200
CONCRETE REINFORCEMENT

PART 1 - GENERAL

1.01 DESCRIPTION

- A. Scope of Work: This Section specifies reinforcing steel and welded wire mesh for cast-in-place concrete structures.
- B. Related Work:
 - 1. Section 03100 "Concrete Formwork"
 - 2. Section 03300 "Cast-in-Place Concrete"
 - 3. ~~Section 03410 "Precast Concrete Structures"~~

1.02 QUALITY ASSURANCE

- A. Standards: Unless otherwise indicated, all materials, workmanship, and practices shall meet all requirements of the current editions of the following standards:
 - 1. Standard Building Code
 - 2. ACI 318 Building Code Requirements for Reinforced Concrete
 - 3. ACI 315 Details and Detailing of Concrete Reinforcement
 - 4. CRSI Manual of Standard Practice, MSP-2

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. Complete shop drawings shall be submitted for comment, including bar lists and placing drawings. Drawings shall show the type, spacing, and location of metal bar supports, the grade of the reinforcing and the name of the manufacturer. The type of coupler splice devices shall be designated.

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. Reinforcing Bars: ASTM A615, Grade 60, deformed billet steel bars of a USA manufacturer.
- B. Welded Wire Fabric: ASTM A185, galvanized.
- C. Metal Bar Supports: CRSI MSP-2, Chapter 3, Class 2, Type B, Stainless Steel Protected Bar Supports.
- D. Coupler Splice Devices: Cadweld tension couplers capable of developing the ultimate strength of the bar, as manufactured by Erico Products, Incorporated, Solon, Ohio, or equal where acceptable to the County.

2.03 FABRICATION

- A. Fabrication shall meet all requirements of the specified standards. Unless otherwise indicated, the following shall apply:
 - 1. Hooks shall be standard hooks.
 - 2. Bottom bars shall extend a minimum of 6-inches into supporting members.
 - 3. Minimum cover shall be measured to the outermost stirrup, tie or bar.
 - 4. Splices are permitted only where indicated on the Drawings.

PART 3 - EXECUTION

3.01 INSTALLATION

- A. Supporting Reinforcing: Bar supports shall be provided as required by CRSI MSP-2 and AC1315. Top and bottom bars in slabs formed on earth shall be supported on precast concrete block supports except where such bars are properly supported from formwork. Precast concrete block supports are not required in slabs formed on tremie concrete but may be used at the Contractor's option.
- B. Placing Reinforcing: Placing of reinforcing steel and welded wire fabric shall conform to CRSI MSP-2, ACI 315, and the Drawings. Reinforcing shall be securely tied and supported to prevent displacement during concrete placement.
- C. Welded Wire Fabric: Splices in welded wire fabric shall be such that the overlap between outermost cross wires of each fabric sheet is not less than the spacing of the cross wires, plus 2-inches. Fabric shall not be extended through expansion joints or construction joints in slabs on grade except as otherwise indicated on the Drawings.
- D. Coupler Splice: Unless indicated on the Drawings or where conventional lap splices cannot be achieved, full positive tension connections shall be provided. Such devices shall be installed in accordance with the recommendations of the manufacturer.

- E. Dowels: Dowels shall be wired in position prior to placing concrete.
- F. Field Bending: Heat shall not be used to bend bars. Bars shall not be bent after being embedded in concrete.
- G. Welding: Welding of reinforcing will not be permitted.
- H. Place reinforcement a minimum of 2-inches clear of any metal pipe or fittings.

END OF SECTION

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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, Concsive 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 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 09865
SURFACE PREPARATION AND SHOP PRIME PAINTING

PART 1 - GENERAL

1.01 SCOPE OF WORK

- A. This section specifies the labor, materials, equipment and incidentals required for the surface preparation and application of shop primers on ferrous metals, excluding stainless steel, as specified herein.

1.02 RELATED WORK

- A. Field painting is included in Section 09960 "High Performance Ferrous Metal Coatings."
- B. Section 09901, Coatings and Linings

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 to the County for review and comment manufacturer's specifications and data on the proposed primers and detailed surface preparation, application procedures and dry mil thickness.
- C. Submit representative physical samples of the proposed primers, if required by 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 MATERIALS

- A. Submerged Services: Shop primer for ferrous metals which will be submerged or which are subject to splash action or which are specified to be considered submerged service shall be sprayed with 1 coat of Glidden Epoxy High Build Primer 5461/5452, or an acceptable equal, at a minimum dry film thickness of 5.0-mils.

- B. Non-submerged Services: Shop primer for ferrous metals, other than those covered by Paragraph 2.01 A, shall be sprayed with 1 coat of Glidden T&S Primer 5205, or an acceptable equal, at a minimum dry film thickness of 2.0-mils.
- C. Non-primed Surfaces: Gears, bearing surfaces and other similar surfaces obviously not to be painted shall be given a heavy shop coat of grease or other suitable rust-resistant coating. This coating shall be maintained as necessary to prevent corrosion during all periods of storage and erection and shall be satisfactory to the County up to the time of the final acceptance test.
- D. Compatibility of Coating System: Shop priming shall be done with primers that are guaranteed by the manufacturer to be compatible with their corresponding primers and finish coats specified in Section 09900 "Painting" for use in the field and which are recommended for use together.

PART 3 - EXECUTION

3.01 APPLICATION

- A. Surface Preparation and Priming
 1. Non-submerged components scheduled for priming, as defined above, shall be sandblasted clean in accordance with SSPC SP 6, Commercial Grade, immediately prior to priming. Submerged components scheduled for priming, as defined above, shall be sandblasted clean in accordance with SSPC SP 10, immediately prior to priming.
 2. Surfaces shall be dry and free of dust, oil, grease, dirt, rust, loose mill scale, and other foreign material before priming.
 3. Shop prime in accordance with acceptable paint manufacturer's recommendations.
 4. Priming shall follow sandblasting before any evidence of corrosion has occurred and within 24-hours.

END OF SECTION

SECTION 09901
COATINGS AND LININGS

PART 1 - GENERAL

1.01 SCOPE OF WORK

- A. This specification pertains to the coating and lining of all new, above ground assets including but not limited to: steel, ductile iron pipe, ductile iron fittings, valves, 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 of the newly installed fuel tanks.
- B. The coating/painting shall cover all surfaces of the proposed fuel tanks, fuel lines and all appurtenances included with the Work.
- C. 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 μm (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 (NOT REQUIRED)

- 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/m², 39/ft²), 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 (NOT REQUIRED)

- 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 (NOT REQUIRED)

- A. Fiberglass liners shall be used for new or existing precast manholes and wetwells. Fiberglass liners shall meet or exceed ASTM D 3753 and shall withstand ASSHTO H-20 Loading.
- B. 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.
- C. Exterior Surface: The exterior surface shall be relatively smooth with no sharp projections and shall be free of blisters larger than 1/2-inch in diameter, delamination and fiber show. Hand work finish is acceptable if enough resin is present to eliminate fiber show.

D. Interior Surface: The interior surface shall be resin rich with no exposed fibers. The surface shall be free of crazing, delamination, and blisters larger than 1/2-inch in diameter, and wrinkles of 1/8-inch or greater in depth. Surface pits shall be permitted up to 6 per square feet if they are less than 3/4-inch in diameter and less than 1/16-inch deep. Voids that cannot be broken with finger pressure and that are entirely below the resin surface shall be permitted if they are less than 1/2-inch in diameter and less than 1/16-inch thick.

E. Physical Properties:

Property	Hoop Direction	Axial Direction
a. Tensile Strength (psi)	18,000	5,000
b. Tensile Modules (psi)	0.6 x 10e	0.7 x 10e
c. Flexural Strength (psi)	26,000	4,500
d. Flexural Modules (psi)	1.4 x 10e	0.7 x 10e
e. Compressive Strength (psi)	18,000	12,000

F. Stiffness

Liner Length in FT.	PSI
3 – 6.5	0.75
7 – 12.5	1.26
13 – 20.5	2.01
21 – 25.5	3.02
26 – 35	5.24

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. Connections: Openings for pipe connections will be core drilled in the field. Pipes shall be placed through concrete wetwell and fiberglass liner in the locations indicated on the Drawings. Pipes shall then be grouted in place with the grout filling the entire void and being as thick as the concrete wetwell. The pipe on the interior of the wetwell shall be fiberglassed to the fiberglass liner. To fiberglass the PVC or Ductile Iron pipe to the fiberglass liner, the surface to be fiberglassed must first be sanded. In the case of Ductile Iron pipe, the protective coating on the exterior of the pipe must be removed and then the pipe sanded. After sanding and cleaning the area to be fiberglassed, apply a coat of primer resin. When the resin becomes tacky, begin normal installation of the fiberglass, taking care to roll out all of the air pockets. All field fiberglassing must be accomplished by a manufacturer certified installer. Submit certification to the County.

- I. **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.
- J. PVC stub-outs shall be factory installed for new installations to accept approved boots for gravity lines or compression seals for force mains.

2.05 FERROUS METAL SURFACES (INCLUSIVE OF STEEL AND DIP, 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, ASTM and 10-State Standards. Color-coding shall be red for all fuel and return lines. 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 paint inspection/testing so that a representative may be present to witness inspection/testing.

- A. **Procedures for Coating Exterior of DIP, 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, 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 – 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 factory applied FBE v(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, 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, 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 Red	Hydrant Bonnet & Caps	Candy Apple Red / Safety 06SF	7573	RD 2 Safety Red
Safety Silver	Hydrant Barrel	Aluminum 57GR	J766	SL Safety Silver
Safety Red	Fuel supply and return lines	Safety 06SF	7573	RD 2 Safety Red

Note: Orange County defaults to 10-State Standards for color standards

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 (AS REQUIRED) – NOT USED

- A. The Specialty Coatings are for rehabilitation of existing precast concrete manholes. 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. Surfacer 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, nuts, and fuel lines).

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.
- E. Contractor to provide three-year warranty on all contractor applied coatings.

END OF SECTION

SECTION 09960
HIGH PERFORMANCE FERROUS METAL COATINGS

PART 1 - GENERAL

1.01 SCOPE OF WORK

- A. The work of this section includes surface preparation, coating systems and methods of application. All work shall be done in strict accordance with this specification, the Contract Documents, and the manufacturer's printed instructions.
- B. The Contractor shall furnish all supervision, labor, tools, materials, equipment, maintenance of traffic, containment systems, scaffolding, other structures and incidentals required for transportation, unloading, storage, surface preparation, protection of the public and environment, application of products, and cleanup necessary to complete this Contract in its entirety.
- C. The scope of Work includes painting all exposed miscellaneous metal, pipe, fittings, valves, hangers, straps, support, hardware, equipment, appurtenances, and all other work obviously required to be painted unless otherwise specified. The Contractor shall also paint all surfaces he affects or damages during his performance of the Work, which may be exposed to view in the finished work including, but not limited to, metals, pipe, fittings, valves, equipment and all other existing items similar to proposed items specified for painting. Miscellaneous metal items to be painted shall be included in the Work of this Section where they come within the general intent of the Specifications or as stated herein.
- D. In general the following surfaces shall be painted:
 - 1. Pipe, fittings, flanges, appurtenances and other metal surfaces to 1 ft below grade. Pipe 1 ft below grade and within 6-inches above grade shall be considered immersion surface and shall be coated with the immersion surface high performance coating system.
 - 2. Metal or Galvanized materials including, but not limited to: pipe straps, hangers, pipe support floor stands, nuts, bolts, hardware and tapping saddles. Pipe straps to be removed and coated on both sides.
 - 3. Pipe Surfaces under pipe straps. Pipe straps shall be removed and pipe coated underneath pipe straps regardless if pipe straps are to be coated. No more than two-thirds of the total number of pipe straps shall be removed at any given time.
 - 4. Pedestrian access barriers shall be removed and coated on all sides.
 - 5. Incidentals within the limits of the project including but not limited to bollards, adjacent walkways, walls or supports containing graffiti.
 - 6. Contractor shall provide new 1/2" neoprene that shall be placed at contact interfaces between materials including, but not limited to, pipe support floor stands, pipe straps, and access barriers. The Contractor shall remove and replace existing neoprene where exposed with new material. In situations where 1/2" neoprene is not sized properly for existing conditions, the County on a case by case basis may require a different thickness.

- E. The following surfaces or items are not generally required to be painted, unless noted otherwise. The Contractor shall properly protect these materials from surface preparation, coating application, or damage.
 - 1. Products with polished chrome, aluminum, nickel, Stainless steel, brass, or bronze materials.
 - 2. Stainless steel finish hardware.
 - 3. Flexible couplings.
 - 4. Labels, signs or nameplates including but not limited to: UL, FM, equipment identification, performance rating, name and nomenclature plates.
 - 5. Aluminum handrails, walkways, window, louvers, and grating unless otherwise specified herein.

1.02 REFERENCES

- A. SSPC – Society for Protective Coatings
- B. ASTM – American Society of Testing Materials
- C. NACE – National Association of Corrosion Engineers
- D. NSF – National Sanitation Foundation (Standard 61)
- E. AWWA – American Water Works Association

1.03 DEFINITIONS

- A. Field Coating is the coating of new or rebuilt items at the job site. Field coating shall be the responsibility of the Contractor.
- B. Shop Coating is the coating of new or rebuilt items in the shop prior to delivery to the jobsite.
- C. Exterior – Outside, exposed to weather
- D. Interior – Inside, not subject to immersion service
- E. Immersion service – Material submerged or subject to splash or spray
- F. WFT – Wet Film Thickness
- G. DFT – Dry Film Thickness
- H. MDFT – average minimum dry film thickness
- I. SCARIFY – Roughen the entire existing coating surface by use of brush off blasting, hand tools, sanding, etc to provide an anchor profile for adhesion by new coating systems. Scarified surface shall be approved by the Coatings manufacturer and County prior to over-coating. Existing rust spots, weld slag, sharp edges, defects etc shall be removed by SSPC-SP3 Power tool cleaning.

- J. General: The following referenced surface preparation specifications of the Joint Surface Preparation Standards from NACE International (NACE) and The Society for Protective Coatings (SSPC) shall form a part of this Specification:
1. SSPC-SP1 Solvent Cleaning. Remove all grease, oil, salt, acid, alkali, dirt, dust, wax, fat, foreign matter, and contaminants, etc. by one of the following methods: steam cleaning, alkaline cleaning, or volatile solvent cleaning. Rags and solvents must be replenished frequently to avoid spreading the contaminant rather than removing it. Low-pressure (1500-4000 psi) high volume (3-5 gal/min) water washing with appropriate cleaning chemicals is a recognized "solvent cleaning" method. All surfaces should be cleaned per this Specification prior to using hand tools or blast equipment and between each coating application.
 2. SSPC-SP2 Hand Tool Cleaning. Removal of loose rust, loose mill scale, loose paint and loose foreign matter to a clean sound substrate by hand chipping, scraping, sanding, and wire brushing. Tightly adherent rust, mill scale or paint may remain providing that it cannot be removed by lifting with a dull putty knife
 3. SSPC-SP3 Power Tool Cleaning. Removal of loose rust, loose mill scale, loose paint and loose foreign matter, to a clean sound substrate by power tool chipping, descaling, sanding, abrasive grinding wheels, needle guns, wire brushes, etc. Tightly adherent rust, mill scale or paint may remain providing that it cannot be removed by lifting with a dull putty knife
 4. SSPC-SP5 White Metal Blasting (NACE-1). Complete removal of all visible oil, grease, dust, dirt, mill scale, rust, coating, oxides, corrosion products, and other foreign matter, leaving the surface a uniform gray-white color.
 5. SSPC-SP6 Commercial Blast (NACE-3). Complete removal of all visible oil, grease, dust, dirt, mill scale, rust, coating, oxides, corrosion products, and other foreign matter, leaving only light shadows or discolorations from stains of rust, mill scale, or previous coating on 33% of the unit surface area. At least 66% of each unit surface area is to be free of all visible discoloration or staining.
 6. SSPC-SP 7 Brush-Off Blast (NACE 4). Complete removal of oil, grease, dust, dirt, loose rust, loose mill scale, and loose coatings, leaving tightly adherent mill scale, rust and previous coating. Tightly adherent rust, mill scale or paint may remain providing that it cannot be removed by lifting with a dull putty knife.
 7. SSPC-SP10 Near White Blast (NACE 2). Complete removal of all visible oil, grease, dust, dirt, mill scale, rust, coating, oxides, corrosion products, and other foreign matter, leaving only light shadows or discolorations from stains of rust, mill scale, or previous coating on 5% of the unit surface area. At least 95% of each unit surface area is to be free of all visible discoloration or staining.
 8. SSPC-SP 11 Power Tool Cleaning to Bare Metal. Complete removal of all visible oil, grease, dirt, dust, mill scale, rust, paint, oxide, corrosion products, and other foreign matter and retain or produce a minimum 1.0 mil surface profile. Slight residues of rust and paint may be left in the lower portion of pits if the original surface is pitted.
 9. SSPC-SP 12 Waterjetting (NACE-5). Surfaces preparation by ultra-high pressure water jetting discharged from a nozzle at pressures of 70 MPa (10,000 psig) or greater to prepare a surface for coating or inspection. The difference in degrees of surface cleanliness is defined by the amount of pressure as follows:
 - a. Low Pressure Water Cleaning (LP WC) Less than 34 MPa (5,000 psi)
 - b. High Pressure Water Cleaning (HP WC) 34 to 70 MPa (5,000-10,000 psi)

- c. High Pressure Water Jetting (HP WJ) 70 to 210 MPa (10,000-30,000 psi)
 - d. Ultra-High Pressure Water Jetting(UHP WJ) Above 210 MPa (30,000 psi)
 - e. WJ-1 Clean to Bare Substrate: Complete removal of all visible rust, dirt, previous coatings, mill scale, and foreign matter. Discoloration of the surface may be present.
 - f. WJ-2 Very Thorough or Substantial Cleaning: Complete removal of all visible oil, grease, dirt, and rust except for randomly dispersed stains of rust, tightly adherent thin coatings, and other tightly adherent foreign matter limited to a maximum of 5% of the surface.
 - g. WJ-3 Thorough Cleaning: A WJ-3 surface shall be cleaned to a matte (dull, mottled) finish is free of all visible oil, grease, dirt, and rust except for randomly dispersed stains of rust, tightly adherent thin coatings, and other tightly adherent foreign matter limited to a maximum of 33% of the surface.
 - h. WJ-4 Light Cleaning: A WJ-4 surface shall be cleaned to a finish which is free of all visible oil, grease, dirt, dust, loose mill scale, loose rust, and loose coating. Any residual material shall be tightly adherent.
10. SSPC-SP13 Surface Preparation of Concrete (NACE-6). Complete removal of contaminants, laitance, form oils, dust, dirt, loosely adhering concrete, and previous coating. Blasting, High-pressure water cleaning or waterjetting methods should be performed sufficiently close to the surface so as to open up surface voids, bug holes, air pockets, and other subsurface irregularities, but so as not to expose underlying aggregate.
11. SSPC-SP 14 Industrial Blast Cleaning (NACE-8). Complete removal of oil, grease, dust, dirt, loose rust, loose mill scale, and loose coatings, leaving tightly adherent mill scale, rust and previous coating evenly distributed on 10% of the unit surface area. Stains and discolorations may be present on 90% of the unit area. Tightly adherent rust, mill scale or paint cannot be removed by lifting with a dull putty knife.
12. SSPC-SP 15 Commercial Grade Power Tool Cleaning. Complete removal of all visible oil, grease, dirt, rust, coating, oxides, mill scale, corrosion products, and other foreign matter, except random staining shall be limited to no more than 33 percent of each unit area of surface. Staining may consist of light shadows, slight streaks, or minor discolorations caused by stains of rust, stains of mill scale, or stains of previously applied coating. Slight residues of rust and paint may also be left in the bottoms of pits if the original surface is pitted. (Equivalent standard as SSPC-SP6 Commercial Grade Blast Cleaning NACE-3).

1.04 SUBMITTALS

- A. Submit to the Engineer as provided in the General Conditions and Division 1, shop drawings, manufacturer's specifications and data on the proposed paint systems and detailed surface preparation, application procedures and dry film thickness.

- B. Schedule of Painting Operations: The Contractor shall submit for approval a complete Schedule of Painting Operations within 30 days after the Notice to Proceed. It shall be the Contractor's responsibility to properly notify and coordinate with the County for schedule updates and site activities. This Schedule shall include for each surface to be painted, the brand name, the volume of solids, the coverage and the number of coats the Contractor proposes to use in order to achieve the specified dry film thickness. When the schedule has been approved, the Contractor shall apply all material in strict accordance with the approved Schedule and the manufacturer's instructions. Wet and dry paint film gauges shall be utilized by the County to verify the proper application while Work is in progress.
- C. Protection and Containment Plan: The Contractor shall submit for approval the process, equipment, design, materials, requirements, disposal and methods to provide for protection of the environment, collection of abrasive blasting material, collection of existing coatings, protection of the public and protection for public access.
- D. Maintenance of Traffic Plan (MOT) (As Required): The Contractor shall prepare and submit a Traffic Control Plan to the Owner, and Orange County Public Works Department or Florida Department of Transportation for review and acceptance prior to commencing any Work on the site. The Traffic Control Plan shall detail procedures and protective measures proposed by the Contractor to provide protection and control of traffic affected by the Work consistent with the following applicable standards:
1. Standard Specifications for Road and Bridge Construction, Latest Edition including all subsequent supplements issued by the Florida Department of Transportation (FDOT Spec.).
 2. Manual of Traffic Control and Safe Practices for Street and Highway construction, Maintenance and Utility Operations, FDOT.
 3. Right-of-Way Utilization Regulations, Orange County, Florida, latest edition.
- E. Test panels/samples: At the request of the County, samples of the finished work prepared in strict accordance with these Specifications shall be furnished, and all painting shall be equal in quality to the approved samples. Finished areas shall be adequate for the purpose of determining the quality of workmanship. Experimentation with color tints shall be furnished to the satisfaction of the County where standard chart colors are not satisfactory.
- F. Equivalent materials of other manufacturers may be substituted on approval of the Engineer. Substitutions that decrease the film thickness, the number of coats applied, change the generic type of coating, or fail to meet the performance criteria of the specified materials will not be approved. Prime and finish coats of all surfaces shall be furnished by the same manufacturer. Requests for substitution shall include Manufacturer's literature for each product giving the name, generic type, descriptive information, evidence of satisfactory past performance, and an independent laboratory certification that their product meets the performance criteria of the specified materials including but not limited to the following:
1. Abrasion – Fed. Test Method Std. No. 141, Method 6192, CS-17 Wheel, 1,000 grams load
 2. Adhesion – Elcometer Adhesion Tester
 3. Exterior Exposure – Exposed at 45 degrees facing the ocean (South Florida Marine Exposure)
 4. Hardness – ASTM D3363-74

5. Humidity – ASTM D2247-68
6. Salt Spray (Fog) – ASTM B117-73

1.05 QUALITY ASSURANCE

A. Manufacturer's Qualifications

1. All paints and/or coatings applied in the performance of the Work shall be supplied by one paint supplier and be the product of one manufacturer; unless the County specifies or accepts a specialty paint not available from that manufacturer.
2. The paint manufacturer shall have supplied paint for water and wastewater facilities for a minimum of ten (10) years, and products supplied shall be contained within the manufacturer's standard water and wastewater brochure.
3. When the manufacturer's minimum recommendations exceed the specified requirements, Contractor shall comply with the manufacturer's minimum recommendations.

B. Contractor / Applicator Qualifications as listed below shall be submitted at the time of Bidding as part of the Bid Package.

1. The Contractor's Project Superintendent / Project Manager shall be at minimum certified NACE Level 1 and be in good standing with NACE International prior to bidding. The Contractor have a Competent Person onsite as defined by OSHA. Certification credentials shall be provided to the County and verifiable through the NACE.org certification search website.
2. The Contractor must show proof that all employees associated with this project shall have been employed by the Contractor for a period not less than six (6) months.
3. Painting shall be performed by experienced painters in accordance with the recommendations of the paint manufacturer and the Contract Documents. All paint shall be uniformly applied without sags, runs, spots, or other blemishes. Work that shows carelessness, lack of skill, or is defective in the opinion of the County, shall be corrected at the expense of the Contractor.
4. The applicator shall have practical experience and successful history in the application of the specified products to surfaces of water supply and wastewater collection and treatment facilities. A written list of references shall be provided to show experience and costs with high performance coatings on pipelines and aerial crossings as well with all other aspects with the defined Scope of Work.
5. The Contractor shall provide a list of equipment owned and maintained by the Contractor that shall be utilized on the project.
6. The Contractor shall provide their written QA / QC program.
7. Contractors shall submit their protection and containment plan to prevent blasting debris, paint chips, paint overspray from entering water bodies.

C. Safety and Health Requirements.

1. General: In accordance with the requirements of the OSHA Regulations for Construction, the Contractor shall provide and require the use of personal protective and lifesaving equipment for all persons working in or about the Project including, but not limited to, head and face protection, fall protection, safety harnesses and respiratory devices. Applicable health and safety precautions required by appropriate regulatory agencies such as OSHA, ANSI, etc., shall be followed.

2. Ventilation: Ventilation shall be adequate to reduce the concentration of air contaminants to the degree that a hazard to workers does not exist.
3. Sound Levels: Whenever the occupational noise exposure exceeds the maximum allowable sound levels, the Contractor shall provide and require the use of approved ear protective devices.
4. Illumination: Adequate illumination shall be provided while work is in progress. Whenever required by the County, the Contractor shall provide additional illumination and necessary support sufficient to cover all areas to be checked. The level of illumination required for observation purposes shall be determined by the County.
5. Temporary Ladders and Scaffolding: All temporary ladders and scaffolding shall conform to the applicable requirements of the OSHA Regulations for Construction. The Contractor shall provide access to the County for all areas of work during each phase of construction.
6. Safety of Public. Provide scaffolding, signage, temporary pedestrian access and barricades as required to protect the public from the work area. Areas to be closed off shall require public notice.

D. Pre-Job Conference

1. A pre-job meeting shall be held prior to the commencement of the Work, prior to significant phases or per specific site location if the Work is not contiguous. Attendance shall include the County, Engineer, Contractor, and Painters Site Supervisor. The meeting will address site specific issues including but not limited to: schedule, access to the site, safety requirements, surface preparation, application, coating systems, inspection, quality control, MOT, protection of the public and protection of the environment as covered in the specifications.
2. Copies of all manufacturer's instructions and recommendations shall be furnished to the County and Engineer by the Contractor prior to the meeting.
3. It shall be the responsibility of the Coating Manufacturer to have their factory representative meet in person with the Contractor and Engineer a minimum of three times during the job as a consultant on surface preparation, mil thickness of coating and proper application of coating unless meeting is determined to be unnecessary by the Engineer.

E. Surface Preparation

1. Visual Standard SSPC-VIS-1 (Swedish SIS OS 5900), "Pictorial Surface Preparation Standards for Painting Steel Surfaces" and The National Association of Corrosion Engineers, "Blasting Cleaning Visual Standards" (TM-01-70 and TM-01-75) shall be the standards used to evaluate proper surface preparation.
2. To facilitate inspection, the Contractor shall on the first day of blasting operations, blast metal panels (12" x 12" x 1/4") to the degree called for in the Specifications and as noted above. Once a sample panel has been approved, it shall establish the quality of all subsequent Work by reference. The sample shall then be stored in a dry, sealed plastic container on the job site. Sample panels shall be prepared and approved for each type of sandblasting specified and shall be maintained and utilized by the County throughout the duration of sandblasting operations as reference standards of quality. Coatings shall be applied only at temperatures and conditions recommended by the paint manufacturer.

F. Inspection Devices:

1. The Contractor shall utilize, until final acceptance of the Work, inspection devices in good working condition for the detection of holidays, environmental conditions, and measurements of wet and dry-film thicknesses of protective coatings. Inspection devices shall be operated in strict accordance with the manufacturer's printed instructions and applicable SSPC and NACE standards and guidelines.
2. Thickness and Holiday Checking: Thickness of coatings shall be checked with a nondestructive, magnetic type thickness gauge. Coating integrity of coated surfaces shall be tested with an approved holiday detection unit per the paint manufacturer's recommendation. All pinholes shall be marked, repaired in accordance with the paint manufacturer's printed recommendations and re-tested. No pinholes or other irregularities will be permitted in the final coating. In cases of dispute concerning film thickness or holidays, the Contractor shall abide by the County's determination unless independent tests are performed by a certified lab at the Contractor's expense. Field measurements of film thickness shall not exceed the requirements of SSPC-PA 2 Measurement of Dry Coating Thickness with Magnetic Gages. Discrepancies shall be measured and verified with a micrometer or Tooke gauge if no other option is available.

1.06 PRODUCT DELIVERY STORAGE AND HANDLING

- A. Delivery: All materials shall be delivered to the job in undamaged, original packages with seals unbroken and in legible, labeled containers. Packages shall not be opened until the County inspects them and they are required for use. Labels shall show name of manufacturer, type of coating, formulation, date, color and manufacturers' recommendations and instructions for use.
- B. Storage: All painting materials shall be stored in a clean, dry, well-ventilated place, protected from sparks, flame, and direct rays of the sun or from excessive heat. Paint susceptible to damage from low temperatures shall be kept in a heated storage space when necessary. The Contractor shall be solely responsible for the protection of the materials he stores at the job site. Empty coating cans shall be neatly stacked in areas the Owner designates, and shall be removed from the job site on a schedule the Owner determines.
- C. Mixing: Mechanical mixers, capable of thoroughly mixing the pigment and vehicle together, shall mix the paint prior to use where required by manufacturer's instructions, however, thorough hand mixing will be allowed for small amounts up to one gallon. Pressure pots shall be equipped with mechanical mixers to keep the pigment in suspension, when required by manufacturer's instructions. Otherwise, intermittent hand mixing shall be done to assure that no separation occurs. Materials shall be in full compliance with the requirements of pertinent codes and fire regulations.
- D. Thinning: Catalysts or thinners shall only be utilized as recommended by the manufacturer, and shall be added or discarded strictly in accordance with the manufacturer's instruction.

1.07 PROJECT SITE CONDITIONS

- A. Application: Paint shall be applied only on thoroughly dry surfaces and during periods of favorable weather, unless specifically allowed by the paint manufacturer. Except as provided below, painting shall not be permitted when the atmospheric temperature is below 50° F, or when freshly painted surfaces may be damaged by rain, fog, dust, or condensation, and/or when it can be anticipated that these conditions will prevail during the drying period.
- B. No coatings shall be applied unless the relative humidity is below 85%.
- C. No coatings shall be applied unless surface temperature is a minimum of 5° above dew point; temperature must be maintained during curing.

1.08 WARRANTY

- A. Warranty Inspection: Warranty inspection shall be conducted during the eleventh month of the three (3) year warranty period following completion of all painting Work. All defective Work shall be repaired in strict accordance with this Specification, and to the satisfaction of the paint manufacturer and the County.
- B. Fluoropolymer / Fluorourethane. The Contractor shall warrant through the Manufacturer that the coating system shall not: check, crack, blister or delaminate from the substrate; change color more than 12 MacAdam units as determined in accordance with ASTM D2244; exhibit loss of gloss in excess of 24 units as measured by a gloss meter in accordance with ASTM D523-8; or chalk in excess of a rating of 8 as measured in accordance with ASTM D4214, Method A. Warranty coverage shall be effective for a period of 15 years from Final Completion depending on color. The Contractor shall notify the Manufacturer prior to ordering materials and begin the warranty process. Sample panels shall be obtained from the Manufacturer, and at least 2 sample panels shall be provided to the County in addition to the Manufacturers minimum requirements regarding the warranty process. The Contractor shall not be permitted to install the coating system until the Manufacturer has provided assurance that the color, substrate, surface preparation or existing conditions are in conformance with the Manufacturer's requirements for warranty.

PART 2 - PRODUCTS

2.01 GENERAL

- A. The painting schedule has been prepared on the basis of Tnemec and Carboline products, and their recommendations for application.
- B. No paint containing lead shall be allowed.

2.02 COATING SYSTEMS

- A. The following summarizes the painting systems for various types of applications.

- B. The Contractor shall have the coating color matched or tinted by the coating supplier to exactly match Tnemec Color Codes as shown below. Manufacturers other than Tnemec shall submit a color matched swatch to the County for approval prior to ordering materials. Fuel tank colors shall be per the State of Florida. Orange County Water Department requires fuel lines to be painted per 10 State Standards.

Color Table

Fluid Conveyed by Pipe	Tnemec Color Codes
Potable Water (WM)	True Blue 11SF
Wastewater (FM)	Hunter Green 08SF
Reclaimed Water (RWM)	Purple Rain 14SF
Fuel tanks	Safety 06SF
Fuel Lines	10 State Standards

- C. Minimum film thickness shall be per manufacturer's recommendations unless a greater thickness is specified. The Contractor shall measure minimum film thickness in the field by utilizing a wet film gauge, which the County shall verify. Regardless of anchor profile, the Contractor shall utilize a wet film gauge to verify that the County-specified average minimum dry film thickness (MDFT) is being applied. The calculated value for wet film thickness (WFT) shall be derived from County's average MDFT unless the manufacturer's minimum range is greater. Following the manufacturer's recommended drying time, the Contractor shall measure and provide results to the County verifying that the average minimum dry film thickness meets the MDFT for each coat and final system, utilizing a dry film gauge. The County may conduct side-by-side verification.
- D. Coating systems shall incorporate the paints specified below, applied at the average dry film thickness (DFT) in mils per coat noted, and have the specified minimum average dry film thickness (MDFT) for each individual coat and total system.

HP – High Performance Coatings of FERROUS METALS

System HP-1
 EXTERIOR EXPOSURE, UV EXPOSURE (NON-IMMERSION)
 Complete removal of existing coating system

Coat	Tnemec	Carboline
Prime	Zinc Series 90-97 2.5 to 3.5 DFT Avg 3.0 MDFT	Carbozinc 621 3.0 to 8.0 DFT Avg 3.5 MDFT
Intermediate	Endura-Shield Series 73 2.0 to 3.0 DFT Avg 2.5 MDFT	Carbothane 133 HB 3.0 to 5.0 DFT Avg 3.5 MDFT
Finish	Hydroflon Series 700 2.0 to 3.0 DFT Avg 2.5 MDFT	Carboxane 950 2.0 to 3.0 DFT Avg 2.5 MDFT
Total	8 MDFT	9.5 MDFT

System HP-2
EXTERIOR EXPOSURE, UV EXPOSURE (NON-IMMERSION)
 Over-coating of localized inaccessible existing coatings and galvanized metal

Coat	Tnemec	Carboline
Prime	Chembuild 135 4.0 to 9.0 DFT Avg 5.0 MDFT	Carboguard 553 3.0 to 4.0 DFT Avg 3.5 MDFT
Intermediate	Endura-Shield Series 73 2.0 to 3.0 DFT Avg 2.5 MDFT	Carbothane 133 HB 3.0 to 5.0 DFT Avg 3.5 MDFT
Finish	Hydroflon Series 700 2.0 to 3.0 DFT Avg 2.5 MDFT	Carboxane 950 2.0 to 3.0 DFT Avg 2.5 MDFT
Total	9.5 MDFT	9.5 MDFT

System HP-3
EXTERIOR EXPOSURE, UV EXPOSURE (NON-IMMERSION)
 Over-coating of existing solvent based coating system exposed to UV

Coat	Tnemec	Carboline
Existing	Existing coating system	Existing coating system
Spot Prime	Chembuild 135 4.0 to 9.0 DFT Avg 5.0 MDFT	Carboguard 553 3.0 to 4.0 DFT Avg 3.5 MDFT
Intermediate	Chembuild 135 4.0 to 9.0 DFT Avg 5.0 MDFT	Carboguard 553 3.0 to 4.0 DFT Avg 3.5 MDFT
Finish	Hydroflon Series 700 2.0 to 3.0 DFT Avg 2.5 MDFT	Carboxane 950 2.0 to 3.0 DFT Avg 2.5 MDFT
Total	7.5 MDFT	6.0 MDFT

System HP-4
INTERIOR/EXTERIOR EXPOSURE, NON-UV EXPOSURE (NON-IMMERSION)
 Over-coating of existing coating, or manufacturer epoxy-primed surface not exposed to UV

Coat	Tnemec	Carboline
Existing	Existing coating system	Existing coating system
Spot Prime	Chembuild 135 4.0 to 9.0 DFT Avg 5.0 MDFT	Carboguard 553 3.0 to 4.0 DFT Avg 3.5 MDFT
Intermediate	Chembuild 135 4.0 to 9.0 DFT Avg 5.0 MDFT	Carboguard 553 3.0 to 4.0 DFT Avg 3.5 MDFT
Finish	Hi-Build Epoxoline II Series N69 4.0 to 8.0 DFT Avg 4.5 MDFT	Carboguard 60 4.0 to 6.0 DFT Avg 4.5 MDFT
Total	9.5 MDFT	8.0 MDFT

System HP-5
 EXTERIOR EXPOSURE, (IMMERSION)
 Complete removal of existing coating system for immersion surfaces

Coat	Tnemec	Carboline
Prime	Zinc Series 90-97 2.5 to 3.5 DFT Avg 3.0 MDFT	Carbozinc 621 3.0 to 8.0 DFT Avg 3.5 MDFT
Intermediate	Hi-Build Epoxoline II Series N69 4.0 to 8.0 DFT Avg 4.5 MDFT	Carboguard 60 4.0 to 6.0 DFT Avg 4.5 MDFT
Finish	Hi-Build Epoxoline II Series N69 4.0 to 8.0 DFT Avg 4.5 MDFT	Carboguard 60 4.0 to 6.0 DFT Avg 4.5 MDFT
Total	12.0 MDFT	12.5 MDFT

System HP-6
 INTERIOR/EXTERIOR EXPOSURE, UV EXPOSURE (NON-IMMERSION)
 Over-coating of existing water based or unknown coating surface exposed to UV

Coat	Tnemec	Carboline
Existing	Existing coating system	Existing coating system
Spot Prime	Typoxy Series 27WB 4.0 to 14.0 DFT Avg 4.5 MDFT	NA
Intermediate	Typoxy Series 27WB 4.0 to 14.0 DFT Avg 4.5 MDFT	NA
Finish	Hydroflon Series 700 2.0 to 3.0 DFT Avg 2.5 MDFT	NA
Total	7.0 MDFT	NA

System HP-7
 EXTERIOR EXPOSURE, UV EXPOSURE (NON-IMMERSION)
 Over-coating of localized inaccessible existing coatings

Coat	Tnemec	Carboline
Prime	Chembuild 135 4.0 to 9.0 DFT Avg 5.0 MDFT	Carboguard 553 3.0 to 4.0 DFT Avg 3.5 MDFT
Intermediate	Chembuild 135 4.0 to 9.0 DFT Avg 5.0 MDFT	Carboguard 553 3.0 to 4.0 DFT Avg 3.5 MDFT
Finish	Hydroflon Series 700 2.0 to 3.0 DFT Avg 2.5 MDFT	Carboxane 950 2.0 to 3.0 DFT Avg 2.5 MDFT
Total	9.5 MDFT	8.0 MDFT

System HP-8
 INTERIOR/EXTERIOR EXPOSURE, NON-UV EXPOSURE (NON-IMMERSION)
 Over-coating of localized inaccessible existing coating

Coat	Tnemec	Carboline
Existing	Existing coating system	Existing coating system
Spot Prime	Typoxy Series 27WB 4.0 to 14.0 DFT Avg 4.5 MDFT	NA
Intermediate	Enduratone Series 1029 2.0 to 3.0 DFT Avg 2.5 MDFT	NA
Finish	Enduratone Series 1029 2.0 to 3.0 DFT Avg 2.5 MDFT	NA
Total	5.0 MDFT	NA

DFT = Dry Film Thickness
 MDFT = Minimum Dry Film Thickness

2.03 EQUIPMENT

- A. The Contractor's surface preparation, coating and painting equipment shall be designed and suitable for the application of the specific materials herein specified. The Contractor shall submit a list of all applicable equipment owned by the Contractor. The Contractor's equipment shall be subject to the approval of the County based on the manufacturer's data.
- B. Effective oil and water separators shall be used in all compressed air lines serving spray painting and sandblasting operations to remove oil or moisture from the air before it is used. Separators shall be placed as far as practical from the compressor.
- C. The Contractor shall furnish all equipment for application of the paint and the completion of the Work in first-class condition and shall comply with recommendations of the paint manufacturer.

PART 3 - EXECUTION

3.01 GENERAL

- A. All coating and painting shall conform to the applicable requirements of the Society for Protective Coatings (SSPC) Manual (most recent edition). Any material applied upon improperly prepared surfaces shall be removed and redone to the satisfaction of the Owner at the sole expense of the Contractor.
- B. All Work shall be done by skilled craftsmen who are qualified to perform the required work and shall be done in a manner comparable to the best standards of practice found in that trade.

- C. The Contractor shall provide a supervisor to be at the work site during surface preparation, cleaning and coating operations. The supervisor shall have the authority to coordinate the work and make other decisions pertaining to the fulfillment of their contract.
- D. Prior to assembly, all surfaces that will be made inaccessible after assembly, shall be prepared as specified herein, and shall receive the paint or coating system as specified herein.
- E. Coating shall not be applied to wet or damp surfaces and shall not be applied in inclement weather. Do not apply when the surface temperature is less than 5° F above the dew point, or if relative humidity is greater than 85%. Dew or moisture condensation should be anticipated and if such conditions are prevalent, coating should be delayed until the surfaces are dry. Further, the day's coating should be completed well in advance of when condensation will occur, in order to permit the film a sufficient drying time prior to the formation of moisture.
- F. Any surfaces not specifically named in the Scope of Work, and not specifically exempted, shall be prepared, primed and painted in the manner and with materials consistent with these Specifications. The Owner shall select which of the manufacturer's products, whether the type is indicated herein or not, shall be used for such unnamed surfaces. No extra payment shall be made for this painting.
- G. Contractor shall inspect each pipe joint, pipe strap, personal barriers and appurtenances after providing access to the location but prior to commencing surface preparation activities. The Contractor shall immediately report leaks, damage, stripped bolts or nuts to the County.

3.02 SURFACE PREPARATION

- A. Solvent Cleaning: All dust, dirt, oil, or any contaminants that would affect the adhesion or durability of the finish coating must be removed before hand tool cleaning, abrasive blasting and prior to each coating layer application by cleaning per SSPC-SP1 "Solvent Cleaning."
- B. Defects: All ferrous metal surfaces shall be free of all defects. The Contractor shall remove by chipping or grinding all sharp edges; other defects shall be ground smooth in accordance with NACE Standard RPO178, Appendix C. Weld flux, weld spatter, slag and excessive rust scale shall be removed by SSPC-SP 11 Power Tool Cleaning to Bare Metal. All weld seams, sharp protrusions, and edges shall be ground smooth prior to surface preparation or application of any coatings.
- C. Gaskets: Existing gaskets in between flanged joints shall be cut or ground flush with the existing flanged joint prior to surface preparation or field blasting operations. The Contractor shall not field blast into bell and spigot joints or under tapping saddles. Contractor shall blast perpendicular to the pipe surface. SSPC-SP3 Power Tool Cleaning shall be used inside bells and against tapping saddles to avoid damage to gaskets and locking mechanisms.
- D. Field blasting cleaning for all surfaces shall be accomplished by dry sandblasting method unless otherwise directed, or the County provides written approval
 - 1. The abrasive used in blast cleaning shall produce an anchor profile in accordance with the recommendations of the manufacturer of the protective coating, which is to be applied to the surface being cleaned.

2. At all times during the blast cleaning operations, adequate means shall be employed to absolutely insure that existing protective coatings shall not be exposed to abrasion from blast cleaning operations.
3. All blast cleaned surfaces shall be carefully dried and cleaned prior to application of specified coatings. No coatings or paint shall be applied over damp or moist surfaces.
4. Field blasting and priming shall be completed on any particular area during the same workday, and the application of the primer shall follow immediately after surface preparation and cleaning prior to formation of any form of corrosion. If the surface is not primed within 8 hours, complete surface preparation shall be repeated.
5. The Contractor shall at all times keep the area of his work in reasonably clean condition shall not permit blasting materials to accumulate in an uncontrolled manner such as to constitute a nuisance or hazard to the satisfactory prosecution or the Work, operation of the existing facilities, public safety, environmental nuisances or public access.
6. "Touch-up systems will be same as original specification except that approved manufacturer's organic zinc-rich shall be used in lieu of inorganic zinc where this system was originally used. Also, strict adherence to manufacturer's complete touch-up recommendations shall be followed. Any questions relative to compatibility of products shall be brought to the attention of the COUNTY and Coating Manufacturer; otherwise, Contractor assumes full responsibility.
7. Areas that are inaccessible to abrasive blasting, including adjacent to concrete pedestals, tapping saddles, pressure gauges or other appurtenances shall be cleaned in accordance with SSPC-SP 11 "Power Tool Cleaning to Bare Metal" immediately adjacent to the area as approved by the County.

E. Specified Surface Preparation: All surfaces shall be cleaned per SSPC-SP1 "Solvent Cleaning". In addition to the surface preparation for the specific Service Condition, surface preparation shall be as follows:

Substrate	Condition	Surface Preparation
All Surfaces	All – Prior to Surface Preparation	SSPC-SP1 Solvent Cleaning
Steel	Exterior / Non-Immersion	SSPC-SP10 Near White Blast (NACE 2)
Steel	Exterior / Immersion	SSPC-SP5 White Metal Blasting (NACE-1)
Ductile Iron Pipe	Exterior / Non-Immersion	SSPC-SP6 Commercial Blast (NACE-3)
Ductile Iron Pipe	Exterior / Immersion	SSPC-SP10 Near White Blast (NACE 2)
Ferrous Metal	Exterior / Non-Immersion / Inaccessible to abrasive blasting	SSPC-SP 11 Power Tool Cleaning to Bare Metal
Galvanized Metals	Exterior / Non-Immersion	SSPC-SP 7 Brush-Off Blast (NACE 4)
PVC	Exterior / Non-Immersion	SSPC-SP1 Solvent Cleaning & Scarify by brush blast, power tools or hand sanding
Existing Coating System to be Over-Coated	Exterior / Non-Immersion	Scarify by brush blast, power tools or Hand Sanding with fine abrasive

1. Exposed Pipe: Bituminous coated pipe shall not be used in above ground or exposed locations and shall be factory primed for all new pipe installations. After installation all exterior, exposed flanged joints shall have the gap between adjoining flanges sealed with a flexible caulking shall meeting ASTM C-920 and shall be Sika Flex 1A or equal to prevent rust stains.
2. The Contractor shall 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.
3. Contractor shall coordinate with the County prior to surface preparation. County approval shall be required prior to application of the prime coat.

3.03 APPLICATION EQUIPMENT

A. Brush and / or Rollers

1. Top quality, properly styled brushes and rollers shall be used. Rollers with a baked phenolic resin core shall be utilized.
2. The brushing or rolling shall be done so that a smooth coat, as nearly uniform in thickness as possible, is obtained. Brush or roller strokes shall be made to smooth the film without leaving deep or detrimental marks.
3. Surfaces not accessible to brushes or rollers may be painted by spray, by dauber or sheepskins, and paint mitt.
4. It may require 2 coats to achieve the specified dry film thickness if application is by brush and roller.

B. Air, Airless or Hot Spray

1. The equipment used shall be suitable for the intended purpose, shall be capable of properly atomizing the paint to be applied, and shall be equipped with suitable pressure regulators and gauges.
2. Paint shall be applied in a uniform layer, with a 50% overlap pattern. All runs and sags should be brushed out immediately or the paint shall be removed and the surface resprayed.
3. High build coatings should be applied by a crosshatch method of spray application to ensure proper film thickness of the coating.
4. Areas inaccessible to spray shall be brushed; if also inaccessible to brush, daubs or sheepskins shall be used, as the manufacturer authorizes.
5. Special care shall be taken with thinners and paint temperatures so that paint of the correct formula reaches the receiving surface.
6. Nozzles, tips, etc., shall be of sizes and designs as recommended by the manufacturer of the paint being sprayed.
7. Edges, corners, crevices, welds, and bolts shall be given a brush coat (stripe coat) of each coating. The stripe coat shall be applied by a brush and worked in both directions prior to spray application. Special attention shall be given to filling all crevices with coating.

3.04 WORKMANSHIP

A. General

1. Under no circumstances shall Asphaltic seal coats and mastics be overcoated.

2. Paints shall be mixed in proper containers of adequate capacity. All paints shall be thoroughly stirred before use and shall be kept stirred while using. No unauthorized thinners or other materials shall be added to any paint.
3. Only skilled painters shall be used on the Work, and specialists shall be employed where required.
4. Extreme care shall be exercised in the painting of all operable equipment, such as valves, electric motors, etc., so that the proper functioning of the equipment will not be affected.
5. The Contractor's scaffolding shall be erected, maintained, and dismantled without damage to structures, machinery, equipment or pipe. Drop cloths shall be used where required to protect the environment, the public, buildings, equipment, and areas surrounding the Work. All surfaces required to be clear for visual observations shall be cleaned immediately after paint application.
6. The prime coat shall be applied immediately following surface preparation within 8 hours of the same working day. All paint shall be applied by brushing, paint mitt and roller, conventional spraying, or airless spraying, using equipment approved by the paint manufacturer.
7. Each coat of paint shall be recoated as per manufacturer's instructions. Paint shall be considered recoatable when an additional coat can be applied without any detrimental film irregularities such as lifting or loss of adhesion.
8. Surfaces that will be inaccessible after assembly shall receive either the full specified paint system or three shop coats of the specified primer before assembly.
9. Finish colors shall be as specified per the color table in section 2.02 of this specification, and shall be factory mixed (i.e., the Contractor shall not tint the paint, unless the COUNTY and the Coating Manufacturer so authorizes.)
10. All shop-coated surfaces shall be protected from damage and corrosion before and after installation by treating damaged area immediately upon detection. Abraded or corroded spots on shop-coated surfaces shall be cleaned per SSPC-SP1 Solvent Cleaning" and then touched up with the same materials as the shop coat in accordance with the manufacturers instruction. At the discretion of the Owner, all shop coated surfaces that are faded, discolored, or that require more than minor touch up shall be field blast cleaned and repainted.

B. Field Coating: All painting at the site shall be designated "Field Coating".

1. All paint shall be at ambient temperature before applying, and no painting shall be done when the temperature is below 50 degrees F, in dust-laden air, when rain is falling, mist is present, when relative humidity exceeds manufacturer's recommendation when temperature is less than 5° F above the dew point, or until all traces of moisture have completely disappeared from the surface to be painted.
2. Protective coverings or drop cloths shall be used to protect existing appurtenances, concrete walkways, concrete structures, existing surfaces, the public, the environment and equipment. Care shall be exercised to prevent paint or coating overspray and spatter onto surfaces that are not to be painted. Surfaces from which such materials cannot be removed satisfactorily shall be painted or repainted, as required to produce, a finish satisfactory to the County.
3. All edges, corners, crevices, welds, hardware and irregular surfaces shall receive a brush coat (stripe coat) of the specified product for each coat prior to application of each complete coat.

4. Coating shall be applied in a neat manner that will produce an even film of uniform and proper thickness, with finished surfaces free from brush marks or other irregularities. 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. Coating shall be cleaned in accordance with SSPC-SP1 prior to the application of next coating. In no case shall coating be applied at a rate of coverage greater than the maximum rate recommended by the coating manufacturer.
5. Coating failures shall 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. Any repairs made on surfaces shall be repaired in accordance with the coating manufacturer's instructions.
6. Each coat shall be uniform in coverage and color. Successive coats of paint shall be tinted so as to make each coat easily distinguishable from each other with the final undercoat tinted to the approximate shade of the finished coat.
7. Painting shall be continuous and shall be accomplished in an orderly manner so as to facilitate inspection. Surfaces of exposed members that will be inaccessible after erection shall be cleaned and painted before erection.
8. All materials shall be applied in accordance with the manufacturer's instructions. If spray painting is required, Contractor shall accept all responsibility for any damage caused by overspray and/or drifting paint mist.
9. Caulking: The Contractor shall caulk all voids or interfaces including but not limited to: flanges, threads, nuts, saddles, gaps, voids or spaces between appurtenances and pipe to be coated immediately after the prime coat to prevent rust formation where ferrous metal is not accessible to surface preparation or blasting. Flexible caulking shall meet or exceed ASTM C-920 and shall be Sika Flex 1A or equal.

3.05 FIELD QUALITY CONTROL

At a minimum, the Contractor shall provide field quality control and verification of the coating film thickness utilizing the below methods.

- A. Wet Film Gauge. Both the Contractor and the County shall use a wet film gauge to verify the applied coating desired wet film thickness (WFT) to produce the required minimum DFT.

$$\text{Target WFT} = \text{County specified average MDFT} / \text{Volume Solids} \times 100\%$$

If thinner is applied per the manufacturer's recommendations, the volume of solids shall be reduced accordingly. Regardless of anchor profile, surface pattern or base metal calculation of the substrate, the gauge reported WFT shall meet the target WFT value for the substrate or previously coated surface to ensure the required average MDFT will be achieved.

- B. DFT Magnetic Gauge. Dry Film Magnetic Pull-Off Gauge (Type I) shall be utilized to determine DFT in accordance with SSPC-PA 2 "Measurement of Dry Coating Thickness with Magnetic Gages." The average of the readings shall meet the County-specified MDFT for each coating application. Electromagnetic Gauge (Type II) shall not be considered acceptable for use on this project.
- C. 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. Areas found to have holidays shall be marked and repaired in accordance with the paint manufacturer's instructions.
- D. Destructive Testing: Destructive testing using a Tooke gauge shall only be utilized in cases of dispute regarding DFT. The County shall be permitted up to three (3) cuts using the Tooke Gauge and the Contractor shall be responsible for repairing the areas examined at no additional cost.
- E. Environmental Testing: humidity, dew point and temperature shall be constantly measured and logged. Any electronic gauges shall be first calibrated against a sling psychrometer each day.

3.06 INSPECTION OF SURFACES

- A. Before application of the prime coat and each succeeding coat, all surfaces to be coated shall be subject to inspection and approval by the County. The Contractor shall correct any defects or deficiencies before application of any subsequent coating. Coatings applied without County approval shall be removed and reapplied at no cost to the County.
- B. The Contractor shall provide the County access to all areas of the Work. All scaffolding or lifts shall be in compliance with OSHA requirements.
- C. The Contractor shall furnish samples of surface preparation and of painting systems to be used as a standard throughout the job, unless omitted by the County. Contractor to provide instruments to verify atmospheric conditions, surface temperature acceptable to paint. Test in presence of inspector/RPR.
- D. When any appreciable time has elapsed or has exceeded the manufactures recommendations between coatings, the County shall carefully inspect previously coated areas and surfaces that are damaged or contaminated, in the opinion of the County shall be cleaned and recoated at the Contractor's expense. Re-coating times of manufacturer's printed instructions shall be adhered to.
- E. Coating thickness shall be determined by the use of a properly calibrated "DeFelsko Positest FM" Type 1 Coating Thickness Gauge (or equal) for ferrous metal or a "Tooke" Paint Inspection gauge (or equal) for non-ferrous and cementitious surfaces. Please note that use of the "Tooke" gauge is classified as a destructive test.

3.07 PROTECTION, CONTAINMENT AND CLEAN-UP

- A. The premises shall at all times be kept free from accumulation of waste material and rubbish caused by employees or work. At the completion of the painting remove all tools, scaffolding, surplus materials, and all rubbish from and about the site and leave the area "broom clean" unless more exactly specified.
- B. It shall be the responsibility of the Contractor to protect at all times, in areas where painting is being done, floors, sidewalks, walls, bridges, environment, public property, equipment, vehicles, appurtenances, and finished surfaces adjacent to paint work. Cover all electric plates, surface hardware, nameplates, gauge glasses, etc., before start of painting work.
- C. The Contractor shall contain all spent abrasives, old paint chips, paint overspray and debris by means suitable to the County, including but not limited to, full shrouding of the area. The Contractor shall provide a complete design and plan of the intended shroud or cover. Care must be taken not to modify or damage the structure during the use of the shroud. If damage should occur, the Contractor is held responsible for all repairs. The Contractor's containment must be adequate enough to stop blasting residue from being released into the environment. There should be no visible emissions of particulate matter or visible deposits on the ground outside the containment area. Water jetting or wet abrasive blast cleaning for the purpose of removing paint and surface debris shall be conducted within a containment designed, installed, and maintained in order to capture paint chips and debris. Collection of the water is not required. Mesh containment materials that capture paint chips and debris while allowing the water to pass through shall have openings a maximum of 25 mils (625 microns) in greatest dimension. Low Pressure Water Cleaning for the purpose of removing chalk, dirt, grease, oil and other surface debris can be performed without additional containment provided paint chips are removed and collected prior to Low Pressure Water Cleaning (LP WC).
- D. At completion of the work, remove all paint where spilled, splashed, splattered, sprayed or smeared on all surfaces, hardware, equipment, painted, and unpainted surfaces.
- E. After completion of all painting, the Contractor shall remove from job site all painting equipment, surplus materials, and debris resulting from this work.
- F. The Contractor is responsible for the removal and proper disposal of all hazardous materials from the jobsite in accordance with Local, State, and Federal requirements as outlined by the Environmental Protection Agency.

END OF SECTION

SECTION 15191

FUEL OIL PIPING SYSTEM

PART 1 - GENERAL

1.01 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 1 Specification Sections, apply to this Section.

1.02 SUMMARY

- A. This Section includes fuel oil piping within and exterior to the building. Products include the following:
 - 1. Steel pipe and fittings
 - 2. Double Wall FRP Piping
 - 3. Pipe specialties and valves

1.03 REGULATORY AGENCIES

- A. General - All work shall conform to the applicable requirements of all federal, state and local laws, ordinances, rules and regulations pertaining to the performance of the work specified herein. Where the requirements of such agencies are more stringent than specified herein, abide by such requirements and consider this specification as supplementary to those requirements.
- B. United States Environmental Protection Agency (USEPA) – All work shall conform to the applicable requirements of the USEPA.
- C. State of Florida Department of Environmental Protection (FDEP) - All work shall conform to the applicable requirements of the FDEP Rules 62-761 and 62-762 of the Florida Administrative Code (FAC).
- D. Florida Department of Environmental Protection (FDEP) – All work within Orange County, FL shall be coordinated with FDEP (George Martin, 407-897-4330).
- E. National Fire Protection Association® (NFPA) - All work shall conform to the applicable requirements of the following: NFPA 30 (A) latest edition – Flammable

and Combustible Liquids Code; and NFPA 37 and 321 – Basic Classification of Flammable and Combustible Liquids.

- F. Florida Fire Prevention Code and Florida Building Code© - All work shall conform to the applicable requirements of the Florida Fire Prevention Code and the Florida Building Code.
- G. National Electric Code® (NEC) – All electrical work shall conform to the applicable requirements of the National Electric Code.
- H. Underwriters Laboratories® (UL) - The tank shall meet the current requirements of UL Standard 142 and 2085. All components of the fuel distribution system shall be UL listed.
- I. Permits, Licenses, Certificates - The Contractor shall obtain all permits, licenses, and certificates, or any such approvals of plans or specifications as may be required by federal, state and local laws, ordinances, rules, and regulations, for the proper execution and completion of the work specified herein. Permits shall include a "Digging Permit" by all utilities as applicable.
- J. Occupational Health and Safety Administration (OSHA) - The Contractor's employees and subcontractor employees shall wear appropriate safety gear, uniforms and footwear that comply with all legal requirements including, but not limited to, OSHA requirements.
- K. Best Industry Practices - The tank and fuel systems shall be designed and fabricated according to best industry practices and methods available to date.

1.04 QUALIFICATIONS

- A. Certified Pollutant Storage System Contractor (Contractor) - The Contractor shall be as defined and registered with the FDEP. A copy of the license shall be submitted with the bid.
- B. Pollution Liability Insurance – The Contractor shall provide the County with acceptable evidence of current Pollution Liability insurance coverage (one million dollars, minimum).
- C. Ability to Perform - The Contractor shall provide the following documentation that illustrates the company's ability to perform the work that will be required. The information shall include the following:
 - 1. Number of years in business
 - 2. Number of full-time employees and years of experience

- D. Experience - The Contractor shall have had experience with a minimum of two similar fuel systems in the past three years. A list of projects similar in size and scope with references (named contacts with title, organization and telephone numbers) shall be submitted with the bid.
- E. Tank Manufacturer Certification - Contractor shall be certified in writing by the tank manufacturer as being qualified to install the equipment. A copy of the certificate shall be submitted with the bid.

1.05 PERFORMANCE REQUIREMENTS

- A. Minimum Working-Pressure Rating: Unless otherwise indicated, minimum pressure requirement for fuel oil piping is 150 psig (1035 kPa).

1.06 SUBMITTALS

- A. Product Data: For the following:
 - Specialty valves
 - Fuel piping
- B. Shop Drawings
 - 1. All documents shall be provided in both hardcopy, bounded, indexed, tabbed, and no larger than 8 ½" x 11" and bookmarked electronic media - Adobe® Acrobat® portable document format. Two sets of hardcopy and two sets of electronic media shall be provided.
 - 2. All drawings shall be provided in both hardcopy, bounded, indexed, and no larger than 11" x 17" and bookmarked electronic media - Autodesk® AutoCAD® file format AND Adobe® Acrobat® portable document format. Two sets of hardcopy and two sets of electronic media shall be provided.
 - 3. Complete shop drawings shall be submitted including certification of shop tests for the County for review.
 - 4. The shop drawings shall include sufficient information to demonstrate compliance with the specified tank design standards, including copies of applicable sections of the specified design standards, manufacturer's catalog data and descriptive literature for the tank, fully dimensioned shop layout drawing (1/4" = 1' scale) showing all piping, manholes, valves, equipment connections, tank outline dimensions, platform and stair dimensions, nozzle locations and foundation requirements, and recommended tank installation and test procedures.

5. The shop drawing for pipe, fittings and each item listed in the specification shall include manufacturer's catalog data and descriptive literature, fully dimensioned shop layout drawing (1/4" = 1' scale) showing all piping, man-holes, valves, equipment connections, nozzle locations and installation clearance requirements.
6. Submit all manufacturers' recommended installation and test procedures for all equipment including tanks, piping, day tanks, instrumentation, controls, etc.
7. Submit manufacturer's test reports (vessel fabrication, coating integrity and tank leakage, etc.) for each tank and specific service application.
8. Submit manufacturer's warranty for each tank and specific service application.
9. Contractor shall provide complete operations and maintenance manuals, in both hardcopy, bounded, indexed, tabbed, and no larger than 8 1/2" x 11" and bookmarked electronic media - Adobe® Acrobat® portable document format for documents and all drawings shall be provided in both hardcopy, bounded, indexed, and no larger than 11" x 17" and bookmarked electronic media - Autodesk® AutoCAD® file format AND Adobe® Acrobat® portable document format. The manual shall include, at a minimum:
 - A. Information on any hazards associated with the system and safety precautions
 - B. Detailed Description of Equipment Operation
 - C. Equipment List
 - D. Equipment Specifications (and Calibration Charts)
 - E. Equipment Installation Instructions
 - F. Equipment Start-Up Instructions
 - G. Maintenance Procedures
 - H. Troubleshooting Instructions
 - I. Exploded View Part Drawing and Parts List for each component
 - J. Piping As-Built Diagram(s)
 - K. Mechanical As-Built Drawing(s)
 - L. Electrical As-Built Drawing(s)
 - M. Dimensional As-Built Drawing(s)
 - N. Guarantees/Warranty information for all items furnished
 - O. Individual operation and maintenance information on major system components
10. Welding certificates.
11. Field quality-control test reports.

12. Operation and Maintenance Data: For fuel oil transfer pumps to include in emergency, operation, and maintenance manuals.

1.07 QUALITY ASSURANCE

- A. Welding: Qualify processes and operators according to the ASME Boiler and Pressure Vessel Code: Section IX.
- B. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, Article 100, by a testing agency acceptable to authorities having jurisdiction, and marked for intended use.
- C. Comply with ASME B31.9, "Building Services Piping," for fuel oil piping materials, installation, testing, and inspecting.
- D. Comply with NFPA 30, "Flammable and Combustible Liquids Code," and NFPA 31, "Installation of Oil Burning Equipment," for fuel oil piping materials, components, installations, testing, and inspecting.

1.08 COORDINATION

- A. Coordinate size and location of concrete bases. Cast anchor-bolt inserts into bases. Concrete, reinforcement, and formwork requirements are specified in Division 3.

PART 2 - PRODUCTS

2.01 MANUFACTURERS

- A. In other Part 2 articles where titles below introduce lists, the following requirements apply to product selection:
 - 1. Available Manufacturers: Subject to compliance with requirements, manufacturers offering products that may be incorporated into the Work include, but are not limited to, manufacturers specified.
- B. Subject to compliance with requirements, provide products by one of the manufacturers specified. If applicable, all materials used on this project shall be listed on the latest FDEP Approved Storage Tank System Equipment, 62-761.850 and 62-762.851 FAC. Each item provided shall be provided with its "FDEP File No." clearly indicated.

2.02 FUEL PIPING MATERIALS

- A. Exterior piping to inside building valves shall be UL listed and as noted below:
1. Primary piping shall be Schedule 40 Type 316 Stainless Steel in conformance with ASTM Standards with 125 pound butt-welded stainless steel fittings conforming to ASTM Standards.
 2. Secondary containment piping shall be sealed at all joints with fuel and water tight joints and sealed end plates to prevent moisture intrusion or fuel leakage.
 3. Support spacing shall be determined by the manufacturer based on pipe diameter, pipe materials, and operating temperature of the product pipes. In all cases pipes within the secondary containment shall be supported at not more than 10-foot intervals. These supports shall be .250" thick steel plate with a .134" thick band tack welded to plate to eliminate point loading the fuel carrier pipe and designed to allow for continuous airflow and drainage of the secondary containment in place. Plastic type supports will be allowed only if they are fuel resistant.
 4. All fuel leak detection shall be integrated with main detection system indicated in section 2.7.
- B. Interior aboveground fuel, vent piping and fittings shall be Schedule 40 black iron in conformance with ASTM-795 and ANSI B31.3-1980 with 125-pound threaded malleable iron fittings conforming to ANSI B16.3 and ANSI B31.3-1980.
- C. Transition Fittings: Type, material, and end connections to match piping being joined.
- D. Pipe Connectors: UL 567, swivel or compression type for connection to equipment.
- E. Y-Pattern Strainers: Minimum 125-psig (860-kPa) working pressure; cast-iron body (ASTM A 126, Class B), threaded connections, perforated stainless-steel basket, and bottom drain connection.
- F. Basket Strainers: Minimum 125-psig (860-kPa) working pressure; high-tensile cast-iron body (ASTM A 126, Class B), threaded- or flanged-end connections, bolted cover, perforated stainless-steel basket, and bottom drain connection.
- G. Flexible Connectors: UL listed for fuel oil systems; stainless-steel bellows with woven, flexible, bronze, wire-reinforcing protective jacket; 150-psig (1035-kPa) minimum working pressure and 250 deg F (121 deg C) maximum operating temperature.
- H. Pressure and vacuum gages are specified in Division 15 Section "Meters and Gages."

2.03 ABOVEGROUND STORAGE TANK (AST)

- A. The vaulted insulated secondary containment aboveground storage tank system for flammable and combustible liquids, vehicle impact protected and projectile resistant shall be tested to and listed for the following:
1. UL-142 and UL-2085, protected aboveground steel tanks for flammable and combustible liquids with a two-hour fire rating
 2. UL-2085, two-hour furnace fire test and two hour simulated pool fire test for insulated and protected tanks
 3. UL-2085 and Uniform Fire Code (UFC) Test Standard (Article 79 or APPENDIX #A-II-F-1), for both Vehicle Impact Protection and Projectile Resistance
 4. UL-2085, Non-Metallic Secondary Containment protected tanks for flammable and combustible liquids with secondary containment Emergency Venting by "Form of Construction"
 5. The primary steel tank shall be rectangular in shape and have continuous welds on all exterior seams, manufactured in accordance with UL listing requirements and UL Standard 142
 6. The primary steel tank shall be pressure tested in accordance with the manufacturer's specifications.
- B. The primary steel tanks shall have an "emergency vent" system as per NFPA 30 Code requirements with no size reduction allowed for concrete encasement (insulation).
- C. The AST shall have a thru-tank leak detector tube to allow for physical inspection and monitoring capability between the primary and the secondary containment.
- D. The primary steel tank shall be pressurized in accordance with the manufacturer's specifications during concrete encasement, if any.
- E. The outer surface of the primary steel tank shall be covered by a minimum of 1/4" thick (6.4 mm) Styrofoam™ insulation panels.
- F. The secondary containment shall consist of a 30 Mil thick (0.76 mm) high-density polyethylene membrane enclosing the steel tank and insulation material.
- G. The primary steel tank and the secondary containment shall be encased in six inches of monolithic reinforced concrete, with minimum design strength of 4,000 and 5,000 psi at 28 days depending on the tank size. The concrete design shall include the following for long-term durability: air entrainment, water reducing admixture and steel reinforcement.

- H. For Concrete exterior tanks, the AST shall be of continuous and visually verifiable monolithic (seamless) pour on top, bottom, ends, and sides and contain no cold joints or heat sinks (heat transfer points).
- I. The AST shall be shop fabricated and tested in accordance with the UL listings. Design may include two layers of steel with lightweight concrete/monolithic thermal insulation material between the two steel layers.
- J. All AST openings shall be from the top only, threaded and powder-coated to inhibit corrosion. Contractor to confirm with County the specific number of openings required for each tank provided.
- K. All AST exposed metal with the exception of stainless steel shall be powder coated to inhibit corrosion.
- L. The AST shall include a 7-gallon powder coated or stainless steel, UL listed spill containment, and shall include normally closed UL valve to release spilled product into the primary steel tank. Spill containment which routes the spilled product into interstitial area will not be approved.
- M. The AST shall have an epoxy coated exterior (concrete or steel) that is fuel and weather resistant and reflects sunlight.
- N. The AST shall have side mounted aluminum stairs with rails and aluminum platform at top of tank for filling, checking levels and servicing purposes unless tank can be filled from the ground level. The stairs, rails and platform shall be manufactured by the same manufacturer providing the AST. Contractor to provide drawings and details of stairs, rails and platform.
- O. The AST shall have a warranty of 30 years. The AST design shall have been in use for a minimum of twenty (20) years.
- P. The AST shall have two (2) bolts for connecting grounding conductors for lightning protection in accordance with NFPA 78.
- Q. The AST shall have a hurricane hold down restraint system and be placed on a neoprene bearing pad on a reinforced concrete pad made to manufacturer's specifications, properly engineered for the weight and conditions
- R. The AST shall have appropriate warning signs (i.e. FLAMMABLE, NO SMOKING, DIESEL, etc.) as required by the local jurisdiction.
- S. The AST shall have the total gross capacity in gallons clearly visible.

- T. The AST shall have signage on top indicating proper filling procedure and a tank calibration chart.
- U. All ASTs provided under this project shall be of the same manufacturer and model.

2.04 AST ACCESSORIES

- A. The tank shall include all openings required for fueling, venting, level monitoring and leak monitoring.
- B. The following equipment shall be furnished along with the necessary piping and fittings required to provide a complete diesel fuel piping system:
 - 1. Vent piping shall be twelve feet above and shall be provided with a vent cap constructed of aluminum with removable stainless steel screen, OPW® Model 23 Series Open Atmospheric Vent or County Preapproved Equal
 - 2. An emergency vent shall be provided for the tank of the size required by code. The emergency vent shall be constructed of an epoxy coated cast iron lid, aluminum body and a removable stainless steel screen. The emergency vent shall be OPW® Model 201 Series or County Preapproved Equal
 - 3. Isolation and ball valves shall be sized appropriately with bronze bodies, Teflon seals, lockable handles and stainless steel trim. The valves shall be OPW® Model 21BV-0100LH Full Port Two-Way Ball Valve Series with Lockable Handles or County Preapproved Equal
 - 4. An anti-siphon valve, OPW® Model 199ASV or County Preapproved Equal, shall be installed on the supply line
 - 5. Overfill protection stop valve, OPW® Model 61fSTOP-2000 Series (FDEP File No. EQ-225) or County Preapproved Equal, shall be installed on the tank and be capable of stopping diesel fuel flow at 95% capacity
 - 6. A double poppet foot valve, OPW® Model 92 Series or County Preapproved Equal, shall be installed inside the aboveground tank at the fuel intake line four (4) inches above the bottom of the tank to hold prime
 - 7. The primary supply and return fuel lines shall be in a 24" x 24" x 14" containment box on top of the AST;
 - 8. An external AST emergency shutoff valve, OPW® Model 178S-6130 or County Preapproved Equal, shall be installed in the fuel supply line at the day tank
 - 9. Provide all piping, valves, unions, filters, strainers and other accessories as required for a complete system.

2.05 REMOTE FUEL FILL STATION

- A. Furnish as shown on the Drawings, a Remote Fuel Fill Station as detailed on the Drawings. The Remote Fuel Station shall be complete with all necessary valves, controls, sensors, piping and fittings required to provide a complete system. It

shall be integrated with the storage tank.

- B. The cabinet shall include integral spill containment, UL Listed, 7 1/2 gallon minimum capacity.
- C. Provide a 3-inch dry break popped cam lock filler adapter with viton seals, dust cap, and associated piping. Provide OPW Kamvalok Model 1612AN or equal.
- D. Provide a 3/4-inch hand operated fuel spill pump, 3/4-inch vertical stainless steel check valve, and associated piping.
- E. Provide a mounting bracket for a spill detection sensor.
- F. The fill station shall be reinforced to withstand 150 mph sustained winds and to support the fuel fill control panel provided under Specification Section 13310. Provide a letter from the manufacturer or the fabricator, signed and sealed by a Florida Registered Engineer, verifying the cabinet shall meet this requirement.
- G. The fill station shall be constructed of fuel and corrosion resistant materials.
- H. Unit shall be by Simplex, Model CAF-3, or County approved equal.

2.06 JOINT COMPOUND

- A. Joint compound for steel pipe threaded connections shall be a non-hardening, non-solvent joint sealer and compatible for diesel and bio-diesel applications.

2.07 FUEL LEVEL AND LEAK MONITORING EQUIPMENT

- A. Furnish a KRUEGER SENTRY GAUGE Therma Gauge H-2 Stainless Steel Rod Direct Reading Gauge or County approved equal for visible level monitoring
- B. Furnish a PNEUMERCATOR™ CO., INC. Tank Management System (FDEP Approved) or County Preapproved Equal.
- C. Furnish a tank monitoring system including tank alarm console, high level detection, low level detection, double containment tank leak sensing, and secondary containment piping leak detection and associated modules for a complete tank leak detection system. Include secondary containment pipe leaks in remote monitoring. Sensors shall be FDEP approved magnetorstrictive level sensors.
- D. The tank monitoring system shall include provisions for remote monitoring of alarm conditions.

- E. The tank monitoring system shall include an integral and remote mounted audible electronic horn and flashing red light to indicate a trouble or leak condition.
- F. The tank monitoring system includes all required terminals, switches, transmitters and local wiring shall be complete. Wiring required between sensors and panels shall be furnished. All wiring shall be installed in conduits per NEC and approved for location.
- G. The tank monitoring system console shall be labeled correctly & properly for HIGH LEVEL ALARM, LOW LEVEL ALARM, TANK LEAK ALARM, PIPE LEAK ALARM, RESET, and TEST
- H. The tank monitoring system shall meet all applicable regulatory requirements for tank leak detection, monitoring and reporting.
- I. One system shall be provided for each new AST, where applicable.
- J. The monitoring system shall be mounted on a stainless steel UNISTRUT® frame at location indicated on drawings. Secure to frame using stainless steel fasteners. Coordinate mounting location with field conditions.
- K. Tank level detection – Tank high/low level floats and secondary piping containment sensors shall be custom length PNEUMERCATOR™ CO., INC. Model LS-600 Series (FDEP File No. EQ-240) or County Preapproved Equal. The floats and sensors shall be furnished complete with the installation kits, riser caps, seals and other parts as required for a complete installation.
- L. Double Wall Interstitial Leak Sensor – The double wall interstitial leak sensor shall be capable of detecting the presence of any liquid in the annulus of the AST. The sensor shall be a PNEUMERCATOR™ CO., INC. Model LS-600-LDSS or County Preapproved Equal. The 316 Stainless Steel Float, Shaft with Teflon® wiring sensor shall be furnished complete with the installation kits, riser caps, seals and other parts as required for a complete installation.
- M. Spill Kit – A 30 gallon spill kit shall be provided for the new AST.

2.08 TANK VENT PIPING, ABOVE GROUND

- A. Steel Pipe: ASTM A53 or ASME B36.10, Schedule 40 black.
- B. Fittings: ASTM B16.3, black malleable iron, Class 150 (300 lb. WOG), threaded.
- C. Joints: NFPA 30 threaded ANSI B31.4
- D. Thread Sealant: Make up all threaded connections utilizing "Gasolite Soft Set" manufactured by Federal Process Company, Cleveland, Ohio.

- E. Provide Pryco UL Listed vent caps for fuel venting systems at terminations outside.

2.09 SPECIALTY VALVES

- A. General duty valves are specified in Division 15 Section "Valves."
- B. Gate and Check Valves, NPS 2 (DN 50) and Smaller: Class 125, bronze body, valves suitable for fuel oil service, with "WOG" indicated on body. Gate and check valves are specified in Division 15 Section "Valves."
 - 1. Gate valves shall have solid wedge.
 - 2. Swing check valves shall have bronze disc.
 - 3. Lift check valves shall be vertical pattern; two-piece construction with bronze disc.
- C. Ball Valves: UL 842; metal-body ball valve with threaded ends according to ASME B1.20.1 for pipe threads.
 - 1. Manufactures
 - A. Conbraco Industries, Inc.; Apollo Div
 - B. Jomar International Ltd
 - C. KITZ Corporation
 - D. McCANNA, Inc.; Flowserve Corporation
 - E. NIBCO INC
 - F. Watts Industries, Inc.; Water Products Div
- D. Drain Valves: Bronze ball valves, complying with MSS SP-110 and having outlet connection according to ASME B1.20.7 for garden-hose thread with cap.

Part 3 -EXECUTION

3.01 EXAMINATION

- A. Examine roughing-in for fuel oil piping system to verify actual locations of piping connections before equipment installation.
 - 1. Proceed with installation only after unsatisfactory conditions have been corrected.

3.02 MASO CONCRETE BASES

- A. Install fuel oil transfer pumps on concrete bases. Concrete bases are specified in Division 15 Section "Basic Mechanical Materials and Methods."

3.03 MASO PIPING INSTALLATION

- A. General piping installation requirements are specified in Division 15 Section "Basic Mechanical Materials and Methods."
- B. Identify fuel oil piping and equipment as specified in Division 15 Section "Mechanical Identification."
- C. Use eccentric reducer fittings to make reductions in pipe sizes. Install fittings with level side down.
- D. Install strainer on inlet side of control valves, pressure-reducing valves, fuel oil pumps, and oil burner connections.
- E. Install sediment traps at points where sediment or condensate may collect. Locate where readily accessible to permit cleaning and emptying. Do not install where condensate would be subject to freezing.
 - 1. Construct sediment traps using tee fitting with bottom outlet plugged or capped. Use minimum-length nipple of 3 pipe diameters, but not less than 3 inches (75 mm) long, and same size as connected pipe. Install with space between bottom of drip and floor for removal of plug or cap.
- F. Install pressure gage(s) at the following locations:
Inlet and outlet side of strainers.
- G. All pipes shall be cut accurately to measurements established at the site and shall be worked into place without forcing or bending. All pipes shall be installed into place without traps or pockets and pitched 1-inch in 20-foot minimum to drain. All fuel piping shall be installed in containment piping with appropriate transition sump boxes with leak detection sensor(s) for a complete system.
- H. Piping shall be installed to minimize the quantity of piping joints. Provide unions and/or flexible connections at all equipment connections and containment pipe sumps.
- I. Joints shall be fabricated in accordance with standard industry practices and manufacturer's instructions. All joints shall be liquid tight, screwed joints except where flanged connections to equipment or valves are required. Cut pipe square using pipe cutting tool and carefully ream pipe to remove all burrs. Cut a complete thread, using sharp dies properly set and centered, while applying oil graphite cutting lubricant.
- J. Contractor shall flush system piping with grade of fuel to be used by County to remove any debris and foreign matter in piping prior to testing for a minimum of six hours continuously. Contractor shall dispose of fuel in accordance with FDEP regulations after flushing.

3.04 FLEXIBLE FUEL PIPING

- A. Provide flexible piping connectors at all day tank connections, all generator connections, all storage tank connections, all equipment connections and all secondary containment sump boxes.
- B. Flexible connections shall be a minimum of 12-inches long or as required for equipment removal or maintenance. Protect flexible connectors where physical damage may occur due to adjacent equipment, other piping, wiring, or where subject to possible damage from operating personnel.

3.05 VALVE INSTALLATION

- A. General valves installation requirements are specified in Division 15 Section "Valves."
- B. Install valves in accessible locations, protected from damage.
- C. Install ball valves at branch connections to supply mains and at equipment.
- D. Install drain valves at piping low points.
- E. Identify valves as specified in Division 15 Section "Mechanical Identification."

3.06 HANGER AND SUPPORT INSTALLATION

- A. Pipe hangers and supports and equipment supports materials and installation requirements are specified in Division 15 Section "Hangers and Supports."
- B. Install hangers for horizontal stainless steel piping with the following maximum spacing and minimum rod sizes:
 - 1. Maximum span, 60 inches (1524 mm);
- C. Support vertical steel pipe at each floor and at spacing not greater than 60 inches, except on exterior piping at tank which shall be supported to tank every 36".

3.07 CONNECTIONS

- A. Install piping adjacent to equipment to allow service and maintenance.
- B. Connect piping to equipment with oil ball valve and union. Install union between valve and equipment.

- C. Install flexible piping connectors at final connection to burners or oil-fired appliances that must be moved for maintenance access.
- D. Ground equipment according to Division 16 Section "Grounding and Bonding."
- E. Connect wiring according to Division 16 Section "Conductors and Cables."

3.08 FIELD QUALITY CONTROL

- A. Manufacturer's Field Service: Engage a factory-authorized service representative to inspect, test, and adjust field-assembled components and equipment installation, including connections, and to assist in field testing. Report results in writing.
- B. Perform the following field tests and inspections and prepare test reports:
- C. Inspect and test fuel oil piping according to NFPA 31, "Tests of Piping" Paragraph; and according to requirements of authorities having jurisdiction.
- D. Start fuel oil transfer pumps to verify for proper operation of pump and check for leaks.
- E. Test and adjust controls and safeties. Replace damaged and malfunctioning controls and equipment.
- F. Repair leaks and defects with new materials and retest system until satisfactory results are obtained.

3.09 INSTALLATION OF VAULTED AST

- A. Permits And Approvals – The Contractor shall obtain all required permits and approvals prior to beginning any construction activities.
- B. General - All components of a storage tank system shall be installed in accordance with the manufacturer's instructions. Storage tank systems shall be installed according to the applicable provisions of NFPA 30, NFPA 30A, STI R912 and PEI/RP200-03
- C. Damage - The County will not tolerate any leakage from the new installed tank. No on-site repairs shall be allowed. A newly installed tank that leaks shall be replaced with another new tank, NO EXCEPTIONS.
- D. Examination - Do not begin AST installation until substrates and adjacent construction have been properly constructed. Verify concrete tank pad, electrical service stub-ups, bollard/barrier installation, clearances, setbacks, and other site

related work that have impact to fueling system. If any unsatisfactory conditions are encountered, notify the County at once. Do not proceed until unsatisfactory conditions have been corrected.

- E. Tank Site – The approximate site of the new vaulted AST is depicted in the Drawings.
- F. Foundation – The foundation for the tank must be designed to support the tank plus the weight of the maximum amount of product the tank will be storing. In addition:
 - 1. The foundation design shall include provision for draining surface water away from the tank to minimize the risk of fuel accumulation under the tank from an overflow or spill
 - 2. Soil around foundation shall be sloped away 1/8" per foot minimum for 5 feet.
 - 3. The foundation design shall incorporate provisions for hurricane hold down restraints.
 - 4. The continuous solid monolith reinforced slab foundation is to sit on compacted fill, free of organic material, which will uniformly distribute the weight of the tank and its contents to the soil: 2,000 lb. per sq. ft. bearing capacity; 1 inch maximum total settlement; 1/2 inch maximum differential settlement;
 - 5. Provide a minimum six inch (6") thick granular sub-grade, compacted and graded to a level uniform subsurface prior to pouring of the cast-in-place slab.
 - 6. 95% compaction certified by third party report shall be provided BEFORE pad is poured or placed
 - 7. Bearing pads shall be used under the tank legs instead of grouting; the tank foundation and slab should be designed to withstand concentrated loads under the bearing pads.
 - 8. 2,000 Gallon Tanks or smaller may use the vaulted AST manufacturer recommended pre-cast slab.
- G. Neoprene Bearing Pad - The AST neoprene bearing pad shall be installed in accordance with the manufacturer's instructions
- H. New Tank Handling – Unloading & Setting - The AST shall be handled in accordance with the manufacturer's instructions
- I. Hurricane Hold down Restraint System – The AST Hurricane Hold-down Restraint System shall be installed in accordance with the manufacturer's instructions.
- J. Electrical/Controls - Electrical service and fuel piping to the pumps shall be installed in accordance with the requirements of NEC, NFPA and local code requirements.
 - 1. All electrical devices used with or located within twenty (20) feet of the AST shall conform to NFPA 70 Hazardous Locations.

2. All electric conduits and wiring connected to the AST shall be explosion proof and in strict accordance with NEC Articles 500 through 514, where applicable or other local standards whichever is stricter.
3. Proper electrical grounding shall be installed as per NEC Article 250.
4. Prior to pouring new concrete pad or installing precast slab, the Contractor shall run electrical and controls conduits.
5. All aboveground conduits and fittings shall be minimum ¾-inch aluminum conduit with approved anti-seize and anti-corrosion compound applied to all threaded ends upon install.
6. All underground conduits and fittings shall be minimum ¾-inch underground PVC coated rigid galvanized steel conduit with approved Kopr-Kote® anti-seize compound on threaded ends before installation.
7. The leak detection monitoring system shall be mounted in NEMA 4X stainless steel junction box. Coordinate with COUNTY for location.
8. All signals from monitoring equipment shall be routed through a NEMA 4X stainless steel junction box.
9. Conduits from the junction box to the site's telemetry enclosure shall be provided – discrete & analog, as depicted in the drawings.

- K. Lightning Protection & Grounding – The AST and associated equipment shall be grounded to provide lightning protection in accordance with NFPA 780 Standard for the installation of Lightning Protection Systems (latest edition) and NEC Article 250. For additional details, reference the County Grounding requirements.
1. At a minimum, a 4/0 ground counterpoise with one ground rod at each corner of AST slab with one ground well and cover shall be installed. Contractor shall be responsible to provide & install additional ground rods to achieve two (2) ohms or less earth ground test reading.
 2. Conductor cable shall be copper conductor
 3. Manufacturers: HARGER LIGHTNING & GROUNDING 19 Strand Concentric Lay Down Soft-Drawn Bare Copper Part No. 4/0-19T, NEHRING ELECTRICAL WORKS CO. Stranded/Concentric Bare Tinned Copper or County Preapproved Equal
 4. Ground rods shall be copper clad steel, 3/4" diameter, and 20 feet long with hardened steel points
 5. Manufacturers: HARGER LIGHTNING & GROUNDING Sectional Copper Clad Steel, THOMPSON LIGHTNING PROTECTION, INC. Sectional Copper-clad No. TL3410S, or County Preapproved Equal
 6. Connectors & terminations shall be
 7. Manufacturers: HARGER LIGHTNING & GROUNDING Ultraweld®, ERICO® PRODUCTS INC. CADWELD®, CONTINENTAL INDUSTRIES thermOweld®, or County Preapproved Equal
- L. Bollard Installation – The AST shall be protected by 6" Schedule 40 Steel Bumper Posts (bollards) installed to protect the AST from vehicular collision. Concrete foundations: 18" diameter x 36" deep; post internally filled with concrete; painted

OSHA certified yellow. The approximate locations of the new bollards are depicted on the plans.

- M. Floats, Sensors and Gauge Installation – Contractor shall install, terminate and verify operation of all instrumentation specified according to the manufacturer’s recommendations.

3.10 LEAK SENSOR INSTALLATION

- A. Install all level and leak sensing equipment, monitoring panel interface modules and all wiring, conduit, junction boxes, sealing fittings and other materials required for a complete operating system.
- B. Install all monitoring equipment in accordance with the manufacturer’s instructions including compliance with hazardous locations as defined in the NEC Articles 500 through 514, where applicable, as locally amended and local codes which have jurisdiction.
- C. Provide instrument identification (tagging), calibration and manufacturer services.

3.11 TESTING

- A. AST shall be tested in accordance with manufacturer’s installation requirements by Contractor under observation of the County prior to filling with fuel. Contractor to provide all testing specifications prior to performing any testing.
- B. While tank is under pressure, the tank and fittings shall be checked for leaks with soap/water mixture. AST under test pressure shall not be left unattended.
- C. Test AST annular space per manufacturer’s requirements.
- D. Piping shall be tested in strict accordance with the manufacturer’s testing requirements. Piping systems shall be tested upon completion of the roughing-in before setting equipment. Defective work or material shall be replaced and retested. The system shall be test plugged or capped prior to testing to prevent test pressure from reaching any equipment or fuel tank.
- E. Contractor shall provide fuel for any required testing and retesting. If the fuel subsequently becomes contaminated, the Contractor shall dispose of the fuel in accordance with all FDEP regulations and at no cost to the County.
- F. Coordination for testing and inspections between FDEP and Contractor will be scheduled by Orange County Risk Management (Risk). Risk will prepare and submit all notifications, registrations forms, etc.

3.12 PAINTING, ADJUSTMENT, TOUCH-UP, CLEANING

- A. Paint and coat all interior and exterior fuel piping as required by State of Florida.
- B. Provide paint sample for verification. Touch-up any abraded areas with an application of same coating used for shop primer and finish.
- C. Adjust, repair or replace all punch list items
- D. The site location shall be groomed (all debris, trash, garbage, etc. picked up, grounds raked/swept, no piles of fill, etc.) prior to Normal Operation to the satisfaction of the County.

3.13 NORMAL OPERATION

- A. Upon completion of the testing and at the time of final acceptance of the system, the Contractor shall fill the AST.
- B. Contractor shall sample diesel fuel and provide a detailed certificate of analysis report regarding fuel quality.
- C. Replace all filters and screens
- D. Open valves to correct position for system operation
- E. Perform training of County personnel on the AST, Day Tank, Leak Monitoring System and all provided equipment.
- F. Review local requirements for system inspection, reporting and registration, as well as administrative paperwork requirements with County personnel.

3.14 DEMONSTRATION

- A. Engage a factory-authorized service representative to train County's maintenance personnel to adjust, operate, and maintain fuel oil pump sets.

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SECTION 15600
GENERATOR FUEL STORAGE SYSTEM

PART 1 - GENERAL

1.01 DESCRIPTION

- A. The work of this Section includes all labor, materials and equipment required for the installation, testing, and registration of the fuel storage and piping system. The system shall include above ground fuel storage tank, fuel piping systems, fuel storage tank monitoring systems, and accessories.

1.02 REQUIREMENTS OF REGULATORY AGENCIES

- A. All Work shall conform to the applicable requirements of the County, State and Federal codes. Where the requirements of such agencies are more stringent than specified herein, abide by such requirements and consider this Specification as supplementary to those requirements.
- B. All Work shall conform to the applicable requirements of the following: National Fire Protection Association (NFPA) 30-Flammable and Combustible Liquids Code; and NFPA 321 - Basic Classification of Flammable and Combustible Liquid.
- C. All Work shall conform to the applicable requirements of the following: Florida Administrative Code, All fuel system installations, removals and upgrades are subject to all current and proposed FDEP and FAC Rules and Regulations; Chapters 4A-16 and 4A-33 of the State Fire Marshall's Rules and Regulations (Florida Fire Prevention Code); Southern Fire Prevention Code, Chapter 20; and the Standard Building Code, 1985 Edition with 1986 revisions.
- D. The tank shall meet the current requirements of Underwriters Laboratories (UL) Standard 142 and UL 2085. All components of the fuel distribution system shall be UL listed, unless otherwise specified, or approved by the County.
- E. The tank and fuel system shall be designed and fabricated according to best practices and methods available to date.

1.03 QUALIFICATIONS

- A. Installer shall have had supervisory experience with 2 similar fuel systems in the past 3-years and shall hold a valid pollution-control contracting license as required by the State of Florida, Department of Environmental Protection (FDEP). A copy of the license shall be submitted, prior to proceeding with construction.

- B. Tank installers shall be certified in writing by the tank manufacturer as being qualified to install the equipment. A copy of the certificate shall be submitted, prior to proceeding with construction.
- C. The tank shall be by a manufacturer listed in FDEP List of Approved Tank Manufacturers. Please see the link below for the current list: <http://www.dep.state.fl.us/waste/categories/tanks/pages/equip.htm>.
- D. Acceptable tank manufacturers/vendors include DelZotto EQ-754, Phoenix Enviro-Vault EQ-013, and Modern Welding Fireguard Double Wall Tanks EQ-352.

1.04 SUBMITTALS

- A. Complete Shop Drawings shall be submitted, including certification of shop test to the County for review.
 - 1. The Shop Drawings shall include sufficient information to demonstrate compliance with the specified tank design standards, including copies of applicable sections of the specified design standards, manufacturer's catalog data and descriptive literature for the tank, fully dimensioned shop layout drawing showing all piping, manholes, valves, equipment connections, tank outline dimensions, platform and stair dimensions, nozzle locations and foundation requirements, and tank installation and test procedures.
 - 2. Submit all manufacturers' recommended installation and test procedures for all equipment including tanks, piping, etc.
 - 3. Coordinate elevation of generator and fuel tank for acceptable operation without the use of a day-tank. Submit proposed elevation of generator and fuel tank and generator fuel pump characteristics.
 - 4. Submit manufacturer's test reports (vessel fabrication, coating integrity and tank leakage, etc.) for each tank and specific service application.
 - 5. Submit manufacturer's warranty for each tank and specific service application.

1.05 PRODUCT HANDLING

- A. Deliver materials and equipment to project site and store in a dry protected area. All damaged items shall be replaced with new at no additional cost to County.
- B. Piping shall be delivered to the site with sealed end caps which shall remain in place until installation. Tank shall be delivered to the site with all openings sealed. The tank shall be properly supported during transportation to the site and during installation in accordance with the manufacturer's instructions.

1.06 FUEL STORAGE REGISTRATION

- A. Risk will coordinate with the Contractor to prepare the registration forms for the fuel storage tank system in accordance with Florida Administration Code, Chapter 62-761.400. Owner to pay all applicable registration fees.

1.07 WARRANTY

- A. The fuel storage tanks shall have a warranty of 30-years and shall have been in use for a minimum of 20-years.

PART 2 - PRODUCTS

2.01 ABOVE GROUND FUEL OIL STORAGE TANK

- A. All equipment utilized as part of a fuel system installation or upgrade shall meet the most current FDEP approved equipment list as provided on the FDEP Website (Storage Tank Regulations).
- B. Storage Tanks
 1. Provide a separate double-wall fuel storage tank. Tank capacity shall be sufficient to run generator for 72-hours at 100% of the unit's rated output plus an additional 10% of fuel capacity.
 2. Steel (primary) Tank: Listed by UL as an above ground tank for flammable and combustible liquids and manufactured in accordance with UL 142 and UL Standard 2085 with a 2-hour fire rating.
 3. Emergency Vent: As required by NFPA 30 with no size reduction allowed for concrete encasement (insulation).
 4. Normal Vent: Independent of the emergency vent as required by NFPA 30.
 5. Steel Tank Openings: Threaded and located in the top of tank.
 6. Steel Tank: Rectangular in shape with 2 lugs for connecting ground conductors for lightning protection in accordance with NFPA 78.
 7. Steel tank shall be pressure tested at the tank factory at 5-psi per UL 142.
 8. Steel Tank provider to be licensed Steel Tank Industries manufacturer.
 9. A double wall steel tank with lightweight concrete/monolithic thermal insulation between the two steel layers is acceptable.
 10. Tank top openings shall be powder coated to resist corrosion.
 11. Steel primary tank and secondary containment tanks encased in concrete shall include a homogenous layer of 4,000-psi reinforced concrete with a thickness required to create a protected (vaulted) tank with no penetrating metal elements except at the top. Concrete encasement (insulation) shall be of a monolithic (seamless) pour and contain no cold joints or direct (heat transfer) connections between the steel and the outside face of the concrete encasement on bottom or sides.
 12. For concrete encased tank (exterior wall), steel tank shall be pressurized at the casting facility and shall remain pressurized until concrete sets, to provide expansion space between concrete and steel tank during use. This is in addition to the test required by UL 142.
 13. Insulated (vaulted) tank shall have capability of physical monitoring between primary and secondary containment and shall have a mechanical indicator device that will indicate the presence of a leak in the primary tank.
 14. Steel tank shall have an integral 7-gallon UL listed spill containment system, as a part of the tank, with internal reservoir and normally closed UL listed drain port.

15. The tank shall be placed on a reinforced concrete pad.
16. The tank shall have an exterior light reflecting and weather resistant epoxy coating.
17. Hurricane restraints shall be installed where required by local jurisdictions.
18. The tank shall be ballistic and vehicle impact resistant.
19. The overall tank design shall have been in manufacturing production and commercial use for a minimum of 5-years.
20. The tank shall include a 4-inch fill coupling with lockable cap for pressurized tanker.
21. All exposed metal and appurtenances with the exception of stainless steel components shall be powder coated to inhibit corrosion.
22. The tank shall have appropriate warning signs (i.e., FLAMMABLE, NO SMOKING, DIESEL, etc.) as required by the local jurisdiction.
23. The tank shall have the total gross capacity in gallons clearly visible.
24. The tank shall have signage installed in a conspicuous location indicating proper filling procedure and a tank calibration chart.
25. All tanks provided under this project shall be of the same manufacturer and model.

2.02 FUEL TANK ACCESSORIES

- A. The following equipment shall be furnished along with the necessary piping and fittings required to provide a complete diesel fuel piping system.
 1. A mechanical level gauge system shall be provided to indicate the liquid level within the tank. The level gauge shall have a circular gauge indicator mounted on top of the tank. The tank shall include all openings required for the level gauge system.
 2. Vent piping shall be 2-inch aluminum and shall extend 12-feet above the adjacent finished slab elevation.
 3. Vent caps shall be constructed of aluminum and shall include a removable stainless steel screen, similar to No. 63 as manufactured by Dover Corp. or an approved equal.
 4. An emergency vent shall be provided for the tank of the size required by code. The emergency vent shall be constructed of an epoxy coated iron lid, aluminum body and a removable stainless steel screen. The emergency vent shall be OPW® Model 201 Series or pre-approved equal.
 5. An anti-siphon valve assembly and foot valve with strainer shall be provided on the fuel supply line for the generator set.
 6. The tank shall include fuel supply and return connections as shown on the Drawings.
 7. Overfill protection stop valve, OPW® Model 61fSTOP-2000 Series (FDEP File No. EQ-225) or County pre-approved equal, shall be installed on the tank and be capable of stopping diesel fuel flow at 95% capacity.
 8. The primary supply and return fuel lines shall be in a 24-inch by 24-inch by 14-inch containment box on top of the tank.
 9. Provide all piping, valves, unions, filters, strainers and other accessories as required for a complete system.
 10. Provide Simplex CAF3-3 with TC25 Tank Commander unit, output of 4-20mA signal for connection to County SCADA system. Connection is for communication from fill panel to SCADA. Alternate submittals to be approved by County prior to ordering and installation.

2.03 FUEL LEVEL AND LEAK MONITORING EQUIPMENT

- A. Furnish a KRUEGER SENTRY GAUGE Therma Gauge H-2 Stainless Steel Rod Direct Reading Gauge or approved equal for visible level monitoring.
- B. Furnish a Liquid Level Sensor (magnetostrictive level/temperature transmitter), or County approved equal, providing 2 (two) 4-20mA outputs for SCADA.
- C. Furnish a tank monitoring system including tank alarm console, high-level detection, low-level detections, double containment tank leak sensing, and secondary containment piping leak detection and associated modules for a complete tank leak detection system.
- D. The emergency system shall include low fuel level contacts for remote alarm. Fuel tanks are required to alarm at 90% (high) and 10-15% (low) fuel levels. If necessary to guard against loss of prime to pump, a check valve and fuel shut off valve shall be mounted on pump intake. The emergency system shall include a float switch, fuel level gauge and standard control panel. Provide fuel level gauge with 4-20 ma output to indicate tank fuel level.
- E. The tank monitoring system shall include provisions for remote monitoring of alarm conditions.
- F. The tank monitoring system shall include an integral and remote mounted audible electronic horn and flashing red light to indicate a trouble or leak condition.
- G. The tank monitoring system includes all required terminals, switches, transmitters, and local wiring shall be complete. Wiring required between sensors and panels shall be furnished. All wiring shall be installed in conduits per NEC and approved for location.
- H. The tank monitoring system console shall be labeled correctly and properly for HIGH LEVEL ALARM, LOW LEVEL ALARM, TANK LEAK ALARM, PIPE LEAK ALARM, RESET, HIGH WATER LEVEL ALARM and TEST.
- I. The tank monitoring system shall meet all applicable regulatory requirements for tank leak detection, monitoring, and reporting.
- J. One (1) system shall be provided for each new tank, where applicable.
- K. The monitoring system shall be mounted on a stainless steel UNISTRUT® frame or approved equal at locations indicated on drawings or as approved by Engineer and/or Owner. Secure to frame using stainless steel fasteners. Coordinate mounting location with field conditions.
- L. The system shall be a PNEUMERCATOR™ CO., INC. Tank Monitoring System (FDEP Approved product) and associated sensors or County approved equal.

- M. Tank level detection – Tank high/low level floats and secondary piping containment sensors shall be custom length PNEUMERCATOR™ CO., INC. Model LS-600 Series (FDEP File No. EQ-240) or approved equal. The floats and sensors shall be furnished complete with the installation kits, riser caps, seals and other parts as required for a complete installation.
- N. Double Wall Interstitial Leak Sensor – The double wall interstitial leak sensor shall be capable of detecting the presence of any liquid in the annulus of the tank. The Sensor shall be a PNEUMERCATOR™ CO., INC. Model LS-600-LDSS or approved equal. The 316 Stainless Steel Float, Shaft with Teflon® wiring sensor shall be furnished complete with the installation kits, riser caps, seals, and other parts as required for a complete installation.
- O. Spill Kit – A 30-gallon spill kit shall be provided for the new tank.

2.04 PIPE, VALVES, AND FITTINGS

- A. Exterior aboveground and underground primary piping shall be Schedule 40 Type 316 Stainless Steel in conformance with ASTM Standards with butt-welded stainless steel fittings conforming to ASTM Standards.
- B. Flexible piping at tank, containment sumps and equipment connections shall be constructed of a seamless flexible plastic liner with corrosion resistant Type 316 Stainless Steel wire braid reinforced cover, stainless steel collars and ductile iron fittings.
- C. Provide piping transitions, sleeve and supports as required for a rigid support and complete installation. All fuel pipe building wall penetrations shall be watertight.
- D. All interior and exterior supports, including hangers, brackets, fasteners and miscellaneous metals shall be Type 316 Stainless Steel.
- E. Valves for service with diesel fuel shall be stainless steel ball valves with sealing materials suitable for the intended application.

2.05 HANGERS, SUPPORTS AND ANCHORS

- A. Furnish supports, hangers and other devices necessary to support firmly and substantially the piping and equipment.
- B. All supports, hangers, hanger rods, fasteners, anchors, guides, including all supplementary steel shall be Type 316 Stainless Steel for all applications.
- C. All piping shall be supported at a maximum of 8-foot intervals.

2.06 PAINTING AND COATINGS

- A. The Contractor shall be responsible for the repair of all defects, blemishes, nicks, and the like apparent in the painted surfaces after installation. Surfaces to be repaired or recoated shall be prepared as recommended by the paint supplier. Care shall be taken not to paint over nameplates.
- B. The Contractor shall furnish touch-up paint for the various types of equipment furnished and deliver 1-pint of unopened paint to the County at completion of the project.

PART 3 - EXECUTION

3.01 INSTALLATION

A. General

1. Contractor shall contact the Risk 45-days prior to installation upgrades or removal of fuel tanks to coordinate state and local permit requirements.
2. Permits and Approvals – The Contractor shall obtain all required permits and approvals prior to beginning any construction activities. An approved FDEP Inspection Report shall be provided to the County prior to fueling the fuel storage tank or pump station start-up. Sampling and reporting shall be conducted as required by FDEP and FAC rules and regulations associated with fuel system installations, removals, and upgrades as required.
3. All components of a storage tank system shall be installed in accordance with the manufacturer's instructions. Storage tank systems shall be installed according to the applicable provisions of NFPA 30, NFPA 30A, STI R912 and PEI/RP200-03.
4. The County will not tolerate any leakage from the new installed tank. No on-site repairs shall be allowed. A newly installed tank that leaks shall be replaced with another new tank, NO EXCEPTIONS.
5. Equipment shall be installed in accordance with the manufacturer's recommendations. A certified Pollutant Storage System Specialty Contractor (PSSSC) as defined in Section 489.113, Florida Statutes shall perform the installation.
6. All materials and equipment shall be new and free from defects or damage and shall be installed in accordance with the approved recommendations of the manufacturer to conform to the Contract Documents. The installation shall be accomplished by workmen skilled in this type of work. Equipment shall be erected in a neat manner, shall be aligned, leveled and adjusted to provide satisfactory operation. Installation shall be such that connection and disconnection of piping and accessories can be readily made and so that all parts are easily accessible for inspection, operation, maintenance and repair. Minor deviations from indicated arrangements to provide proper access may be made.

B. Storage Tanks

1. The tank shall be grounded. Where fittings cause a break in the electrical continuity of the system-approved jumpers shall be provided.
2. Any damage to tank coatings or tank exteriors shall be repaired.

C. Fuel Piping

1. Unions shall be supplied between the fuel tank and the generator on both the supply and return lines to allow for easy removal of piping. Any surface mounted piping that may be a trip hazard shall be painted Safety red. Fuel piping shall receive surface preparation and coating schedule prior to installation.
2. All pipes shall be cut accurately to measurements established at the site and shall be worked into place without forcing or bending. All pipes shall be installed into place without traps or pockets and pitched 1-inch in 20-foot minimum to drain.
3. Piping shall be installed to minimize the quantity of piping joints. Provide unions and/or flexible connections at all equipment connections.
4. Joints shall be fabricated in accordance with standard industry practices and the manufacturer's instructions. All joints shall be liquid tight, welded joints except where flanged connections to equipment or valves are required. Cut pipe square using pipe cutting tool and carefully ream pipe to remove all burrs prior to welds.
5. Contractor shall flush system piping with grade of fuel to be used by County to remove any debris and foreign matter in piping prior to testing for a minimum of 6-hours continuously. Contractor shall dispose of fuel in accordance with FDEP regulations after flushing.

D. Flexible Fuel Piping

1. Provide flexible piping connectors at generator connections and equipment connections.
2. Flexible connections shall be a minimum of 12-inches long or as required for equipment removal or maintenance. Protect flexible connectors where physical damage may occur due to adjacent equipment, other piping, wiring, or where subject to possible damage from operating personnel.

3.02 CLEANING

- A. At the conclusion of the Work thoroughly clean all pipelines to remove all dirt, stones, and pieces of wood or other material which may have entered pipelines during the construction period.
- B. If defective piping or joints are discovered at this time, they shall be repaired or replaced by the Contractor at no cost to the County.

3.03 LEAK SENSOR INSTALLATION

- A. Install all level and leak sensing equipment, monitoring panel interface modules and all wiring, conduit, junction boxes, sealing fittings and other materials required for a complete operating system. Leak detection shall be provided with contact points for SCADA monitoring.
- B. Install all monitoring equipment in accordance with the manufacturer's instructions including compliance with hazardous locations as defined in the NEC Articles 500

through 514, where applicable, as locally amended and local codes which have jurisdiction.

- C. Provide instrument identification (tagging), calibration and manufacturer services.

3.04 TESTING

- A. Tanks shall be tested in accordance with manufacturer's installation requirements by Contractor under observation of the County and the FDEP prior to filling with fuel.
- B. Install all monitoring equipment in accordance with the manufacturer's instructions including compliance with hazardous locations as defined in the NEC Articles 500 through 514, where applicable, as locally amended and local codes which have jurisdiction.
- C. Provide instrument identification (tagging), calibration and manufacturer services.
- D. While tank is under pressure, the tank and fittings shall be checked for leaks with soap/water mixture. Tank under test pressure shall not be left unattended.
- E. Test tanks annular space per manufacturer's recommendations.
- F. Piping shall be tested in strict accordance with the manufacturer's testing requirements. Piping systems shall be tested upon completion of the roughing-in before setting equipment. Defective work or material shall be replaced and retested. The system shall be test plugged or capped prior to testing to prevent test pressure from reaching any equipment or fuel tank.
- G. Contractor shall provide fuel for any required testing and retesting. If the fuel subsequently becomes contaminated, the Contractor shall dispose of the fuel in accordance with all FDEP regulations and at no cost to the County.
- H. Coordination for testing and inspections between FDEP and Contractor will be scheduled by Orange County Risk Management (Risk). Risk shall arrange for testing and inspection of the tank by the FDEP representative and the approved DEP inspection report shall be provided prior to station startup. Risk shall be responsible for submitting and preparing all registration forms, notifications and other regulatory requirements in coordination with the County.

3.05 ADJUSTMENT, TOUCH-UP, AND CLEANING

- A. Touch-up any abraded areas with an application of same coating used for shop primer and finish.
- B. Adjust, repair or replace all punch list items.

- C. The site location shall be groomed (all debris, trash, garbage, etc. picked up, grounds raked/swept, no piles of fill, etc.) prior to Normal Operation to the satisfaction of the City.

3.06 NORMAL OPERATION

- A. Upon completion of the testing and at the time of final acceptance of the system, the Contractor shall fill the tank.
- B. Contractor shall sample diesel fuel and provide a detailed certificate of analysis report regarding fuel quality.
- C. Replace all filters and screens.
- D. Open valves to correct position for system operation.
- E. Perform training of County personnel on the tank, day tank, leak-monitoring system and all provided equipment.
- F. Review local requirements for system inspection, reporting and registration, as well as administrative paperwork requirements with County personnel.

END OF SECTION

SECTION 16010
ELECTRICAL GENERAL PROVISIONS

PART 1 - GENERAL

1.01 WORK INCLUDED

A. The Work covered under this Division of the Specifications is intended to include the furnishing of all materials, equipment and labor necessary for or reasonably incidental to, the installation of a complete and fully operative electrical system as indicated on the Drawings and specified in this Section.

1. The Work shall consist generally of, but is not limited to, the following major items:
 - a. Circuit Protective Devices
 - b. Conduit and Wiring
 - c. Equipment Connections
 - d. Temporary power

B. Work Not Included: The following work is not included in this Section:

1. Furnishing of pump control panels.

C. Fees and Permits

1. Obtain all permits required for the Work and include the cost of same in bid.
2. The Contractor shall also include in the bid, the cost for the power company service.

D. Certificate of Inspection

The Contractor shall pay for a final inspection made of the complete electrical installation and shall deliver a certificate of approval of the complete Work to the County before receiving final payment.

E. Service

Voltage and Phase as indicated on the Drawings. Secondary metered electrical power underground or overhead as indicated on the Drawings. Serving electrical utility company is as noted 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."

B. Submit to the County as provided in the General Conditions, Shop Drawings, manufacturer's literature and technical data on the proposed electrical systems before commencing work.

C. Shop Drawings

1. Submit copies of manufacturer's drawing of surge protection devices, circuit protective devices, panel boards, conduit, wire, wiring devices, and any other special electrical equipment to be installed, and shall receive the County's acceptance before ordering the same for installation.
2. All Shop Drawings shall be submitted in a 3-ring binder with each specification section indicated with tabs.
3. If Shop Drawings are submitted intermittently and not in 3-ring binders, they will not be reviewed and they will be returned to the Contractor for proper submittal.
4. Acceptable Equivalent
 - a. Any manufacturer and/or catalog number listed on the Drawings or in the Project Manual shall be construed to mean "or acceptable equivalent" as listed in Appendix D "List of Approved Products."
 - b. Any substitutions to be considered as "Acceptable Equivalent" shall be submitted with both the cut of the proposed substitution and a cut of the specified equipment to the County in writing, and returned to the Contractor at least 10-days prior to bid opening.
 - c. No substitutions shall be submitted or will be allowed after the contract has been awarded.

1.03 QUALITY ASSURANCE

A. Qualifications of manufacturers, materials and equipment

1. Material and equipment, except as herein otherwise noted, shall be new and conform to standards specified herein defined to include conduits, cable, wiring materials and devices and panel boards.
2. Materials and equipment shall be of an approved design.
 - a. Similar materials shall be of one manufacturer wherever possible.
3. Equipment offered under these Specifications shall be limited to products regularly produced and recommended for service ratings in accordance with manufacturer's catalogs, engineering data, or other comprehensive literature made available to the public and in effect at the time of opening of bids.
4. Install equipment in strict accordance with manufacturer's instruction for type, capacity and suitability of each piece of equipment used.
 - a. Obtain these instructions, which shall be considered a part of these Specifications.

B. Qualifications of supervisor, workmanship and installers

1. The Contractor shall have a Master Electrician constantly supervising the Work covered by these Specifications, and so far as possible shall keep the same foreman on the job from start to finish.
 - a. The workmanship of the entire job shall be excellent and only experienced and competent workers shall be employed for the Work.

1.04 CODES AND REGULATIONS

- A. Work shall be installed in accordance with the regulations and requirements of the National Electrical Code NFPA No. 70; Life Safety Code NFPA No. 101, Standard Building Code as well as all rules, state and local codes, regulations and requirements of the telephone and power companies.
- B. Where conduits and/or cables penetrate wetwell walls, the penetrations shall be sealed in accordance with NFPA 70, Article 500.
 - 1. The above shall be ascertained and fully coordinated before the installation of any material, equipment, and the like, and any discrepancy shall be immediately brought to the attention of the County in writing, and the Contractor shall receive a disposition of same before proceeding with the Work.
 - 2. Furnish, without additional charge, any additional materials and labor that may be required for compliance with these codes, law, rules, regulations or requirements even though the work is not mentioned in these Specifications or shown on the Drawings.
- C. Material and equipment shall bear the label of approval of the National Board of Fire Underwriters Laboratory.

1.05 INSPECTIONS

- A. All work and materials covered by these Specifications and shown on the Drawings shall be subject to inspection at any and all times by the County.
- B. If the County finds that any material does not conform with these Specifications, the Contractor shall within 3-days after being notified by the County; remove the material from the premises, and if said material has been installed, the entire expense of removing and replacing same, including any cutting and patching that may be necessary, shall be borne by the Contractor.
- C. Tests

The County reserves the right to inspect and test any portion of the equipment during the progress of this Work.

- 1. The Contractor shall test the entire system in the presence of the County when the Work is completed to insure that all portions are free from short circuits and grounds.
- 2. All equipment, material and labor necessary to conduct the above tests shall be furnished at the Electrical Contractor's expense.

1.06 PRODUCT HANDLING

- A. Protection of Equipment, Material and Work: The Contractor shall effectively protect and pay for protection of the work, materials or equipment, as is liable to injury during the construction period.
 - 1. Openings into any part of the conduit system as well as associated fixtures, equipment, and the like, both before and after being set in place, shall be securely covered or otherwise protected to prevent obstruction of the conduit, or injury due to carelessness or maliciously dropped tools or materials, grit, dirt, or any foreign matter.
 - a. The Contractor will be held responsible for all damage done until the Work is fully and finally accepted.
 - 2. Cover conduit ends with capped bushings.
- B. Repair of damage: In the event of damage, repair shall be made immediately, to the County's satisfaction and at no additional cost to the County.
- C. Special Handling: Special care, storage and handling of new and existing lighting fixtures shall be taken to minimize breakage of lenses and lamps shipped with fixtures.
 - 1. Immediately replace any breakage with the exact lens or lamp.

1.07 JOB CONDITIONS

- A. Accuracy of Data: The data given herein and on the Drawings are as exact as could be secured.
 - 1. The Specifications and Drawings are for the assistance and guidance of the Contractor.
 - 2. Exact locations, distances, levels, and the like, will be governed by the building field conditions and the Contractor shall use the data contained herein with this understanding.
- B. Drawings
 - 1. The electrical drawings are diagrammatic, but shall be followed as closely as actual construction and work of other Contractors will permit.
 - 2. Deviations from diagrammatic electrical drawings required by either building construction or the work of other Contractors shall be made by the Contractor at his/her expense.
 - 3. It is not the intention of the Drawings or specifications to indicate each piece of conduit and fittings required for the satisfactory operation of the installation and whereby one is indicated, but not specified, or specified but not indicated on the Drawings, it shall be considered to be both specified and indicated.
- C. Measurements
 - 1. Review the Contract Drawings and Specifications and visit the job site to ascertain all conditions, including conduit runs, interfacing, interferences, conflicts, discrepancies, etc., and shall report the same to the County for clarification 10-days prior to submittal of the bid.

2. Failure to comply with this condition shall constitute an acceptance of the conditions and any necessary changes will be at Contractor's expense.
3. The Contractor shall make all measurements necessary for his/her work and shall assume responsibility for their accuracy.
4. Install necessary pull boxes, manholes and junction boxes as may be required to accomplish the distribution system indicated on the riser diagram.

D. Structural difficulties: Should any structural difficulties prevent the setting of cabinets, running conductors, and the like, at points indicated on the Drawings, the necessary deviation will be as determined by the County shall be made without additional cost.

E. Cooperation with Other Contractors

1. The Contractor shall arrange all parts of his/her work in proper relation to the work of other Contractors.
2. Where interferences occur, the Contractor shall, before installing the work involved, consult with the County as to exact location and level of his/her work.
3. The County's decision will be final.
4. The Contractor shall be responsible for arrangement of his/her work and equipment and maintenance of proper headroom under this Work.
5. Should work installed under this Section require any modifications to avoid interference with the other work, such changes shall be made without additional cost.
6. The County's decision as to determination or allocation or responsibility where conditions require changing of work, shall be final.
7. If any work of the Contractor is dependent for its proper execution on contiguous work, examine such work and report in writing any defect thereon or conditions rendering it unsuitable.
8. The beginning of work, without making such report, shall constitute an acceptance of such work, and any defects in his/her own work consequently shall be his/her responsibility.

1.08 TEMPORARY SERVICE

- A. Temporary power: Provide, maintain and remove after construction is completed, a temporary, receptacle and power system in accordance with the progress schedule.
1. Receptacles: Ground fault interrupter type.
 2. Three Phase Power for Testing Motors: Provided at all necessary points.
- B. Temporary telephone service: Each respective trade shall be responsible for providing and maintaining their telephone services.

1.09 CLEANING

- A. Keep the premises free of debris and unusable materials resulting from the Work, and immediately upon completion of the Work remove such debris and material from the site and leave floors broom clean in areas affected by the Work.

1.10 GUARANTEE

- A. Leave the electrical installation in proper working order and without charge, replace any work or materials which develop defects within 1-year from date of final inspection and acceptance by the County.

1.11 DEFINITIONS

- A. In this Division "provide" is used as a term contraction meaning "to furnish, install and connect up completely in the specified or in an approved manner for the item and/or material described."

PART 2 - PRODUCTS (NOT USED)

PART 3 - EXECUTION (NOT USED)

END OF SECTION

SECTION 16110

RACEWAYS

PART 1 - GENERAL

1.01 RELATED DOCUMENTS

- A. Drawings and general provisions of Contract, including General and Supplementary Conditions and Division 1 Specification sections, apply to work of this Section.

1.02 DESCRIPTION OF WORK

- A. Extent of raceway work is indicated by drawings and schedules.
- B. Types of raceway specified in this Section include the following:
 - 1. Liquid tight flexible metal conduit
 - 2. Rigid non-metallic conduit (PVC)
 - 3. Rigid aluminum conduit
- C. Electrical non-metallic tubing (ENT) is not acceptable.

1.03 QUALITY ASSURANCE

- A. Manufacturers: Firms shall have sufficient experience that will allow for quality and successful manufacture of raceway systems of types and sizes required for this Project.
- B. Installer's Qualifications: Firms shall have sufficient experience to allow for quality and successful installation of electrical raceway work required for this Project.

1.04 CODES AND STANDARDS

- A. NEMA Compliance: Comply with applicable requirements of NEMA Standards Publications pertaining to raceways.
- B. UL Compliance and Labeling: Comply with applicable requirements of UL safety standards pertaining to electrical raceway systems. Provide raceway products and components which have been UL listed and labeled.
- C. NEC Compliance: Comply with applicable requirements of NFPA-70 pertaining to construction and installation of raceway systems.
- D. Comply with NECA "Standard of Installation."
- E. Coordinate layout and installation of raceway and boxes with other construction elements to ensure adequate headroom, working clearance, and access.

1.05 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. Product Data: Submit manufacturer's technical product data, including specifications and installation instructions for each type of raceway system required. Include data substantiating that materials comply with requirements.
- C. A copy of this specification section, with addendum updates included, and all referenced and applicable sections, with addendum updates included, with each paragraph check-marked to indicate specification compliance or marked to indicate requested deviations from specification requirements. Check marks shall denote full compliance with a paragraph as a whole.
- D. If deviations from the specifications are indicated, and therefore requested by the Contractor, each deviation shall be underlined and denoted by a number in the margin to the right of the identified paragraph, referenced to a detailed written explanation of the reasons for requesting the deviation.
- E. The County shall be the final authority for determining acceptability of requested deviations. The remaining portions of the paragraph not underlined will signify compliance on the part of the Contractor with the specifications.
- F. Failure to include a copy of the marked-up specification sections, along with justification(s) for any requested deviations to the specification requirements, with the submittal shall be sufficient cause for rejection of the entire submittal with no further consideration.

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 NON-METALLIC CONDUIT

- A. General: Provide non-metallic conduit and fittings of types, sizes, and weights for each service indicated. Where types and grades are not indicated, provide proper selection determined by Installer to fulfill wiring requirements, which comply with provisions of NFPA-70 for raceway.

B. Electrical Plastic Conduit

1. Extra Heavy Wall Conduit: Schedule 80, UL rated, construct of polyvinyl chloride compound C 200 PVC, and UL listed in accordance with NFPA-70 Article 347 for direct burial, or above ground use. Conduits shall be UL listed and marked for use with conductors having 90°C insulation. Use conduits, couplings, bushings, elbows, nipples, and other fittings meeting the requirements of NEMA TC 2 and TC 3, Federal Specification W C 1094, UL, NEC, and ASTM specified tests for the intended use. Use only conduit with a factory formed bell on 1 end. Conduit that requires the use of couplings for straight runs will not be acceptable. Minimum size 3/4-inch exposed, 1-inch embedded or buried.

C. Conduit and Tubing Accessories: Provide conduit and accessories of types, sizes, and materials, complying with manufacturers published product information, which mate and match conduit.

D. Conduit Bodies: Provide extra heavy PVC conduit bodies of types, shapes and sizes as required to fulfill job requirements and NFPA-70 requirements. Construct conduit bodies with threaded conduit entrance ends, removable covers, either cast or of galvanized steel and corrosion resistant screws.

E. Available Manufacturers: Subject to compliance with requirements, manufacturers offering conduit bodies which may be incorporated in the Work include, but are not limited to the following:

1. Appleton Electric; Div. of Emerson Electric Co.
2. Arrow Hart Div.; Crouse Hinds Co.
3. Bell Electric Div.; Square D Co.
4. Killark Electric Mfg. Co.
5. O Z/Gedney Div.; General Signal Co.
6. Spring City Electrical Mfg. Co.

2.03 RIGID ALUMINUM CONDUIT

A. Meet requirements of ANSI C80.1 and UL6.

B. Material: Type 6063, copper free aluminum alloy.

C. Available Manufacturers

1. Appleton Electric, Div. Of Emerson Electric Co.
2. Arrow Hart Div; Crouse Hinds Co.
3. Bell Electric Div.; Square D Co.
4. O-Z/Gedney Div.; General Signal Co.

D. Minimum size shall be 3/4-inch unless noted otherwise or permitted by the following: 1/2-inch may be used for connections to individual instruments, outlets, wiring devices and indoor lighting fixtures.

2.04 LIQUIDTIGHT FLEXIBLE METAL CONDUIT AND FITTINGS

- A. Liquid-tight Flexible Steel Conduit (LFS): UL listed liquid tight consisting of an extruded thermoplastic cover over a galvanized steel core. Minimum size 3/4-inch unless for equipment with 1/2-inch knockout.
- B. Fittings and Conduit Bodies: NEMA FB-1; galvanized steel compression type with O-ring.

PART 3 - EXECUTION

3.01 INSTALLATION

- A. General: Install raceways as indicated; in accordance with manufacturer's written installation instructions, and in compliance with NFPA-70, and NECA's "Standards of Installation."
- B. Coordinate with other work including wires/cables, boxes and panel work, as necessary to interface installation of electrical raceways and components with other work.
- C. Install conduits concealed below grade or in slabs. Where conduits turn up and/or cannot be concealed, route conduits exposed.
- D. Mechanically fasten together conduits, enclosures and raceways for conductors to form continuous system. Connect to electrical boxes, fittings and cabinets to provide firm mechanical assembly.
- E. Avoid use of dissimilar metals throughout system to eliminate possibility of electrolysis. Where dissimilar metals are in contact, coat surfaces with corrosion inhibiting compound before assembling.
- F. Cap conduits or plug flush conduits during construction to prevent entrance of dirt, trash, and water. Cap or plug empty conduits designated as "future", "spare", or "empty" and include a pulling line accessible at both ends. Use anti-seize compound on cap and plug threads prior to installation.
- G. Protect stub-ups from damage where conduits rise through floor slabs. Arrange so curved portion of bends is not visible above the finished slab.
- H. Make bends and offsets so the inside diameter is not reduced. Unless otherwise indicated, keep the legs of a bend in the same plane and the straight legs of offset parallel.
- I. Use raceway fittings compatible with raceway and suitable for use and location. Fitting sizes shall be such that the enclosed conductors do not exceed the permissible percentage of fitting area/volume.

- J. Install miscellaneous fittings such as reducers, chase nipples, 3-piece unions, split couplings, and plugs that have been specifically designed and manufactured for their particular application. Install expansion fittings in raceways every 200-foot linear run or wherever structural expansion joints are crossed.
- K. Use roughing in dimensions of electrically operated unit furnished by supplier. Set conduit and boxes for connection to units only after receiving review of dimensions and after checking location with other trades.
- L. Provide nylon pull cord in all empty conduits. Test conduits required to be installed, but left empty; test with ball mandrel. Clear any conduit, which rejects ball mandrel. Pay costs involved for restoration of conduit and surrounding surfaces to original condition.

3.02 CONDUIT INSTALLATION

- A. Use Schedule 80 PVC throughout below grade and for turn ups including elbows and bends and where required. All buried conduits to be concrete encased.
- B. Use rigid aluminum for all above grade conduits.
- C. Cut conduits straight and properly ream.
- D. Field bend conduit with benders designed for purpose so as not to distort nor vary internal diameter.
 - 1. Size conduits to meet NFPA-70, except no conduit smaller than 3/4-inches shall be embedded in concrete or installed below grade.
 - 2. Fasten conduit terminations in sheet metal enclosures by threaded hubs, and terminate with insulating bushings.
 - 3. Complete installation of electrical raceways before starting installation of cables/wires within raceway.

3.03 CONCEALED CONDUITS

- A. Install coupling full depth to ensure watertight integrity.
- B. Install underground conduits minimum of 24-inches below finished grade.

3.04 CONDUITS IN CONCRETE SLAB

- A. Place conduits between bottom reinforcing steel and top reinforcing steel.
- B. Place conduits either parallel, or at 90° (degrees) to main reinforcing steel.
- C. Separate conduits by not less than diameter of largest conduit to ensure proper concrete bond.
- D. Conduits crossing in slab must be reviewed for proper cover by the County.

E. Embedded conduit diameter is not to exceed 1/3 (one-third) of slab thickness.

F. Install conduits as not to damage or run through structural members.

3.05 NON METALLIC CONDUITS

A. Make solvent cemented joints in accordance with recommendations of manufacturer.

B. Install PVC conduits in accordance with NFPA-70 and in compliance with local practices.

3.06 CONDUIT FITTINGS

A. Construct locknuts for securing conduit to metal enclosure with sharp edge for digging into metal, and ridged outside circumference for proper fastening.

B. Install insulated type bushings for terminating conduits. Bushings shall have cast flared bottom and ribbed sides. Upper edge to have phenolic insulating ring molded into bushing. Bushings shall be "O.Z" type or "B" or equal.

C. Bushings shall have screw type grounding terminal.

D. Miscellaneous fittings such as reducers, chase nipples, 3-piece unions, and plugs to be specifically designed for their particular application.

END OF SECTION

SECTION 16120
WIRES AND CABLES

PART 1 - GENERAL

1.01 RELATED DOCUMENTS

- A. Drawings and general provisions of Contract, including General and Supplementary Conditions and Division 1 Specifications sections, apply to work of this Section.
- B. Work described in this Section includes furnishing all labor, materials, equipment, tools and incidentals required for a complete and operable installation of all electrical conductors, wire and cables and associated splices, connectors, and termination for wiring systems rated 600 volts or less. All electrical conductors shall be installed, adjusted, tested and placed in operation in accordance with these Specifications, the manufacturer's recommendations and as shown on the Drawings.

1.02 DESCRIPTION OF WORK

- A. Extent of electrical wires and cable work is indicated by drawings and schedules.
- B. Types of electrical wire, cable, and connectors specified in this Section include the following:
 - 1. Copper conductors
 - 2. 2 and/or 4 bolt connectors
 - 3. Wire nut connectors
- C. Applications of electrical wire, cable, and connectors required for project are as follows:
 - 1. For power distribution circuits
 - 2. For control and equipment circuits
 - 3. For motor branch circuits

1.03 QUALITY ASSURANCE

- A. Manufacturers: Firms shall have sufficient experience that will allow for quality and successful manufacture of electrical wire and cable products of types, sizes and ratings required for items required for this Project.
- B. Installer's Qualifications: In addition to the requirements specified in Division 16 an independent testing firm shall meet OSHA criteria for accreditation of testing laboratories, Title 29, Part 1907 quality and successful installation of wire and cable products for this Project.
- C. NFPA-70 Compliance: Comply with NFPA-70 requirements as applicable to construction, installation and color-coding of electrical wires and cables.

- D. UL Compliance: Comply with applicable requirements of UL Std. 83, "Thermoplastic Insulated Wires and Cables" and Std. 486A, "Wire Connectors and Soldering for Use With Copper Conductors".
- E. UL Compliance: Provide wiring/cabling and connector products, which are UL, listed and labeled.
- F. NEMA/ICEA Compliance: Comply with NEMA/ICEA Std. Pub/No's WC5, Thermoplastic Insulated Wires and Cable for the "Transmission and Distribution of Electrical Energy", and WC30, "Color Coding of Wires and Cables", pertaining to electrical power type wires and cables.
- G. IEEE Compliance: Comply with applicable requirements of IEEE Standards 82, "Test Procedures for Impulse Voltage Tests on Insulated Conductors", and Standard. 241, "IEEE Recommended Practice for Electric Power Systems in Commercial Buildings" pertaining to wiring.
- H. ASTM Compliance: Comply with applicable requirements of ASTM B1, 2, 3, 8, and D-573. Provide copper conductors with conductivity of not less than 98% at 20°C (68°F.)
- I. FOIST Compliance: Comply with Federal Specifications J C 30, "Electrical Cable and Wire (Power, Fixed, Installation)", and W-S-610, "Splice Conductor."
- J. Listing and Labeling: Provide products specified in this Section that are listed and labeled.
 - 1. The Terms "Listed" and "Labeled": As defined in the "National Electrical Code", Article 100.
 - 2. Listing and Labeling Agency Qualifications: A "Nationally Recognized Testing Laboratory" (NTRL) as defined in OSHA Regulation 1910.7.

1.04 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: Submit manufacturer's data on electrical wires, cables, and conductors.
- C. A copy of this specification section, with addendum updates included, and all referenced and applicable sections, with addendum updates included, with each paragraph check-marked to indicate specification compliance or marked to indicate requested deviations from specification requirements. Check marks shall denote full compliance with a paragraph as a whole.
- D. If deviations from the specifications are indicated, and therefore requested by the Contractor, each deviation shall be underlined and denoted by a number in the margin to the right of the identified paragraph, referenced to a detailed written explanation of the reasons for requesting the deviation.

- E. The County shall be the final authority for determining acceptability of requested deviations. The remaining portions of the paragraph not underlined will signify compliance on the part of the Contractor with the specifications.
- F. Failure to include a copy of the marked-up specification sections, along with justification(s) for any requested deviations to the specification requirements, with the submittal shall be sufficient cause for rejection of the entire submittal with no further consideration.

1.05 DELIVERY, STORAGE, AND HANDLING

- A. Deliver wire and cable properly packaged in factory-fabricated type containers, or wound on NEMA specified type wire and cable reels.
- B. Store wire and cable in clean dry space in original containers. Protect products from weather, damaging fumes, construction debris and traffic.
- C. Handle wire and cable carefully to avoid abrasing, puncturing, and tearing wire and cable insulation and sheathing. Ensure that dielectric resistance integrity of wires/cables is maintained.

PART 2 - PRODUCTS

2.01 GENERAL

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

2.02 ACCEPTABLE MANUFACTURERS

- A. Available Manufacturers: Subject to compliance with requirements, manufacturers offering products which may be incorporated in the Work include, but are not limited to the following:
 - 1. Wire and Cable
 - a. Alpha Wire Corporation
 - b. Apex Wire and Cable Corp.
 - c. American Insulated Wire Corp.
 - d. American Wire and Cable Co.
 - e. Anaconda-Ericson Inc., Wire and Cable Div.
 - f. Beldon Div.; Cooper Industries
 - g. Brand-Rex Div.; Pyle National Co.
 - h. Cablec
 - i. Cerro Wire and Cable Corp.
 - j. Cleveland Insulated Wire Co.
 - k. Dekoron
 - l. Konite
 - m. Penn

- n. Pirelli
 - o. Phelps Dodge Cable and Wire Co.
 - p. Rome Cable Corp.
 - q. Southwire Corp.
 - r. Triangle PWC, Inc.
2. Connectors
- a. AMP, Inc.
 - b. Anderson
 - c. Appleton Electric Co.; Emerson Electric Co.
 - d. Burndy Corporation
 - e. Brand-Rex Div.; Pyle National Co.
 - f. Electrical Products Div.; Midland Ross Corp.
 - g. General Electric Co.
 - h. Ideal Industries, Inc.
 - i. 3M Company
 - j. Monograms Co.
 - k. O-Z/Gedney Co.
 - l. Pyrotenax
 - m. Southport Industries Inc.
 - n. Square D Company
 - o. Thomas and Betts Corp.

2.03 WIRES, CABLES, AND CONNECTORS

- A. General: Provide electrical wires, cables, and connectors of manufacturer's standard materials, as indicated by published product information; designed and constructed as recommended by manufacturer, for a complete installation, and for application indicated. Except as otherwise indicated, provide copper conductors with conductivity of not less than 98% at 20°C (68°F.)
- B. Building Materials: Provide factory-fabricated wires of sizes, ampacity ratings, and materials for applications and services indicated. Where not indicated, provide proper wire selection as determined by installer to comply with project's installation requirements, NFPA-70 and NEMA standards. Select from the following UL types, those wires with construction features, which fulfill project requirements.
1. Type THW/THHN/ THWN, dual rated: For dry or wet locations; maximum operating temperature 75°C (167°F.) Insulation, flame retardant, moisture and heat resistant, thermoplastic; outer covering, nylon jacket; conductor, annealed copper. NEMA WC-5 thermoplastic insulated building wire. 98% conductivity copper, 600V PVC insulated with nylon jacket, 75/90 wiring type. Minimum size #12 AWG. For control circuits minimum size #14 AWG.
 2. Type XHHW: For dry and wet locations; maximum operating temperature 90°C (194°F.) Insulation, flame retardant, cross-linked synthetic polymer; conductor, annealed copper.

3. Type 1 (600 Volt Multi-Conductor Control Conductor Cable, Type TC)
 - a. General: Multi conductor control circuit interconnection cable with ground. Suitable for installation in open air, in cable trays, conduit or other approved raceways. Minimum cable temperature rating 90°C dry locations, 75°C wet locations. Passes vertical tray flame test.
 - b. Individual Conductors: No. 14 AWG, 7-strand copper.
 - c. Insulation and Jackets: Provide conductors having 15-mil PVC insulation with 4-mil nylon jacket, and UL listed as Type THHN/THWN.

2.04 CABLES FOR VARIABLE FREQUENCY MOTORS

- A. General: All AC motors rated 600 volt (maximum) which are powered from AC Variable Frequency Drives (VFDs), so as to permit variable speed operation, shall be wired with shielded multiconductor Variable Frequency Drive Cable, specifically manufactured for that application in exposed applications. When in conduit, 600V THHN/THWN copper wire is acceptable
- B. Conform to NEC Article 336.
- C. Ratings
 1. 1,000 Volt UL flexible motor supply cable
 2. XLPE insulated, XHHW-2 90°C Wet/Dry
- D. Suitable for Class 1, Div. 2 hazardous locations.
- E. Suitable for direct burial, cable tray installation and conduit installation.
- F. Full-sized ground wire or equivalent.
- G. Overall shield with full-sized drain wire or equivalent.
- H. Belden Part No. 295XX, or approved equal.

2.05 TYPE 2 (600 VOLT NO. 16 AWG TWISTED, SHIELDED PAIR INSTRUMENTATION CABLE, TYPE TC)

- A. General: Single pair instrumentation cable designed for noise rejection for process control, computer, or data log applications. Suitable for installation in cable trays, conduit, or other approved raceways. Minimum cable temperature rating shall be 90°C dry locations, 75°C wet locations.
- B. Individual Conductors: Bare soft annealed copper, Class B, 7-strand concentric per ASTM B 8; 20 AWG, 7-strand tinned copper drain wire.
- C. Insulation and Jacket: Each conductor 15-mil nominal PVC and 4-mil nylon insulation. Pair conductors pigmented black and red. Jacket flame-retardant and sunlight and oil resistant PVC with 45-mil nominal thickness. Shield 1.35-mil aluminum/mylar overlapped to provide 100% coverage.

D. Dimension: 0.31-inch nominal OD.

2.06 TYPE 3 (600 VOLT NO. 16 AWG, MULTIPLE TWISTED SHIELDED PAIRS WITH A COMMON OVERALL SHIELD INSTRUMENTATION CABLE, TYPE TC)

A. General: Twisted, shielded pairs of instrument cables, grouped in a single cable, designed for use as instrumentation, process control, and computer cable. Suitable for installation in cable tray, conduit or other approved raceways. Minimum cable temperature rating shall be 90°C dry locations, 75°C wet locations.

B. Conductors: Bare soft annealed copper Class B, 7-strand, concentric per ASTM B 8. Tinned copper drain wires. Pair drain wire size AWG 20, group drain wire size AWG 18.

C. Insulation and Jacket: Each conductor 15-mil PVC and 4-mil nylon insulation. Pair conductors pigmented black and red with red conductor numerically printed for group identification. Outer jacket flame retardant and sunlight and oil resistant PVC with nominal thickness as shown in table. Individual pair shield 1.35-mil aluminum/mylar. Group shield 2.35-mil aluminum/mylar, overlapped for 100% coverage.

D. Dimensions as noted in table below:

No. of Pairs	Max. Outside Dimension (inches)	Nominal Jacket Thickness(mils)
4	0.50	45
8	0.77	60
12	0.82	60
24	1.16	60

2.07 TYPE 4 (600 VOLT NO. 16 AWG, SINGLE TWISTED, SHIELDED TRIAD INSTRUMENTATION CABLE)

A. General: Twisted, shielded triad instrument cables, designed for use as instrumentation, process control, and computer cable. Suitable for installation in cable tray, conduit or other approved raceways. Minimum cable temperature rating shall be 90°C dry locations, 75°C wet locations.

B. Conductors: Bare soft annealed copper Class B, 7-strand, concentric per ASTM B 8. Tinned copper drain wires. Triad drain wire size AWG 18.

C. Insulation and Jacket: Each conductor 15-mil PVC and 4-mil nylon insulation. Triad conductors pigmented black, white and red. Outer jacket flame retardant and sunlight and oil resistant PVC with nominal thickness. Individual triad shield 1.35-mil aluminum/mylar.

2.08 EQUIPMENT GROUNDING CONDUCTORS

- A. Provide stranded copper conductors, as indicated or as required by NEC, for equipment grounding.
- B. Provide conductors bare.

2.09 CONNECTORS

- A. General: Provide UL type factory-fabricated, metal connectors of sizes, ampacity ratings, materials, types and classes for applications and for services indicated. Where not indicated, provide proper selection as determined by Installer to comply with project's installation requirements, NFPA-70 and NEMA standards. Select from the following those types, classes, kinds and styles of connectors to fulfill project requirements:
 - 1. Type: Pressure
 - 2. Type: Crimp
 - 3. Type: Threaded
 - 4. Class: Insulated
 - 5. Kind: Copper (for CU to CU connection)
 - 6. Style: Butt connection
 - 7. Style: Elbow connection
 - 8. Style: Combined "T" and straight connection
 - 9. Style: "T" connection
 - 10. Style: 2 or 4 bolt parallel connection. Use of split bolt connectors is prohibited
 - 11. Style: Tap connection
 - 12. Style: Pigtail connection
 - 13. Style: Wire nut connection

PART 3 - EXECUTION

3.01 INSTALLATION OF WIRES AND CABLES

- A. General: Install electrical cables, wire and wiring connectors as indicated, in compliance with applicable requirements of NFPA-70, NEMA, UL, and NECA's "Standard of Installation" and in accordance with recognized industry practices.
- B. Coordinate wire/cable installation work including electrical raceway and equipment installation work, as necessary to properly interface installation of wires/cables with other work.
- C. Install UL type wiring in conduit, for feeders and branch circuits.
- D. Pull conductors simultaneously where more than 1 is being installed in same raceway.
- E. Use pulling compound or lubricant, where necessary; compound used must not deteriorate conductor or insulator.

- F. Use pulling means including, fish tape, cable, rope and basket weave wire/cable grips, which will not damage cables or raceways.
- G. Keep conductor splices to a minimum.
- H. Install splices and tapes, which possess equivalent or better mechanical strength and insulation ratings than conductors being spliced.
- I. Use splice and tap connectors, which are compatible with conductor material.
- J. Tighten electrical connectors and terminals, including screws and bolts, in accordance with manufacturer's published torque tightening values. Where manufacturer's torquing requirements are not indicated, tighten connectors and terminals to comply with tightening torques specified in UL Standard 486A and B.
- K. Use only stranded conductors. Exception: Solid conductors size #12 and #10 AWG may be used for receptacle branch circuit wiring and lighting.
- L. Use #10 AWG conductor for 20-ampere, 120-volt branch circuit home runs longer than 75-feet, and for 20-ampere, 277-volt branch circuit home runs longer than 200-feet.
- M. Neatly train and lace wiring inside boxes, equipment, and panel boards. Support to prevent conductor movement under fault conditions.
- N. All underground wiring shall be suitable for wet locations per NEC.
- O. Discrete control 120-VAC and 4-20mA signals must not be run in same conduit. Discrete control 120-VAC and 4-20mA signal wiring in control panels and cabinets shall be separated from each other and when required, should cross perpendicular with each other to reduce signal noise.
- P. Avoid unnecessary splices. Splice only in accessible junction or outlet boxes.
- Q. Make all connections with solderless lugs.
- R. Use mechanical connectors for low voltage splices, taps, fixture and motor connections.
- S. Use insulated spade type crimp on connectors for strap screw device terminals.
- T. Where possible use connectors with integral, insulating covers. Otherwise tape uninsulated conductors and connectors to 150% of the insulation value of conductor.
- U. Thoroughly clean wires before installing lugs and connectors.
- V. Make splices, taps and terminations to carry full ampacity of conductors without perceptible temperature rise.

3.02 FIELD QUALITY CONTROL

- A. Prior to energization of circuitry, check installed wires and cables with megohm meter to determine insulation resistance levels to ensure requirements are fulfilled.
- B. Prior to energization, test wires and cables for electrical continuity and for short circuits.
- C. Subsequent to wire and cable hook-ups, energize circuitry and demonstrate functioning in accordance with requirements. Where necessary, correct malfunctioning units, and then retest to demonstrate compliance.

END OF SECTION

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SECTION 16135
ELECTRICAL BOXES AND FITTINGS

PART 1 - GENERAL

1.01 RELATED DOCUMENTS

- A. Drawings and general provisions of Contract, including General and Supplementary Conditions and Division 1 Specification sections, apply to work of this Section.
- B. Work described in this Section includes furnishing all labor, materials, equipment, tools and incidentals required for a complete and operable installation of boxes, bushings and locknuts. All equipment shall be installed, adjusted, tested and placed in operation in accordance with these Specifications, the manufacturer's recommendations and as shown on the Drawings.

1.02 DESCRIPTION OF WORK

- A. Extent of electrical box and associated fitting work is indicated by drawings and schedules.
- B. Types of electrical boxes and fittings specified in this Section include the following:
 - 1. Outlet boxes
 - 2. Junction boxes
 - 3. Pull boxes
 - 4. Bushings
 - 5. Locknuts

1.03 QUALITY ASSURANCE

- A. Manufacturers: Firms shall have sufficient experience that will allow for quality and successful manufacture of electrical boxes and fittings of types, sizes and capacities required for manufacture of electrical boxes and fittings required for use in this Project.
- B. Installer's Qualifications: Firms shall have sufficient experience that will allow for quality and successful installation of electrical boxes and fittings required for this Project.
- C. NFPA-70 Compliance: Comply with NFPA-70 as applicable to construction and installation of electrical wiring boxes and fittings.
- D. UL Compliance: Comply with applicable requirements of UL 50, UL 514 Series, and UL 886 pertaining to electrical boxes and fittings which are UL listed and labeled.

- E. NEMA Compliance: Comply with applicable requirements of NEMA Standard Publication Numbers OS1, OS2, and Pub.250 pertaining to outlets and device boxes, covers and box supports.
- F. Comply with NECA "Standard of Installation."
- G. Listing and Labeling: Provide products specified in this Section that are listed and labeled.
 - 1. The Terms "Listed" and "Labeled." As defined in the "National Electrical Code", Article 100.
 - 2. Listing and Labeling Agency Qualifications: A "Nationally Recognized Testing Laboratory" (NRTL) as defined in OSHA Regulation 1910.7.

1.04 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: Submit manufacturer's data on electrical boxes and fittings.
- C. A copy of this specification section with addendum updates included, and all referenced and applicable sections with addendum updates included, with each paragraph check-marked to indicate specification compliance or marked to indicate requested deviations from specification requirements. Check marks shall denote full compliance with a paragraph as a whole.
- D. If deviations from the specifications are indicated and therefore requested by the Contractor, each deviation shall be underlined and denoted by a number in the margin to the right of the identified paragraph, referenced to a detailed written explanation of the reasons for requesting the deviation.
- E. The County shall be the final authority for determining acceptability of requested deviations. The remaining portions of the paragraph not underlined will signify compliance on the part of the Contractor with the specifications.
- F. Failure to include a copy of the marked-up specification sections along with justification(s) for any requested deviations to the specification requirements, with the submittal shall be sufficient cause for rejection of the entire submittal with no further consideration.

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 FABRICATED MATERIALS

- A. Outlet Boxes: Provide corrosion resistant cast metal rain tight outlet wiring boxes, of types, shapes and sizes, including depth of boxes, with threaded conduit holes for fastening electrical conduit, cast metal face plates with spring-hinged watertight caps suitably configured for each application, including face plate gaskets and corrosion resistant plugs and fasteners.
 - 1. Manufacturers: Subject to compliance with requirements, provide rain tight outlet boxes of 1 of the following:
 - a. Appleton Electric; Emerson Electric Co.
 - b. Arrow Hart Div.; Crouse-Hinds Co.
 - c. Bell Electric; Square D Co.
 - d. Harvey Hubbell, Inc.
 - e. OZ/Gedney; General Signal Co.
 - f. Pass and Seymour, Inc.
- B. Junction and Pull Boxes: Provide NEMA 4X Stainless Steel junction and pull boxes, with screw-on covers; of types, shapes, and sizes to suit each respective location and installation; with welded seams and equipped with stainless steel nuts, bolts, screws and washers.
 - 1. Manufacturers: Subject to compliance with requirements, provide junction and pull boxes of 1 of the following:
 - a. Adalet-PLM Div.; Scott Fetzer Co.
 - b. Appleton Electric; Emerson Electric Co.
 - c. Arrow Hart Div.; Crouse Hinds-Co.
 - d. Bell Electric; Square D Company
 - e. OZ/Gedney Co.; General Signal Co.
 - f. Spring City Electrical Mfg. Co.
- C. Bushings, Knockout Closures and Locknuts: Provide corrosion resistant box knockout closures, conduit locknuts and malleable iron conduit bushings, offset connectors, of types and sizes, to suit respective installation requirements and applications.
 - 1. Manufacturers: Subject to compliance with requirements, provide bushings, knockout closures, locknuts and connectors of 1 of the following:
 - a. Adalet-PLM Div.; Scott Fetzer Co.
 - b. AMP, Inc.
 - c. Arrow Hart Div.; Crouse-Hinds Co.
 - d. Appleton Electric Co.; Emerson Electric Co.
 - e. Bell Electric; Square D Co.
 - f. Midland Ross Corp.

- g. Midwest Electric; Cooper Industries, Inc.
- h. OZ/Gedney Co.; General Signal Co.
- i. RACO Div.; Harvey Hubbell, Inc.
- j. Thomas and Betts Co. Inc.

PART 3 - EXECUTION

3.01 INSTALLATION OF ELECTRICAL BOXES AND FITTINGS

- A. General: Install electrical boxes and fittings as indicated, in accordance with manufacturer's written instructions, applicable requirements of NFPA-70 and NECA's "Standard of Installation", and in accordance with recognized industry practices to fulfill project requirements.
- B. Coordinate installation of electrical boxes and fittings with wire/cable, wiring devices, and raceway installation work.
- C. Provide weather tight outlets at all locations.
- D. Provide knockout closures to cap unused knockout holes where blanks have been removed.
- E. Install electrical boxes in those locations, which ensure ready accessibility to enclosed electrical wiring.
- F. Fasten electrical boxes firmly and rigidly to substrates, or structural surfaces to which attached, or solidly embed electrical boxes in concrete or masonry.
- G. Provide electrical connections for installed boxes.
- H. Subsequent to installation of boxes, protect boxes from construction debris and damage.

3.02 GROUNDING

- A. Upon completion of installation work, properly ground electrical boxes and demonstrate compliance with requirements.

END OF SECTION

SECTION 16142
ELECTRICAL CONNECTIONS FOR EQUIPMENT

PART 1 - GENERAL

1.01 RELATED DOCUMENTS

- A. Drawings and general provisions of Contract, including General and Supplementary Conditions and Division 1 Specifications sections, apply to work of this Section.
- B. Work described in this Section includes furnishing all labor, materials, equipment, tools and incidentals required for a complete and operable installation of all electrical connections for wiring systems rated 600 volts or less. All electrical connections shall be installed, adjusted, tested and placed in operation in accordance with these Specifications, the manufacturer's recommendations and as shown on the Drawings.

1.02 DESCRIPTION OF WORK

- A. Extent of electrical connections for equipment is indicated by drawings and schedules. Electrical connections are hereby defined to include connections used for providing electrical power to equipment.
- B. Applications of electrical power connections specified in this Section include the following, but not limited:
 - 1. From electrical source to control panel
 - 2. From control panel to motors and control devices
- C. Electrical connections for equipment, not furnished as integral part of equipment, are specified in Division 15 and other Division 16 sections, and are work of this Section.
- D. Refer to Division 15 sections for motor starters and controller furnished integrally with equipment; not work of this Section.
- E. Junction boxes and disconnect switches required for connecting motors and other electrical units of equipment are specified in applicable Division 16 sections, and are work of this Section.
- F. Raceways and wires/cables required for connecting motors and other electrical units of equipment are specified in applicable Division 16 sections, and are work of this Section.
- G. Refer to Division 15 or Division 13 sections as applicable for control system wiring; not work of this Section.
- H. Refer to sections of other Divisions for specific individual equipment power requirements, not work of this Section.

1.03 QUALITY ASSURANCE

- A. Manufacturers: Firms shall have sufficient experience and be regularly engaged in manufacture of electrical connectors and terminals, of types and rating required, and ancillary connection materials, including electrical insulating tape, soldering fluxes, and cable ties, whose products have been in satisfactory use in projects with similar service as this Project.
- B. Installer's Qualifications: Firms shall have sufficient experience to allow for quality and successful installation utilizing electrical connections for equipment for this Project.
- C. NFPA-70 Compliance: Comply with applicable requirements of NFPA-70 as to type of products used and installation of electrical power connections (terminals and splices), for junction boxes, motor starters and disconnect switches.
- D. IEEE Compliance: Comply with Std. 241, "IEEE Recommended Practice for Electric Power Systems in Commercial Buildings" pertaining to connections and terminations.
- E. ANSI Compliance: Comply with applicable requirement of ANSI/NEMA and ANSI/EIA standards pertaining to products and installation of electrical connections for equipment.
- F. UL Compliance: Comply with UL Std.486A, "Wire Connectors and Soldering Lugs for Use with Copper Conductors" including, but not limited to, tightening of electrical connectors to torque values indicated. Provide electrical connection products and materials which are UL listed and labeled.

1.04 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: Submit manufacturer's data on electrical connections for equipment products and materials.
- C. A copy of this specification section with addendum updates included, and all referenced and applicable sections with addendum updates included, with each paragraph check-marked to indicate specification compliance or marked to indicate requested deviations from specification requirements. Check marks shall denote full compliance with a paragraph as a whole.
- D. If deviations from the specifications are indicated, and therefore requested by the Contractor, each deviation shall be underlined and denoted by a number in the margin to the right of the identified paragraph, referenced to a detailed written explanation of the reasons for requesting the deviation.
- E. The County shall be the final authority for determining acceptability of requested deviations. The remaining portions of the paragraph not underlined will signify compliance on the part of the Contractor with the specifications.

- F. Failure to include a copy of the marked-up specification sections along with justification(s) for any requested deviations to the specification requirements, with the submittal shall be sufficient cause for rejection of the entire submittal with no further consideration.

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 ACCEPTABLE MANUFACTURERS

- A. Manufacturers: Subject to compliance with requirements, provide products of one of the following (for each type of product):
 1. Adalet PLM Div., Scott and Fetzer Co.
 2. Allen Stevens Conduit Fittings Corp.
 3. AMP Inc.
 4. Appleton Electric Co.
 5. Arrow Hart Div., Crouse Hinds Co.
 6. Burndy Corp.
 7. General Electric Co.
 8. Harvey Hubbell Inc.
 9. Ideal Industries, Inc.
 10. Pyle National Co.
 11. Reliable Electric Co.
 12. Square D Company
 13. Thomas and Betts Corp.

2.03 MATERIALS AND COMPONENTS

- A. General: For each electrical connection indicated, provide complete assembly of materials, including but not necessarily limited to; pressure connectors, terminals (lugs), electrical insulating tape, heat shrinkable insulating tubing, cables ties, solderless wire nuts, and other items and accessories as needed to complete splices and terminations of types indicated.

2.04 CONDUIT, TUBING AND FITTINGS

- A. General: Provide conduit, tubing, and fittings of types, grades, sizes, and weights (wall thickness) indicated for each type service. Where types and grades are not indicated, provide proper selection to fulfill wiring requirements, and comply with NFPA-70 requirements for raceways. Provide products complying with Section 16110 "Raceways" and in accordance with the following listing of conduit, tubing and fittings:
 1. Schedule 80 PVC conduit
 2. Schedule 80 PVC fittings

3. Liquid-tight flexible metal conduit
4. Liquid-tight flexible metal conduit fittings
5. Rigid aluminum conduit
6. Rigid aluminum conduit fittings

2.05 WIRES, CABLES AND CONNECTORS

- A. General: Provide wires, cables, and connectors complying with Section 16120 "Wires and Cables."
- B. Wires/Cables: Unless otherwise indicated, provide wires/cables (conductors) for electrical connections which match, including sizes and ratings, of wires/cables which are supplying electrical power. Provide copper conductors with conductivity of not less than 98% at 20°C (68°F)
- C. Connectors and Terminals: Provide electrical connectors and terminals which mate and match, including sizes and ratings, with equipment terminals and are recommended by equipment manufacturer for intended applications.
- D. Electrical Connection Accessories: Provide electrical insulating tape, heat shrinkable insulating tubing and boots, wire nuts and cable ties as recommended for use by accessories manufacturers for type services indicated.

PART 3 - EXECUTION

3.01 INSPECTION

- A. Inspect area and conditions under which electrical connections for equipment are to be installed and notify Contractor in writing of conditions detrimental to proper completion of the Work. Do not proceed with the Work until unsatisfactory conditions have been corrected in a manner acceptable to Installer and/or owner as applicable.

3.02 INSTALLATION OF ELECTRICAL CONNECTIONS

- A. Install electrical connections as indicated; in accordance with equipment manufacturer's written instructions and with recognized industry practices, and complying with applicable requirements of UL, NFPA-70, and NECA's "Standard of Installation" to ensure that products fulfill requirements.
- B. Coordinate with other work, including wires/cables, raceways and equipment installation, as necessary to properly interface installment of electrical connections for equipment with other work.
- C. Connect electrical power supply conductors to equipment conductors in accordance with equipment manufacturer's written instructions and wiring diagrams. Mate and match conductors of electrical connections for proper interface between electrical power supplies and installed equipment.

- D. Cover splices with electrical insulating material equivalent to, or of greater insulation resistivity ratings, than electrical insulation rating of those conductors being spliced.
- E. Prepare cables and wires, by cutting and stripping covering armor, jacket, and insulation properly to ensure uniform and neat appearance where cables and wires are terminated. Exercise care to avoid cutting through tapes, which will remain on conductors. Also avoid "ringing" copper conductors while skinning wire.
- F. Tighten connectors and terminals, including screws and bolts, in accordance with equipment manufacturers published torque-tightening values for equipment connectors. Accomplish tightening by utilizing proper torquing tools, including torque screwdriver, bean type torque wrench, and ratchet wrench with adjustable torque settings. Where manufacturer's torquing requirements are not available, tighten connectors and terminals to comply with torquing values contained in UL's 486A.
- G. Provide liquid tight flexible conduit for connections of motors and other electrical equipment where subject to movement and vibration.
- H. Fasten identification markers to each electrical power supply wire/cable conductor which indicates their voltage, phase and feeder number in accordance with Section 16195 "Electrical Identification." Affix markers on each terminal conductor, as close as possible to the point of connection.

3.03 FIELD QUALITY CONTROL

- A. Upon completion of installation of electrical connections, and after circuitry has been energized with rated power source, test connections to demonstrate capability and compliance with requirements. Ensure that direction of rotation of each motor fulfills requirement. Correct malfunctioning units at site, then retest to demonstrate compliance.

END OF SECTION

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SECTION 16450

GROUNDING

PART 1 - GENERAL

1.01 RELATED DOCUMENTS

- A. Drawings and general provisions of Contract, including General and Supplementary Conditions and Division 1 Specification sections, apply to work of this Section.

1.02 DESCRIPTION OF WORK

- A. Extent of grounding work is indicated by these specifications. This Section specifies the system for grounding electrical distribution and utilization equipment cabinets, motor frames, manholes, instrumentation, metal surfaces of process/mechanical equipment that contain energized electrical components, metal structures and buildings, outdoor metal enclosures, fences and gates. This Section also includes grounding of electrical systems and equipment and basic requirements for grounding for protection of life, equipment, circuits, and systems. Grounding requirements specified in this Section may be supplemented in other Sections of these Specifications.
- B. Work described in this Section includes furnishing all labor, materials, equipment, tools and incidentals required for a complete installation of grounding system. All work shall be installed, adjusted and tested in accordance with these Specifications, the manufacturer's recommendations and as shown on the Drawings. Types of grounding specified in this Section include the following:
 - 1. Solid Grounding
- C. Applications of grounding work in this Section include the following:
 - 1. Underground metal piping
 - 2. Grounding electrodes
 - 3. Grounding rods
 - 4. Service equipment
 - 5. Enclosures
 - 6. Equipment
 - 7. Fences and gates

1.03 QUALITY ASSURANCE

- A. Manufacturers: Firms shall have sufficient experience in the manufacture of electrical connectors, terminals and fittings, of types and ratings required, and ancillary grounding materials, including stranded cables, copper braid and bus, ground rods and plate electrodes, for manufacture of grounding equipment for use in this Project.

- B. Installer: Firms shall have sufficient experience to allow for quality and successful installation of grounding equipment for this Project.
- C. NFPA-70 Compliance: Comply with NFPA-70 requirements as applicable to materials and installation of electrical grounding systems, associated equipment and wiring. Provide grounding products which are UL listed and labeled.
- D. UL Compliance: Comply with applicable requirements of UL Standards Numbers 467 and 869 pertaining to electrical grounding and bonding.
- E. IEEE Compliance: Comply with applicable requirements of IEEE Standard 81, 142 and 241 pertaining to electrical grounding.
- F. NETA Compliance: Comply with the International Electrical Testing Association, Inc. Acceptance Testing Specifications.
- G. Testing Agency Qualifications: A "Nationally Recognized Testing Laboratory" (NRTL) as defined in OSHA Regulation 1910.7, or a full member company of the international Electrical Testing Association (NETA).
 - 1. Testing Agency Field Supervision: Use persons currently certified by NETA or the National Institute for Certification in Engineering Technologies to supervise on-site testing specified in Part 3.
- H. Comply with NFPA 70.
- I. Comply with UL 467.
- J. Listing and Labeling: Provide products specified in this Section that are listed and labeled.
 - 1. The Terms "Listed" and "Labeled." As defined in the National Electrical Code, Article 100.
 - 2. Listing and Labeling Agency Qualifications: A "Nationally Recognized Testing Laboratory" (NRTL) as defined in OSHA Regulation 1910.7.
- K. See also Section 16010 Part 1 for listing of applicable reference standards.

1.04 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: Submit manufacturer's data on grounding systems and accessories.
- C. A copy of this specification section with addendum updates included, and all referenced and applicable sections with addendum updates included, with each paragraph check-marked to indicate specification compliance or marked to indicate requested deviations from specification requirements. Check marks shall denote full compliance with a paragraph as a whole.

- D. If deviations from the specifications are indicated, and therefore requested by the Contractor, each deviation shall be underlined and denoted by a number in the margin to the right of the identified paragraph, referenced to a detailed written explanation of the reasons for requesting the deviation.
- E. The County shall be the final authority for determining acceptability of requested deviations. The remaining portions of the paragraph not underlined will signify compliance on the part of the Contractor with the specifications.
- F. Failure to include a copy of the marked-up specification sections along with justification(s) for any requested deviations to the specification requirements, with the submittal shall be sufficient cause for rejection of the entire submittal with no further consideration.

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 ACCEPTABLE MANUFACTURERS

- A. Manufacturers: Subject to compliance with requirements, provide grounding products of one of the following:
 1. Apache Grounding; Nashville Wire Products
 2. Chance: A. B. Chance Co.
 3. B-Line Systems, Inc.
 4. Burndy Corp.
 5. Crouse-Hinds Co.
 6. Electrical Components Div.; Grould, Inc.
 7. Galvan Industries, Inc.
 8. General Electric Supply Co.
 9. Hastings Fiber Glass Products, Inc.
 10. Heary Brothers Lightning Protection Co.
 11. Kearney
 12. Ideal Industries, Inc.
 13. Lightning Master Corp.
 14. Lyncole XIT Grounding.
 15. O-Z/Gedney Co.
 16. Raco, Inc.
 17. Thomas and Betts Corp.

2.03 GROUNDING SYSTEMS

A. Materials and Components

1. General: Except as otherwise indicated, provide electrical grounding systems indicated; with assembly of materials, including, but not limited to, cables/wires, connectors, terminals (solderless lugs), grounding rods/electrodes, and plate electrodes, bonding jumper braid, surge arrestors, and additional accessories needed for complete installation. Where more than one type unit meets indicated requirements, selection is Installer's option. Where materials or components are not indicated, provide products complying with NFPA-70, UL, IEEE, and established industry standards for applications indicated.
2. Governing Requirements: Where types, sizes, ratings, and quantities indicated are in excess of National Electrical Code (NEC) requirements, the more stringent requirement and the greater size, rating, and quantity indications shown shall be adhered.
3. A counterpoise cable grounding system installed a minimum of 30-inches below grade, shall be installed with connections to at least the following equipment:
 - a. Wetwell cover
 - b. Valve vault cover
 - c. Control panels
 - d. Generator
 - e. Electrical system grounding electrode conductor
 - f. Main disconnect switch
 - g. Fence
 - h. Emergency bypass piping and station back flow preventer and water spigot to be bonded
 - i. Exception: Ground connection to fencing is not required for PVC coated chain link fence framing, concrete block wall, or wood fencing.
4. Provide raceways, and electrical boxes and fittings complying with accordance with the following listing:
 - a. PVC conduit
 - b. PVC conduit fittings
 - c. Liquid-tight flexible metal conduit
 - d. Liquid-tight flexible metal conduit fittings
 - e. Rigid aluminum conduit
 - f. Rigid aluminum conduit fittings

B. Conductors: Unless otherwise indicated, provide electrical grounding conductors for grounding connections matching power supply wiring materials and sized according to NFPA-70.

C. Ground Rods: Steel with copper welded exterior, 3/4-inch dia. x 10-feet.

D. Electrical Grounding Connection Accessories: Provide electrical insulating tape, heat-shrinkable insulating tubing, welding materials, bonding straps, as recommended by accessories manufacturers for type services indicated.

E. Comply with Division 16 Section 16120 "Wires and Cables." Conform the NEC Table 8, except as otherwise indicated, for conductor properties, including stranding.

- F. Equipment Grounding Conductors: Insulated copper with green color insulation.
- G. Grounding-Electrode Conductors: Stranded copper cable.
- H. Underground Conductors: Bare and stranded copper.
- I. Bare Copper Conductors: Conform to the following:
 - 1. Solid Conductors: ASTM B3
 - 2. Assembly of Stranded conductors: ASTM B8
- J. Ground cable shall be soft-drawn, bare annealed copper, concentric stranded, as specified.
- K. The minimum sizes shall be as follows, where American Wire Gauge (AWG) cable sizes are not shown or specified:

5 and 15 kV switchgear	2/0 or 4/0 AWG
5 kV motor starters	2/0 or 4/0 AWG
15 kV-5 kV transformers	2/0 or 4/0 AWG
5 kV-480V transformers	2/0 or 4/0 AWG
480V switchgear	2/0 or 4/0 AWG
480V switchboards	2/0 or 4/0 AWG
480V MCC and	2/0 or 4/0 AWG
Cable tray	2/0 or 4/0 AWG
Large motors 250 hp & >	2/0 or 4/0 AWG
Lighting & Power panels	2 AWG
Exposed metal cabinets	2 AWG
Electrical equipment	2 AWG
Buildings and enclosure	2 AWG
Fences and gates	2 AWG
Motors 25 hp to 250 hp	2 AWG
Motors 1 hp to 25 hp	6 AWG
- L. Grounding Bus: Bare, annealed copper bars of rectangular cross section.
- M. Braided Bonding Jumpers: Copper tape, braided Number 3/0 AWG bare copper wire, terminated with copper ferrules.
- N. Bonding straps: Soft copper, 0.05-inch (1-mm) thick and 2-inches (50-mm) wide, except as indicated.
- O. Compression connections shall be irreversible, cast copper, high conductivity as manufactured by Thomas and Betts, or equal.
- P. Bolted connectors shall be Burndy, O. Z. Gedney, or equal heavy-duty type.

- Q. Exothermic welding products shall be Erico's Cadweld Plus system with electronic ignition device and moisture resistant weld metal cup for the required mold, or equal. Connectors shall be provided in kit form and selected per manufacturer's written instructions for specific types, sizes, and combination of conductors and connected items.
- R. Provide concrete test well with cover and connect the ground grid extension using a removable connector.
- S. Copper equipment ground bars shall be Erico Eritech EGB Series or equal, sized as required for the installation.

PART 3 - EXECUTION

3.01 APPLICATION AND TESTING

- A. Contractor shall test ground rod in presence of R.P.R. or Engineer to obtain a ground resistance value of less than 5 ohms.
- B. Maximum distance between counterpoise ground rods shall be 100-feet. Provide additional ground rods as required.
- C. Counterpoise shall be installed a minimum of 30-inches below grade.
- D. Tests: Before making connections to the ground electrode, measure the resistance of the electrode to ground using a ground resistance tester specifically designed for ground resistance testing. Perform the test not less than 2-days after the most recent rainfall, and in the afternoon after any ground condensation (dew) has evaporated. If a resistance less than the performance requirements is not obtained, provide a ground rod driven 6-inches below grade spaced 10-feet away from the ground well and connect to ground test well with Number 2/0 tinned stranded copper wire and repeat the test. If the performance requirements are still not obtained, inform the County for resolution. Testing results by a certified testing agency using fall of potential testing as described by NETA (International Electrical Testing Association).
- E. Provide a certified copy of the grounding test report to the County.
- F. Equipment grounding Conductors: Comply with NEC Article 250 for types, sizes, and quantities of equipment grounding conductors, except where specific types, larger sizes, or more conductors than required by NEC are indicated.
 - 1. Install equipment grounding conductor with circuit conductors for the items below in addition to those required by Code:
 - a. Feeders and branch circuits
 - b. Lighting circuits
 - c. Receptacle circuits
 - d. Single-phase motor or appliance branch circuits
 - e. Three-phase motor or appliance branch circuits
 - f. Flexible raceway runs

2. Metallic Raceways: Raceways, conduits and cable trays, etc. shall be made electrically continuous, and shall be bonded/grounded to earth. Utilize bonding/grounding wires, jumpers, clamps, etc. as necessary to meet requirements of NEC.
 3. Non-metallic Raceways: Install a grounding conductor in non-metallic raceways unless they are designated for telephone or data cables.
 4. Air-Duct Equipment Circuits: Install a grounding conductor to duct mounted electrical devices operating at 120 V and above, including air cleaners and heaters. Bond conductor to each unit and to air duct.
 5. Water Heater, Heat-Tracing, and Anti-frost Heater Circuits: Install a separate grounding conductor to each electric water heater, heat-tracing assembly, and anti-frost heating cable. Bond conductor to heater units, piping, connected equipment, and components.
- G. Signal and Communication Systems: For telephone, alarm, voice and data, and other communication systems, provide a Number 4 AWG minimum insulated grounding conductor from grounding-electrode system to each service location, backboard, terminal cabinet, wiring closet, and central equipment location.
1. Service and Central equipment Locations and wiring Closets: Terminate grounding conductor on a 1/4 by 2 by 12-inch (6 by 50 by 300-mm) grounding.
 2. Terminal Cabinets: Terminate grounding conductor on cabinet grounding terminal.
- H. Separately Derived Systems: Where NEC requires grounding, ground according to NEC.
- I. Metal Poles Supporting Lighting Fixtures: Ground pole to a grounding electrode in addition to separate equipment grounding conductor run with supply branch circuit.
- J. General: Ground electrical systems and equipment according to NEC requirements, except where Drawings or Specifications exceed NEC requirements.
- K. Grounding Electrode System: Where available on the premises, at each building or structure served, a metal underground water pipe, the metal frame of the building or structure, concrete encased electrodes, any ground ring encircling the building or structure and all made electrodes (ground rods, etc.) shall be bonded together to form the grounding electrode system. The main bonding jumper and the grounding electrode conductor shall be installed and sized per NEC except where larger sizes than required by NEC are indicated.
- L. Grounding Rods: A minimum of two (2) ground rods shall be installed where the ground rod serves as the grounding electrode per NEC. Locate a minimum of 1-rod length from each other and at least the same distance from any other grounding electrode.
1. Drive until tops are 2-inches (50-mm) below finished floor or final grade, except as otherwise indicated.
 2. Interconnect with grounding-electrode conductors except at test wells and as otherwise indicated. Use exothermic welds or irreversible compression connections. Make these connections without damaging copper coating or exposing steel.
- M. Grounding Conductors: Route along the shortest and straightest paths possible, except as otherwise indicated. Avoid obstructing access or placing conductors where they may be subjected to strain, impact, or damage.

- N. Grounding conductors, insulated and color coded green, shall be provided in all low voltage feeder and sub-feeder and branch circuit conduit runs, except low voltage service entrance conduit runs which contain a grounded neutral. These grounding conductors shall be connected to all metallic conduits by means of approved grounding bushings at all conduit terminations at the supply end of all feeders.
- O. General: Make connections so possibility of galvanic action or electrolysis is minimized. Select connectors, connection hardware, conductors, and connection methods so metals in direct contact will be galvanically compatible.
1. Use electroplated or tin-coated materials to assure high conductivity and to make contact points closer in order of galvanic series.
 2. Make connections with clean, bare metal at points of contact.
 3. Make aluminum-to-steel connections with stainless steel separators and mechanical clamps.
 4. Make aluminum-to-galvanized steel with tin-plated copper jumpers and mechanical clamps.
 5. Coat and seal connections having dissimilar metals with inert material to prevent future penetration of moisture to contact surfaces.
- P. Exothermic-Welded Connections: Use for connections to structural steel and for underground connections, except those at test wells. Comply with manufacturer written instructions. Welds that are puffed up or that show convex surfaces indicating improper cleaning are not acceptable. Irreversible compression connections may be acceptable as an alternate method.
- Q. Equipment Grounding-Wire Terminations: For Number 8 AWG and larger, use pressure-type grounding lugs. Number 10 AWG and smaller grounding conductors may be terminated with winged pressure-type connectors.
- R. Non-contact metal Raceway Terminations: Where metallic raceways terminate at metal housings without mechanical and electrical connection to housing, terminate each conduit with a grounding bushing. Connect grounding bushings with a bare grounding conductor to grounding bus or terminal in housing. Bond electrically non-continuous conduits at both entrances and exits with the grounding conductors, except as otherwise indicated.
- S. Connections at Test Wells: Use compression-type connectors on conductors and make bolted and clamped-type connections between conductors and grounding rods.
- T. Tighten screws and bolts for grounding and bonding connectors and terminals according to manufacturer's published torque-tightening values. Where these requirements are not available, use those specified in UL 486A and UL 486B.
- U. Compression-Type Connections: Use hydraulic compression tools to provide correct circumferential pressure for compression connectors. Use tools and dies recommended by manufacturer of connectors. Provide embossing die code or other standard method to make a visible indication that a connector has been adequately compressed on grounding conductor.

END OF SECTION

APPENDIX C

ORANGE COUNTY UTILITIES

PERMITS OBTAINED BY COUNTY

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APPENDIX D

ORANGE COUNTY UTILITIES Standards and Construction Specification Manual

LIST OF APPROVED PRODUCTS

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APPENDIX D

LIST OF APPROVED PRODUCTS - TRANSMISSION SYSTEMS

FEBRUARY 11, 2011

Cat.	Desc	Manufacturer	Water		Reclaimed Water		Wastewater	
			Model #	Comments	Model #	Comments	Model #	Comments
Air Release	ARV Enclosure	All ARV above ground enclosures shall be vented with tamper proof locking device						
		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	Air Release Valves shall be Combination Type, 316 SS						
		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	Air Release Valve Frame and Cover							
	US Foundry	NA	NA	NA	NA	USF 7665-HH-HJ		
Blow Off	Auto Blow Off	Automatic Blow Off Valve						
		Hydro Guard	HG-1 Standard Unit	Automatic	NA	NA	NA	NA
	Blow Off Valve	Blow Off Valve - Fits standard 5-1/4 inch Valve Box						
		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	Casing End Seals. Annular space between pipe and steel casing shall be brick and mortar with end seals to secure ends.						
		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	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.						
		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	Coatings: Aerial pipe, hydrants, above ground piping, fittings, valves and Appurtenances - System 1 Zinc / Urethane / Fluoropolymer application and color code per Section 3119 Coatings & Linings. Coating shall not be in contact with Potable water unless NSF 61 approved.						
		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	Coatings: Aerial pipe, hydrants, above ground piping, fittings, valves and Appurtenances - System 2 Zinc / Epoxy / Urethane application and color code per Section 3119 Coatings & Linings. Coating shall not be in contact with Potable water unless NSF 61 approved.						
		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	Ductile Iron Fittings C153 SSB / C110 FLG: (Water & Reclaimed Water fittings shall cement lined or holiday free fusion bonded epoxy lined) (Wastewater fittings interior shall be Protecto 401 and holiday free)						
		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	Flow Meters With Replaceable Sensors						
		EMCO	NA	NA	NA	NA	Unimag 4411E	
Hydrants	Hydrants	Hydrants Shall open left, 1-1/2 Pentagon operating nut, NST hose & pumper thread, rotate 360 degrees, closed drains, epoxy on shoe in & out and 304 SS nuts & bolts below ground.						
		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	Mechanical Joint Wedge-action Restraining Gland, Epoxy Coated Restrain ductile iron pipe to mechanical joint fittings, pipe and appurtenances.						
		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)	Bell Joint Restraints for Ductile Iron Pipe (4"-12") (New & 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)						
		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)	Ductile Iron Pipe Bell Joint Restraints for Ductile Iron Pipe (16" & 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 & reclaimed water piping 16" and greater shall have restraint gaskets or locking bells.							
	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)	Bell Joint Restraint Gaskets and Locking Bell (4" & 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.						
		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
			McWane Inc. DI Pipe Group	Sure Stop 350 Gasket	Gasket	Sure Stop 350 Gasket	Gasket	NA
		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
		US Pipe	Field Lok 350 Gasket	Gasket	Field Lok 350 Gasket	Gasket	NA	NA
			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
	SS to DIP Transition Restraint	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.						
		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	Mechanical Joint Wedge-action Restraining Gland, Epoxy Coated Restrain PVC pipe to mechanical joint fittings, and appurtenances.						
		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)	PVC Bell Joint Restraints: PVC pipe Split Serrated on Bell End and Spigot End. (4" - 12") (New & Existing)						
		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		

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	PVC Bell Joint Restraints (16" & Greater)	PVC Bell Joint Restraints: (16" & Greater) PVC pipe Split Serrated on Bell End and Spigot End. Water & Reclaimed Water Existing pipe only. Wastewater shall be new and existing pipe.						
		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")	C900 Bell & 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.						
		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	C905 Bell & 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.						
		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	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.							
	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	

APPENDIX D

LIST OF APPROVED PRODUCTS - TRANSMISSION SYSTEMS

FEBRUARY 11, 2011

Cat.	Desc	Manufacturer	Water		Reclaimed Water		Wastewater	
			Model #	Comments	Model #	Comments	Model #	Comments
Pipe	Ductile Iron Pipe	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.						
		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	Sample Stations - Bacteriological Sample Station with built in flush system, all internal piping to be 2", brass and includes lockable green enclosures.						
		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	Brass Service Saddles for 1" & 2" water & 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.						
		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	Service Saddles for 1" (CC) & 2" (Iron pipe threads) Water & 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.					
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	Service Saddles for 1" (CC) & 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.						
		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	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.						
		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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LIST OF APPROVED PRODUCTS - TRANSMISSION SYSTEMS

FEBRUARY 11, 2011

Cat.	Desc	Manufacturer	Water		Reclaimed Water		Wastewater	
			Model #	Comments	Model #	Comments	Model #	Comments
Services	Curb Stops	Curb Stops - Straight Valves: Ball type compression 2" cts O.D. tubing by 2" FIP						
		Ford	B41-777W		B41-777W		NA	NA
		AY McDonald	6102W-22		6102W-22		NA	NA
		Mueller	P25172		P25172		NA	NA
	Curb Stops	Curb Stops - Straight Valves: ball type compression x compression						
		Ford	B44-444W		B44-444W		NA	NA
		AY McDonald	6100W-22		6100W-22		NA	NA
		Mueller	P25146		P25146		NA	NA
	PE tubing	Polyethylene tubing: AWWA C901. UV protection (SDR-9) 1-inch and 2-inch only. PE 3408 / PE 4710						
		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	Line Stops							
	JCM							
	Romac							
	Smith Blair							
Tapping Sleeves and Valves	Tapping Sleeves	Tapping Sleeves: (Mechanical joint for taps on cast iron, ductile iron, PVC & AC pipe, including size on size) with stainless steel nuts and bolts.						
		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	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							
	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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LIST OF APPROVED PRODUCTS - TRANSMISSION SYSTEMS

FEBRUARY 11, 2011

Cat.	Desc	Manufacturer	Water		Reclaimed Water		Wastewater	
			Model #	Comments	Model #	Comments	Model #	Comments
Tapping Sleeves and Valves	Tapping Valves: 16" and Larger	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.						
		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	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.						
		Clow	Style #1450		Style #1450		NA	NA
		Dezurik	BAW		BAW		NA	NA
		Mueller / Pratt	LINSEAL III / Groundhog		LINSEAL III / Groundhog		NA	NA
	Check Valves	Valves (Check) 4-inch and Larger (8 mil epoxy lined)						
		American Flow Control	NA		NA		Series 600 or 50 line	
		Clow / M&H / Kennedy	NA		NA		106	
	Gate Valves 4" - 12"	Gate Valves 12" and smaller - resilient seated only AWWA C509 or C515. Valve seat shall be leak-tight in both directions at 150 psi.						
		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	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.							
	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	

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LIST OF APPROVED PRODUCTS - TRANSMISSION SYSTEMS

FEBRUARY 11, 2011

Cat.	Desc	Manufacturer	Water		Reclaimed Water		Wastewater			
			Model #	Comments	Model #	Comments	Model #	Comments		
Valves	Plug Valves	Plug Valves - Bi-directional, MJ & 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.								
		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)	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								
		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	For mains equal to, or greater than, 16" diameter or equal to greater than 6' feet deep						
				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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LIST OF APPROVED PRODUCTS - GRAVITY SYSTEMS

FEBRUARY 11, 2011

Cat.	Desc	Manufacturer	Water		Reclaimed Water		Wastewater	
			Model #	Comments	Model #	Comments	Model #	Comments
Coatings	Anti-Graffiti Paint	Block Walls-Anti-Graffiti Paint per Section 3119 Coatings & Linings						
		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	Rehabilitation corrosion protection system per Section 3119 Coatings & Linings. Interior coating for force main connections to existing concrete manholes only. New precast structures and existing pump stations shall be lined.						
		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	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.						
		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	Locating Marker Systems - Wastewater Locator balls placed at all sanitary sewer cleanouts						
		3M	NA	NA	NA	NA	3M™ EMS 4" Extended Range 5' Ball Marker 1404-XR	
	Fittings SDR 35	Fittings, Adapters and Plugs - Gravity PVC ASTM-D3034, Min SDR26/ SDR 35						
		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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LIST OF APPROVED PRODUCTS - GRAVITY SYSTEMS

FEBRUARY 11, 2011

Cat.	Desc	Manufacturer	Water		Reclaimed Water		Wastewater	
			Model #	Comments	Model #	Comments	Model #	Comments
PVC Pipe a	Flexible Pipe Connectors	Flexible Pipe Connectors and Transitions						
		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	Frame and Cover						
		USF Fabrication Inc.	NA	NA	NA	NA	USF 225-AS	
	Adj Ring	Top Adjusting Rings - HDPE with heavy duty loading (H-20)						
		Ladtech, Inc	NA	NA	NA	NA	24R, 24S with Rope Sealant CS2455	
	Hatches	Wet Well and Valve Vault Access Frames and Covers (Include the term "Confined Space" etched or cast into the cover with recessed lock & hasp. Frames and covers per manufacturers specifications.						
		Halliday Products	NA	NA	NA	NA	S1R or S2R Series	
		USF Fabrication Inc.	NA	NA	NA	NA	APS or APD Series	
	Precast Concrete Structures	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.						
		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	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.							
	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	Interior Liner for New or existing Precast Manhole and Precast Wetwell Structures per Section 3119 Coatings & Linings							
	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	Heat Shrink Seal - Precast structures shall be primed with manufacturer approved primer prior to application of heat shrunk encapsulation.							
		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	Joining Material Min. 2" width for all products to ensure squeeze out with manufacturer approved primer.							
		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	Resilient Connector Pipe Seals, Manhole - Gravity less than 12-inch and less than 15-ft deep							
		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	Cast in Place Pipe Seals, Manhole - Gravity Greater Than or Equal to 12-inch and all pipe sizes greater than 15-ft deep							
		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	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							
		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		

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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
Generator	Gen	Generator Systems, Fixed Shall be UL 2200 Certified.						
		Caterpillar	NA	NA	NA	NA	CAT Diesel Generator Set	
		Cummins Power Generation	NA	NA	NA	NA	Diesel Generator Set	
	Fuel Tanks	Generator Fuel Tanks. Shall be UL2085 certified.						
		Convault	NA	NA	NA	NA	CVT-3SF or CVT-3FF	
		Phoenix	NA	NA	NA	NA	Envirovault	
	GR	Generator Receptacle (GR)						
		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	Generator Transfer Switch							
	Russelectric	NA	NA	NA	NA	RMTD Series with model 2000 controller	NEMA 12/3R 316SS Enclosure	
Odor Control Units	Biotrickling Filters	Biotrickling filters						
		BioAir	NA	NA	NA	NA		
		Bioem	NA	NA	NA	NA	Biosorbens BTF	
		Envirogen	NA	NA	NA	NA	BTF	
		Siemens	NA	NA	NA	NA	Zabocs BTF	
	Carbon Adsorption Units	Carbon Adsorption Units						
		Calgon	NA	NA	NA	NA		
		Pure Air Filtration	NA	NA	NA	NA		
		Siemens	NA	NA	NA	NA		
	Pressure Gauges	Pressure Gauges shall have Diaphragm Seals. Oil filled.						
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			
Winter Gauges					D99100 Fill and Mount Charge			
					PFQ770 0-60 PSI			
					D70950 top			
Pumps	Submersible Pumps							
	ABS	NA	NA	NA	NA			
	Flygt	NA	NA	NA	NA			

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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
Pumps	Floats	Float Regulator (FR) - Duplex and Triplex Pump Stations						
		Atlantic Scientific	NA	NA	NA	NA	Roto-Float	
Pumps	Radar	Radar - Pulse Burst Radar Transmitter. Input 24 VDC and Output 4-20 mA						
		Magnetrol	NA	NA	NA	NA	R82-520A-011	
Pump Station Main Ser	Main Srvc Disconnect	Main Service Disconnect Breaker						
		Square D	NA	NA	NA	NA	H or J Frame 3 Pole 600 Volt (HGL or JGL determined by amperage)	
	Surge Protector Device	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 & 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.						
		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	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						
		Hoffman	NA	NA	NA	NA		
		Schaefer	NA	NA	NA	NA		
		Universal enclosure systems	NA	NA	NA	NA		
Pump Station Control Panel	Control Panel	Control Panel Supplier						
		ECS	NA	NA	NA	NA		
		Sta-Con Inc	NA	NA	NA	NA		
	Enclosure	Enclosure - NEMA 12/3R Enclosure 316SS, white polyester Powder coated finish inside and out, With 3 Point Pad lockable Handle, and Door Stop						
		Hoffman	NA	NA	NA	NA		
		Schaefer	NA	NA	NA	NA		
		Universal enclosure systems	NA	NA	NA	NA		
	Mnts	Mounting Channel for Enclosures						
		Unistrut Stainless Steel	NA	NA	NA	NA	1" 5/8 x 1" 5/8 316 SS	
	Seal-off	Explosion-Proof Sealoff						
	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	

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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	AL	Alarm Light / With Base and Globe (AL)							
	American Electric	NA	NA	NA	NA	F32552			
	Red Dot Globe	NA	NA	NA	NA	VGLR-01			
	Red Dot Base					VA-01			
	AH	Alarm Horn (AH)							
	Wheelock	NA	NA	NA	NA	3IT-115-R			
	Fuse	Fuses (F)							
	Bussmann	NA	NA	NA	NA	FNQ-R or KTK-R			
	HOA	Hand-Auto-Off Selector (HOA)							
	Square D	NA	NA	NA	NA	9001-SKS43B			
	HSS	Horn Silence Button (HSS)							
	Square D	NA	NA	NA	NA	9001-SKR1RH5			
	Inter-lock	Mechanical Interlock							
	Square D	NA	NA	NA	NA	S29354			
	Breakers	Control Panel Main Circuit Breaker (MCB) With S29450 Circuit Breaker Auxiliary Switch							
		Square D	NA	NA	NA	NA	H or J Frame 3 Pole 600 Volt (HGL or JGL determined by amperage)		
		Emergency Circuit Breaker (ECB) With S29450 Circuit Breaker Auxiliary Switch							
		Square D	NA	NA	NA	NA	H or J Frame 3 Pole 600 Volt (HGL or JGL determined by amperage)		
		Motor Circuit Breaker (MB)							
	Square D	NA	NA	NA	NA	H or J Frame 3 Pole 600 Volt (HGL or JGL determined by amperage)			
	Control Circuit Breaker/ GFCI Receptacle Breaker/ SCADA Breaker								
Square D	NA	NA	NA	NA	QOU120				
MS	Motor Starter (MS)								
Square D	NA	NA	NA	NA	Type S Class 8536				
OL	Overload Heater(OL)								
Square D	NA	NA	NA	NA	Part number will vary with size needed				
OR	Overload Reset								
Square D	NA	NA	NA	NA	9066-RA1				
Transformer	Control Circuit Transformer (XMFR)								
	Square D	NA	NA	NA	NA	9070TF75D23	120/24 Volt .075 KVA		
	Main Circuit Transformer (MCT)								
Square D	NA	NA	NA	NA	9070T2000D1	480/120 2KVA			
SPB	Supplemental Protector Breaker - 3 pole, 1-amp for Phase Monitor								
Square D	NA	NA	NA	NA	MG24532				

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	PM	Phase Monitor (PM)						
		MPE 240 V.	NA	NA	NA	NA	001-230-118-OVG5	
		MPE 480 V.	NA	NA	NA	NA	002-480-123-OVG5	
	Pump Alternator	Pump Automatic Alternator (PAA)						
		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	Alt. Test Switch						
		Carling Technologies	NA	NA	NA	NA	6GG5E-78	
		Honeywell	NA	NA	NA	NA	2TL1-50	
	Relay	Relay						
		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	Relay Base						
		IEDC 8 Pin Relay Base 600 Volt	NA	NA	NA	NA	SR2P-06	
	Duplex Receptacle / GFCI	Duplex Receptacle/GFCI (DR) Upgraded to 20 Amp						
		Hubbell	NA	NA	NA	NA	GFTR20BK	
		Pass & Seymour	NA	NA	NA	NA	2095TRBK	
	ETM	Elapse Time Meter (ETM)						
		Reddington	NA	NA	NA	NA	711-0160	
	Grounding	Grounding System						
		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	Terminal Strip (TS)							
	Marathon	NA	NA	NA	NA	Series 200		
	Square D	NA	NA	NA	NA	9080GR6		
TS	Terminal Strip End Blocks and End Clamps							
	Square D	NA	NA	NA	NA	9080GM6B & 9080GH10		

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 Pane	PL	Pilot Light (PL) 24 Volt with 1819 Bulb						
		Dialight	NA	NA	NA	NA	803-1710	
		Lighting Components & Design	NA	NA	NA	NA	Littlelight 930507X	
	RL	Run Indicator Light (RL) 120 Volt						
		Dialight	NA	NA	NA	NA	803-1710	
		Lighting Components & Design	NA	NA	NA	NA	Littlelites 930507X With 120MB Bulb	
MT	Moisture and Temperature Failure Light (MT) 120 Volt with 120MB Bulb							
	Dialight	NA	NA	NA	NA	803-1710		
	Lighting Components & Design	NA	NA	NA	NA	Littlelites 930507X		
Sluice Gate	Sluice Gate for Wet Well with Motorized Operator							
	BNW	NA	NA	NA	NA	Model 77 - 316 SS		
	Fontaine	NA	NA	NA	NA	Model 20 - 316 SS		
VFD	Variable Frequency Drives							
	Square D	NA	NA	NA	NA			

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APPENDIX E

ORANGE COUNTY UTILITIES

FDEP LIST OF APPROVED TANK MANUFACTURERS

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AST/ AST with Enclosed Secondary Containment Equipped with Overfill Protection, Spill Containment, and Interstitial Release Detection

<u>File No.</u>	<u>Company Name</u>	<u>Contact</u>	<u>Telephone</u>	<u>Approval Date</u>	<u>Product's Name</u>	<u>Condition(s)</u>
EQ-002	RECoVault, Inc.	Bob Green	800/879-3989	4/25/1991	Ecovault	
EQ-009	Tesco Resources, Inc.	Hank Berberat	203/758-3270	5/02/1991	Tesco	
EQ-010	Davis Industries, Inc.	D. Harriford	813/355-2971	5/20/1991	IT2	
EQ-013	Phoenix Products, Company	Chris Beck	904/354-1858	5/06/1991	Enviro-Vault	
EQ-031	PWH Equipment & Services Co., Inc.	James Hudson	813/621-2077	7/03/1991	Duocon, and Duotank Tanks	Secondary containment shall be at min 90% coverage of primary tank. The System shall have an overfill shut off at a min 90% and have a spill containment.
EQ-037	Industrial Environmental Supply	Jim Burns	919/274-4817	8/20/1991	Scat Tanks	
EQ-042	Petro-Tank Sales, Inc.	Raulph Suarez	800/528-6722	9/05/1991	Centurion Tanks	
EQ-047	Brown Minneapolis Tank	Brian DiGrado	612/454-6750	10/15/1991	Sure-Check	
EQ-053	Hall Mark Industries	Shannon McMillian	800/872-2770	1/14/1992	Hall Mark Tank Vaults	
EQ-062	Hausner, Inc.	John Hausner	800/533-9509	2/14/1992	Hi-Tech Vault	
EQ-068	The Boss Group, Inc.	David Riggie	410/783-9633	4/16/1992	Fuel Pack	
EQ-082	Ultra Tank Company	Don Schurr	800/330-8871	7/27/1992	Ultra Vault	
EQ-116	Clawson Tank Company	Brian Shelton	800/272-1367	3/10/1993	Liqui Vault	

AST/ AST with Enclosed Secondary Containment Equipped with Overfill Protection, Spill Containment, and Interstitial Release Detection (Continued)

<u>File No.</u>	<u>Company Name</u>	<u>Contact</u>	<u>Telephone</u>	<u>Approval Date</u>	<u>Product's Name</u>	<u>Condition(s)</u>
EQ-124	Containment Solutions, Inc. (Formerly Hoover Containment Systems, Inc.)	Robert Upton	936/756-7731	4/05/1993	Safewaste & Fuel Master	
EQ-125	Liquid Management Product	Jake Magish	203/778-2018	4/05/1993	Super-Tank	
EQ-146	PWH Equipment and Services Company, Inc.	James Hudson	813/623-6871	10/20/1993	Master Tank & Master Vault	
EQ-153	Trusco Tank, Inc.	Ken Jakes	805/544-9155	1/04/1994	Super Vault	
EQ-155	Containment Solutions, Inc. (Formerly Hoover Group, Inc.)	Robert Upton	936/756-7731	1/21/1994	Tank-Vault	
EQ-158	East Coast Engineering	David Kardish	904/783-1142	2/04/1994	Igloo Tank	
EQ-173	General Industries, Inc.	Jamie Stanley	919/751-1791	6/14/1994	Trisafe Vault Systems	
EQ-175	Boss Petroleum Products, Inc.	David Riggie	800/759-9988	6/14/1994	Boss Fire guard	
EQ-190	The Gateway Group, Inc.	Robert Becon	602/244-8664	2/17/1995	The Gateway Aboveground Storage System	
EQ-207	Porta Tank Manufacturing, Inc.	Bill Hudson	813/633-3092	6/26/1995	Porta Tank Model # 100	
EQ-208	Garsite, Inc.	Mark Kendrick	913/342-5600	6/26/1995	ITI Aboveground Storage Tank System	

AST/ AST with Enclosed Secondary Containment Equipped with Overfill Protection, Spill Containment, and Interstitial Release Detection (Continued)

<u>File No.</u>	<u>Company Name</u>	<u>Contact</u>	<u>Telephone</u>	<u>Approval Date</u>	<u>Product's name</u>	<u>Condition(s)</u>
EQ-232	Paul Moore Associates, Inc.	Jeff Smith	404/452-7377	11/22/1995	Aero Power Type I	Secondary containment shall be at min 90% coverage of primary tank. The System shall have an overfill shut off at a min 90% and have a spill containment.
EQ-233	Steca, Inc.	Carol Latiolais	804/436-0000	11/20/1995	Generator Base Fuel Tank	
EQ-235	Southern Pre-Cast, Inc.	Charles Davidson	800/669-2278	12/07/1995	Strongbox	
EQ-239	Memco MFG, Inc.	Bill Stamp	407/656-5601	2/07/1996	Envirosafe	Secondary containment shall be at min 90% coverage of primary tank. The System shall have an overfill shut off at a min 90% and have a spill containment.
EQ-254	Stor-Safe Systems	Ronald Lieper	407/589-5830	4/22/1996	Stor-Safe Model #200	
EQ-255	Dunn Industries/ Tommy Tank	Tom Morris	800/253-8265	4/26/1996	Tommy Tank Double Wall Steel Storage Tank System	
EQ-274	Containment solutions, Inc. (Formerly Beta Tank, Inc.)	Robert Upton	936/756-7731	2/07/1997	Fireguard Double Wall Storage Tank system	
EQ-279	Floyd Manufacturing	Joseph Floyd	800/868-2018	4/22/1997	Floyd AST OE279 Double Wall Aboveground Storage Tank System	
EQ-280	Prichard Brown of Florida, Inc. (Formerly Electric Specialty, Inc.)	John Lundahl	800/231-2258	4/22/1997	Electric Specialty Sub-Base Aboveground Storage Tank System	
EQ-309	Atlas Fuel & Liquid Storage Tanks	Kelly Stanton	800/797-8265	12/15/1997	Atlas Tank Aboveground Storage Tank System	

AST/ AST with Enclosed Secondary Containment Equipped with Overfill Protection, Spill Containment, and Interstitial Release Detection (Continued)

<u>File No.</u>	<u>Company Name</u>	<u>Contact</u>	<u>Telephone</u>	<u>Approval Date</u>	<u>Product's Name</u>	<u>Condition(s)</u>
EQ-314	Porta Tank Manufacturing, Inc.	Bill Hudson	813/633-3092	2/04/1998	Porta Tank Model # 200	Secondary containment shall be at min 97% coverage of primary tank. The System shall have an overfill shut off at a min 95% and have a spill containment. This order supersedes EQ-58.
EQ-315	Phoenix Metal Products, Inc.	Pierre Dionne	540/334-2100	1/27/1998	Phoenix Metal Products UL 142 Double-Wall Aboveground System	
EQ-336	Alabama Tank, Inc.	Kevin Woods	251/577-6415	9/08/1998	Fireguard and F921 Double-Wall Aboveground Storage Tank	
EQ-338	Newberry Tank Equipment, Inc.	Anderson Scott	800/643-9395	10/08/1998	Dual Wall Aboveground Storage Tank, the Fireguard Double-Wall Aboveground Tank, the F921 Double-Wall Aboveground Tank	
EQ-338	Newberry Tank Equipment, Inc.	Anderson Scott	800/643-9395	10/08/1998	UL 142 single-wall tanks with steel dikes that are equipped with a rain shield	UL 142 single-walled tanks with steel dikes that are equipped with a rain shield shall have secondary containment at a minimum of 90% of the primary tank. The system shall be equipped with overfill shut-off at a minimum of 90% of the primary tank capacity. The system shall be equipped with spill containment.

AST/ AST with Enclosed Secondary Containment Equipped with Overfill Protection, Spill Containment, and Interstitial Release Detection (Continued)

<u>File No.</u>	<u>Company Name</u>	<u>Contact</u>	<u>Telephone</u>	<u>Approval Date</u>	<u>Product's Name</u>	<u>Condition(s)</u>
EQ-342	Metal Products Company	Burcher Gammage	770/945-8383	11/02/1998	Fireguard and UL-142 Double-Wall AST	
EQ-347	Ist Fueling System	Taylor Hall	888/478-3835	12/01/1998	UL 142 Double-Wall Tank With Pumping System For Aviation Fuel	
EQ-352	Modern Welding Company Florida, Inc.	Gene Schober	407/843-1270	11/22/1998	UL 142 single-wall tanks with steel dikes that are equipped with a rain shield	UL 142 Single-Walled tanks with steel dikes that are equipped with a rain shield shall have secondary containment at a minimum of 90% of the primary tank. The system shall be equipped with overfill shut-off at a minimum of 90% of the primary tank capacity. The system shall be equipped with spill containment.
EQ-352	Modern Welding Company Florida, Inc.	Gene Schober	407/843-1270	11/22/1998	Double-Wall UL142 Aboveground Storage Tank, the Fireguard Double-Wall Aboveground Tank	
EQ-371	U-Fuel, Inc.	Michael Webb	715/836-0905	3/12/1999	U-Fuel System	
EQ-375	Altrofer Packaging	Kevin Nunn	309/697-1234	6/04/1999	UL-142 Double-Wall Altrofer Sub-Base Generator Tank Sy	
EQ-498	Sigam Engineering Inc. (Formerly SuperSafe™ Tanks, Inc.)	Jacob Magish	317/255-5387	5/23/2001	SuperSafe™ Aboveground Petroleum Storage and Dispensing System	The product is approved in the State of Florida as an aboveground storage tank and containment system equipped with spill containment, overfill protection, Warwick Controls Model 470/570 series interstitial release detection, and a dispensing system.

AST/ Secondary Containment Only

<u>File No.</u>	<u>Company Name</u>	<u>Contact</u>	<u>Telephone</u>	<u>Approval Date</u>	<u>Product's Name</u>	<u>Condition(s)</u>
EQ-206	Stor-Safe Systems	Ronald Lieper	407/489-5830	7/03/1995	Stor Safe Model #100	
EQ-213	Southern Pre-cast, Inc.	John True	800/669-2278	7/21/1995	Spill/Leak Containment Vessel	An FDEP-Approved coating is applied in accordance with manufacturer's instruction and NACE standard RP0892-92.
EQ-749	Henning, Inc.	Christian Grobe	866/910-1784	2/17/2010	UL 142 Listed double wall aboveground tank with spill containment, UL File Number MH45787	The tanks must be equipped with approved overflow protection and with an interstitial release detection system prior to dispensing product. The storage tanks shall be tested in accordance with Chapter 13 of the Petroleum Equipment Institute's Standard PEI/RP 200-96 prior to dispensing product.

AST/ AST with Secondary Containment Only; Tanks are Required to be Equipped with Approved Overfill Protection, Spill Containment and Interstitial Release Detection

<u>File No.</u>	<u>Company Name</u>	<u>Contact</u>	<u>Telephone</u>	<u>Approval Date</u>	<u>Product's Name</u>	<u>Condition(s)</u>
EQ-354	Specialty Tank & Equipment Company	William Mann	904/353-8761	12/17/1998	UL 142 Double-Wall Aboveground Storage Tank, the F921 Double Wall Tank	Tanks are required to be equipped with approved overfill protection, spill containment, and interstitial release detection prior to dispensing products.
EQ-372	Turner Equipment Company, Inc.	Joe McMichael	800/672-4770	4/02/1999	UL 142 Double-Wall Aboveground Storage Tank	Tanks are required to be equipped with approved overfill protection, spill containment, and interstitial release detection prior to dispensing products.
EQ-376	Cave Hill Corporation	Gary Snyder	800/833-7655	6/04/1999	Atlantic Fabritech UL 142 Double-Wall Storage Tank	Tanks are required to be equipped with approved overfill protection, spill containment, and interstitial release detection prior to dispensing products.
EQ-386	Com-Fab, Inc.	Jim Patton	740/857-1107	8/30/1999	Com-Fab Double Wall aboveground Tanks	Tanks are required to be equipped with approved overfill protection, spill containment, and interstitial release detection prior to dispensing products.
EQ-387	Newco Fabrication Division	AL Vogel	608/755-4774	8/30/1999	Newco Generator Base Double Wall UL Tank	Tanks are required to be equipped with approved overfill protection, spill containment, and interstitial release detection prior to dispensing products.

AST/ AST with Secondary Containment Only; Tanks are Required to be Equipped with Approved Overfill Protection, Spill Containment and Interstitial Release Detection (Continued)

<u>File No.</u>	<u>Company Name</u>	<u>Contact</u>	<u>Telephone</u>	<u>Approval Date</u>	<u>Product's Name</u>	<u>Condition(s)</u>
EQ-400	Steel Tank Institute	Dana Schmidt	847/438-8265	11/03/1999	Fireguard Double-Wall Aboveground Storage Tank	Conditional Approval
EQ-401	Steel Tank Institute	Dana Schmidt	847/438-8265	11/03/1999	F921 Double-Wall Aboveground Storage Tank	Conditional Approval
EQ-401 Amendment	Steel Tank Institute	Dana Schmidt	847/438-8265	6/17/2003	F921 Double-Wall Aboveground Storage Tank	Conditional Approval
EQ-410	Assmann Corporation of America	William Zielinski	219/357-3181	12/22/1999	Assmann Double-Wall Aboveground Storage Tank	Tanks are required to be equipped with approved overfill protection, spill containment, and interstitial release detection prior to dispensing products. The storage tank shall be hydro-statically tested by filling the tank completely with water prior to dispensing product.
EQ-417	MGS Incorporated	Ronald Speth	717/336-7528	1/12/2000	MGS Double-Wall Sub-Base Generator Tank	Tanks are required to be equipped with approved spill containment, overfill protection, and interstitial release detection prior to dispensing products. The storage tank shall be tested in accordance with Chapter 13 of Petroleum Equipment Institute Standard PEI/RP 200-96 prior to dispensing product.
EQ-429	Freeman Brothers Tank Manufacturing, Inc.	Gary Freeman	912/759-6210	3/16/2000	UI-142 Single-Wall with steel dike	Conditional Approval

AST/ AST with Secondary Containment Only; Tanks are Required to be Equipped with Approved Overfill Protection, Spill Containment and Interstitial Release Detection (Continued)

<u>File No.</u>	<u>Company Name</u>	<u>Contact</u>	<u>Telephone</u>	<u>Approval Date</u>	<u>Product's Name</u>	<u>Condition(s)</u>
EQ-431	Specialty Tank & Equipment Company	William Mann	904/353-8761	3/28/2000	Flameshield Doubled-Wall Aboveground Storage Tank	Tanks are required to be equipped with approved overfill protection, spill containment, and interstitial release detection prior to dispensing products. The storage tank shall be tested in accordance with Chapter 13 of Petroleum Equipment Institute Standard PEI/RP 200-96 prior to dispensing product.
EQ-434	Steel Tank Institute	Dana Schmidt	847/438-8766	5/08/2000	Flameshield Doubled-Wall Aboveground Storage Tank	Conditional Approval
EQ-434 Amendment	Steel Tank Institute	Dana Schmidt	847/438-8766	6/17/2003	Flameshield Doubled-Wall Aboveground Storage Tank	Conditional Approval
EQ-469	Leeds Fabrication Services, Inc.	Jack Ranney	303/659-6801	12/22/2000	Double-wall Base Fuel Tank	Tanks are required to be equipped with approved spill containment, overfill protection, and interstitial release detection prior to dispensing product. The storage tanks shall be tested in accordance with Chapter 13 of Petroleum Equipment Institute Standard PEI/RP 200-96 prior to dispensing product.

AST/ AST with Secondary Containment Only; Tanks are Required to be Equipped with Approved Overfill Protection, Spill Containment and Interstitial Release Detection (Continued)

<u>File No.</u>	<u>Company Name</u>	<u>Contact</u>	<u>Telephone</u>	<u>Approval Date</u>	<u>Product's Name</u>	<u>Condition(s)</u>
EQ-471	Engine & Compressor Accessories, Inc.	Bill Pafford	713/466-8679	12/22/2000	Closed Top Dike Generator Base Tank and the Secondary Containment Generator Base Tank	Tanks are required to be equipped with approved spill containment, overfill protection, and interstitial release detection prior to dispensing product. The storage tanks shall be tested in accordance with Chapter 13 of Petroleum Equipment Institute Standard PEI/RP 200-96 prior to dispensing product.
EQ-474	Containment Solutions, Inc.	Robert Upton	936/756-7731	2/09/2001	Hoover Vault and Lube Cube Tank	Tanks are required to be equipped with approved spill containment, overfill protection, and interstitial release detection prior to dispensing product. The storage tanks shall be tested in accordance with Chapter 13 of Petroleum Equipment Institute Standard PEI/RP 200-96 prior to dispensing product.
EQ-479	Cummins Southeastern Power, Inc.	Greg Shapiro	813/635-5701	2/14/2001	Closed Top Dike Generator Base Tank and the Secondary Containment Generator Base Tank	Tanks are required to be equipped with approved spill containment, overfill protection, and interstitial release detection prior to dispensing product. The storage tanks shall be tested in accordance with Chapter 13 of Petroleum Equipment Institute Standard PEI/RP 200-96 prior to dispensing product.

AST/ AST with Secondary Containment Only; Tanks are Required to be Equipped with Approved Overfill Protection, Spill Containment and Interstitial Release Detection (Continued)

<u>File No.</u>	<u>Company Name</u>	<u>Contact</u>	<u>Telephone</u>	<u>Approval Date</u>	<u>Product's Name</u>	<u>Condition(s)</u>
EQ-522	Power Enclosures	Rakesh Komar	309/274-9000	4/05/2002	Double-Wall Generator Base Tank	Tanks are required to be equipped with approved spill containment, overfill protection, and interstitial release detection prior to dispensing product. The storage tanks shall be tested in accordance with Chapter 13 of Petroleum Equipment Institute Standard PEI/RP 200-96 prior to dispensing product.
EQ-523	Professional Power Products, Inc.	Tom Birchman	815/943-9000	4/05/2002	UL Listed 142 and 2085 double-wall Tank, UL File No. MH 26043	Tanks are required to be equipped with approved spill containment, overfill protection, and interstitial release detection prior to dispensing product. The storage tanks shall be tested in accordance with Chapter 13 of Petroleum Equipment Institute Standard PEI/RP 200-96 prior to dispensing product.
EQ-538	Bendel Corporation	William Beaver	704/596-5112	11/20/2002	UL-142 Horizontal and Vertical Double-Walled Aboveground Tank	Tanks are required to be equipped with approved spill containment, overfill protection, and interstitial release detection prior to dispensing product. The storage tanks shall be tested in accordance with Chapter 13 of Petroleum Equipment Institute Standard PEI/RP 200-96 prior to dispensing product.

AST/ AST with Secondary Containment Only; Tanks are Required to be Equipped with Approved Overfill Protection, Spill Containment and Interstitial Release Detection (Continued)

<u>File No.</u>	<u>Company Name</u>	<u>Contact</u>	<u>Telephone</u>	<u>Approval Date</u>	<u>Product's Name</u>	<u>Condition(s)</u>
EQ-542	Alabama Tank, Inc.	Kevin Woods	251/577-6415	10/03/2002	UL-142 Double-Walled Sub-Base Generator Aboveground Storage Tank	Tanks are required to be equipped with approved spill containment, overfill protection, and interstitial release detection prior to dispensing product. The storage tanks shall be tested in accordance with Chapter 13 of Petroleum Equipment Institute Standard PEI/RP 200-96 prior to dispensing product.
EQ-543	Prichard Brown	Robert Ropp	800/231-2258 Ext.102	10/09/2002	UI-142 Listed Closed-Top Diked Generator Base Tank, UL File No. MH 15307	Tanks are required to be equipped with approved spill containment, overfill protection, and interstitial release detection prior to dispensing product. The storage tanks shall be tested in accordance with Chapter 13 of Petroleum Equipment Institute Standard PEI/RP 200-96 prior to dispensing product.
EQ-547	Horizon MFG., LLC	David Evans	352/787-7000	11/21/2002	UL-142 Closed Top Generator Base Fuel Tank, UL File No. MH 28640	Tanks are required to be equipped with approved spill containment, overfill protection, and interstitial release detection prior to dispensing product. The storage tanks shall be tested in accordance with Chapter 13 of Petroleum Equipment Institute Standard PEI/RP 200-96 prior to dispensing product.

AST/ AST with Secondary Containment Only; Tanks are Required to be Equipped with Approved Overfill Protection, Spill Containment and Interstitial Release Detection (Continued)

<u>File No.</u>	<u>Company Name</u>	<u>Contact</u>	<u>Telephone</u>	<u>Approval Date</u>	<u>Product's Name</u>	<u>Condition(s)</u>
EQ-561	Steel Tank Institute	Dana Schmidt	847/438-8265	7/25/2003	Flameshield Double-Walled UL-142 Listed Aboveground Storage Tank	Tanks are required to be equipped with approved spill containment, overfill protection, and interstitial release detection prior to dispensing product. The storage tanks shall be tested in accordance with Chapter 13 of Petroleum Equipment Institute Standard PEI/RP 200-96 prior to dispensing product.
EQ-575	Acoustical Sheetmetal, Inc.	William Tolbert	757/456-9720	1/30/2004	ASI's UL-142 Listed Sub-Base Double-Wall Tank, UL File Number MH115323	Tanks are required to be equipped with approved spill containment, overfill protection, and interstitial release detection prior to dispensing product. The storage tanks shall be tested in accordance with Chapter 13 of Petroleum Equipment Institute Standard PEI/RP 200-96 prior to dispensing product.
EQ-581	Steel Tank Institute	Dana Schmidt	847/438-8265	4/14/2004	Fireguard Double-Walled UL-142 Listed Aboveground Tank	Tanks are required to be equipped with approved spill containment, overfill protection, and interstitial release detection prior to dispensing product. The storage tanks shall be tested in accordance with Chapter 13 of Petroleum Equipment Institute Standard PEI/RP 200-96 prior to dispensing product.

AST/ AST with Secondary Containment Only; Tanks are Required to be Equipped with Approved Overfill Protection, Spill Containment and Interstitial Release Detection (Continued)

<u>File No.</u>	<u>Company Name</u>	<u>Contact</u>	<u>Telephone</u>	<u>Approval Date</u>	<u>Product's Name</u>	<u>Condition(s)</u>
EQ-582	Steel Tank Institute	Dana Schmidt	847/438-8265	4/14/2004	F921 Double-Walled UL-142 Listed Aboveground Tank	Tanks are required to be equipped with approved spill containment, overfill protection, and interstitial release detection prior to dispensing product. The storage tanks shall be tested in accordance with Chapter 13 of Petroleum Equipment Institute Standard PEI/RP 200-96 prior to dispensing product.
EQ-590	Steel Tank Institute	Dana Schmidt	847/438-8265	7/14/2004	Gen-Tank Double-Walled Sub-Base Generator UL Listed Aboveground Tank	Tanks are required to be equipped with approved spill containment, overfill protection, and interstitial release detection prior to dispensing product. The storage tanks shall be tested in accordance with Chapter 13 of Petroleum Equipment Institute Standard PEI/RP 200-96 prior to dispensing product.
EQ-595	Acoustical Control Systems, Inc.	Ron Schulz	252/243-0150	9/30/2004	ACS's UL-142 Listed Double-Wall Sub-Base Generator Tank with Spill Containment	Tanks are required to be equipped with approved overfill protection and with an interstitial release detection system if Acoustical Control System Inc. provides the spill containment devices prior to dispensing product. If not, the tanks must be equipped with approved overfill protection, spill containment system and with an interstitial release detection system if the spill containment is not provided by Acoustical Control Systems, Inc. The storage tanks shall be tested in accordance with Chapter 13 of the Petroleum Equipment Institute's Standard PEI/RP 200-96 prior to dispensing product.

AST/ AST with Secondary Containment Only; Tanks are Required to be Equipped with Approved Overfill Protection, Spill Containment and Interstitial Release Detection (Continued)

<u>File No.</u>	<u>Company Name</u>	<u>Contact</u>	<u>Telephone</u>	<u>Approval Date</u>	<u>Product's Name</u>	<u>Condition(s)</u>
EQ-613	Arc-Rite, Inc.	Mike Bullock	386/325-3523	7/20/2005	Arc-Rite's UL-142 Listed Double-Wall Tank, UL File Number MH30000	Tanks are required to be equipped with approved spill containment, overfill protection, and interstitial release detection prior to dispensing product. The storage tanks shall be tested in accordance with Chapter 13 of Petroleum Equipment Institute Standard PEI/RP 200-96 prior to dispensing any regulated substances from the tank.
EQ-616	Robinson Custom Enclosures	Jim Birkholz	920/615-3406	9/12/2005	Enclosed Top Dike and Secondary Containment Sub-Base Generator UL Listed Aboveground Storage Tank, UL File No. MH26813	Tanks are required to be equipped with approved spill containment, overfill protection, and interstitial release detection prior to dispensing product. The storage tanks shall be tested in accordance with Chapter 13 of Petroleum Equipment Institute Standard PEI/RP 200-96 prior to dispensing any regulated substances from the tank.
EQ-619	Smith Tank & Equipment Co.	Jim Blair, III	903/597-5541	11/23/2005	UL-142 Double-Walled, and Single-Walled with Open Secondary Containment Equipped with Rain-shields Aboveground Storage Tank, UL Model Number MH3582	Conditional Approval

AST/ AST with Secondary Containment Only; Tanks are Required to be Equipped with Approved Overfill Protection, Spill Containment and Interstitial Release Detection (Continued)

<u>File No.</u>	<u>Company Name</u>	<u>Contact</u>	<u>Telephone</u>	<u>Approval Date</u>	<u>Product's Name</u>	<u>Condition(s)</u>
EQ-622	Armstrong Power Systems, LLC	Mubarak Kazan	305/470-0058	12/14/2005	Enclosed Top Dike and Secondary Containment Sub-Base Generator UL Listed Aboveground Storage Tank, UL File No. MH29496,	The tanks are required to be equipped with approved spill containment, overfill protection, and interstitial release detection prior to dispensing product. The storage tanks shall be tested in accordance with Chapter 13 of Petroleum Equipment Institute Standard PEI/RP 200-96 prior to dispensing any regulated substances from the tank.
EQ-625	Phoenix Products, LLC	Pete Slater	904/354-1858	12/27/2005	The Phoenix Fire Steel UL-142 and UL 2085 Listed Double-Wall Sub-Base Generator Tank with Spill Containment, UL File Number MH15322	Refer to the Final Order
EQ-632	International Supply Co., Inc.	Chad Jenkins	309/249-6211	2/07/2006	Enclosed Top Dike and Secondary Containment Sub-Base Generator UL 142 and 2085 Listed Aboveground Storage Tank, UL File Numbers MH17176 and MH17561	The tanks are required to be equipped with approved spill containment, overfill protection, and interstitial release detection prior to dispensing product. The storage tanks shall be tested in accordance with Chapter 13 of Petroleum Equipment Institute Standard PEI/RP 200-96 prior to dispensing any regulated substances from the tanks.

AST/ AST with Secondary Containment Only; Tanks are Required to be Equipped with Approved Overfill Protection, Spill Containment and Interstitial Release Detection (Continued)

<u>File No.</u>	<u>Company Name</u>	<u>Contact</u>	<u>Telephone</u>	<u>Approval Date</u>	<u>Product's Name</u>	<u>Condition(s)</u>
EQ-633	Zierke Built Manufacturing	Kyle Zierke	800/269-2222	2/20/2006	Enclosed Top Dike Containment Sub-Base Generator UL Listed Aboveground Storage Tank, UL File No. MH26824	The tanks are required to be equipped with approved spill containment, overfill protection, and interstitial release detection prior to dispensing product. The storage tanks shall be tested in accordance with Chapter 13 of Petroleum Equipment Institute Standard PEI/RP 200-96 prior to dispensing any regulated substances from the tanks.
EQ-634	Sauk Technologies	John Bohm	262/268-3800	3/27/2006	UL 142 Listed Double-Walled Sub-Base Generator Aboveground Storage Tank, UL File Number MH25145	The tanks are required to be equipped with approved spill containment, overfill protection, and interstitial release detection prior to dispensing product. The storage tanks shall be tested in accordance with Chapter 13 of Petroleum Equipment Institute Standard PEI/RP 200-96 prior to dispensing any regulated substances from the tanks. The Department Final Order EQ-249 issued on April 12, 1996 is no longer in effect.

AST/ AST with Secondary Containment Only; Tanks are Required to be Equipped with Approved Overfill Protection, Spill Containment and Interstitial Release Detection (Continued)

<u>File No.</u>	<u>Company Name</u>	<u>Contact</u>	<u>Telephone</u>	<u>Approval Date</u>	<u>Product's Name</u>	<u>Condition(s)</u>
EQ-650	Pryco, Inc.	Dennis Womack	217/364-4467	11/07/2006	Double-Wall Sub-Base Generator UL Listed Aboveground Storage Tank, UL File No. MH17469	The tanks are required to be equipped with approved spill containment, overfill protection, and interstitial release detection prior to dispensing product. The storage tanks shall be tested in accordance with Chapter 13 of Petroleum Equipment Institute Standard PEI/RP 200-96 prior to dispensing any regulated substances from the tank. The Department Final Order EQ-229 issued on October 31, 1995 is no longer in effect.
EQ-661	JAS Integrated Products Corporation	Randy Slaven	813/882-3118	2/08/2007	Double-Wall Sub-Base Generator UL Listed Aboveground Storage Tank, UL File No. MH45666	The tanks are required to be equipped with approved spill containment, overfill protection, and interstitial release detection prior to dispensing product. The storage tanks shall be tested in accordance with Chapter 13 of Petroleum Equipment Institute Standard PEI/RP 200-96 prior to dispensing any regulated substances from the tank.

AST/ AST with Secondary Containment Only; Tanks are Required to be Equipped with Approved Overfill Protection, Spill Containment and Interstitial Release Detection (Continued)

<u>File No.</u>	<u>Company Name</u>	<u>Contact</u>	<u>Telephone</u>	<u>Approval Date</u>	<u>Product's Name</u>	<u>Condition(s)</u>
EQ-663	Power Equipment Co. Inc.	David Berube	508/226-3410	2/26/2007	Double-Wall Sub-Base Generator UL Listed Aboveground Storage Tank, UL File No. MH29115	The tanks are required to be equipped with approved spill containment, overfill protection, and interstitial release detection prior to dispensing product. The storage tanks shall be tested in accordance with Chapter 13 of Petroleum Equipment Institute Standard PEI/RP 200-96 prior to dispensing any regulated substances from the tank.
EQ-665	Hardin Industries, Inc.	Dennis Black	309/246-8456	3/20/2007	Double-Wall Sub-Base Generator UL Listed Aboveground Storage Tank, UL File No. MH26771	The tanks are required to be equipped with approved spill containment, overfill protection, and interstitial release detection prior to dispensing product. The storage tanks shall be tested in accordance with Chapter 13 of Petroleum Equipment Institute Standard PEI/RP 200-96 prior to dispensing any regulated substances from the tank.

AST/ AST with Secondary Containment Only; Tanks are Required to be Equipped with Approved Overfill Protection, Spill Containment and Interstitial Release Detection (Continued)

<u>File No.</u>	<u>Company Name</u>	<u>Contact</u>	<u>Telephone</u>	<u>Approval Date</u>	<u>Product's Name</u>	<u>Condition(s)</u>
EQ-673	Highland Tank Mfg. Co.	Todd Shearer	717/664-0600	6/11/2007	Double-Wall, and Double-Wall Pitch Top UL Listed Aboveground Storage Tank, UL File No. MH5086	The tanks are required to be equipped with approved spill containment, overfill protection, and interstitial release detection prior to dispensing product. The Double-Wall storage tanks shall be tested in accordance with Exhibit A section 3.0 and Double-Wall Pitch Top storage tanks shall be tested in accordance with Exhibit B section 3.0 and Exhibit C prior to dispensing any regulated substances from the tank. The Department Final Orders EQ-268 issued on November 25, 1996, and EQ-270 issued on November 25, 1996, is no longer in effect.

AST/ AST with Secondary Containment Only; Tanks are Required to be Equipped with Approved Overfill Protection, Spill Containment and Interstitial Release Detection (Continued)

<u>File No.</u>	<u>Company Name</u>	<u>Contact</u>	<u>Telephone</u>	<u>Approval Date</u>	<u>Product's Name</u>	<u>Condition(s)</u>
EQ-677	Steel Tank Institute	Dana Schmidt	847/438-8265	6/20/2007	Flameshield and F921 UL-142 Listed Aboveground Storage Tank with 95% Secondary Containment Wrap	The tanks are required to be equipped with approved spill containment, overfill protection that shuts off the flow at 95% of nominal capacity of the primary tank, and interstitial release detection prior to dispensing product. The Secondary containment coverage of the primary tank shall be at a minimum of 95% containment of primary tank. The storage tanks shall be tested in accordance with Chapter 13 of Petroleum Equipment Institute Standard PEI/RP 200-96 prior to dispensing any regulated substances from the tank.
EQ-681	Pee Dee Tank Company of SC LLC	Mike Moran	800/868-8265	8/14/2007	Double-Wall UL Listed Aboveground Storage Tank, UL File No. MH12846	The tanks are required to be equipped with approved spill containment, overfill protection, and interstitial release detection prior to dispensing product. The storage tanks shall be tested in accordance with Chapter 13 of Petroleum Equipment Institute Standard PEI/RP 200-96 prior to dispensing any regulated substances from the tank.

AST/ AST with Secondary Containment Only; Tanks are Required to be Equipped with Approved Overfill Protection, Spill Containment and Interstitial Release Detection (Continued)

<u>File No.</u>	<u>Company Name</u>	<u>Contact</u>	<u>Telephone</u>	<u>Approval Date</u>	<u>Product's Name</u>	<u>Condition(s)</u>
EQ-700	Engineering Manufacturing Corp.	Lisley Jimenz	305/639-0089	2/20/2008	Double-Wall Sub-Base Generator UL Listed Aboveground Storage Tank, UL File No. MH30019	The tanks are equipped with approved spill containment; overfill protection, and interstitial release detection prior to dispensing product. The storage tanks shall be tested in accordance with Chapter 13 of Petroleum Equipment Institute Standard PEI/RP 200-96 prior to dispensing any regulated substances from the tank.
EQ-707	Freeman Bros. Tank MFG., Inc.	Gary Freeman	229/759-6210	5/12/2008	Double-Wall UL Listed Aboveground Storage Tank, UL File No. MH14128	The tanks are equipped with approved spill containment; overfill protection, and interstitial release detection prior to dispensing product. The storage tanks shall be tested in accordance with Chapter 13 of Petroleum Equipment Institute Standard PEI/RP 200-96 prior to dispensing any regulated substances from the tank.
EQ-710	Cab Construction, Inc.	Paul Schley	507/625-2233	6/30/2008	Double-Wall UL Listed Sub-Base Aboveground Storage Tank, UL File No. MH10130	The tanks are equipped with approved spill containment; overfill protection, and interstitial release detection prior to dispensing product. The storage tanks shall be tested in accordance with Chapter 13 of Petroleum Equipment Institute Standard PEI/RP 200-96 prior to dispensing any regulated substances from the tank.

AST/ AST with Secondary Containment Only; Tanks are Required to be Equipped with Approved Overfill Protection, Spill Containment and Interstitial Release Detection (Continued)

<u>File No.</u>	<u>Company Name</u>	<u>Contact</u>	<u>Telephone</u>	<u>Approval Date</u>	<u>Product's Name</u>	<u>Condition(s)</u>
EQ-721	E.K. Machine Co., Inc.	Gino Klein	262/492-4600	12/18/2008	Double-Wall UL Listed Sub-Base Aboveground Storage Tank, UL File No. MH46187	Approved as an aboveground storage tank and containment system in the State of Florida provided that the tanks are equipped with approved spill containment, overfill protection, and interstitial release detection prior to dispensing product. The storage tanks shall be tested in accordance with Chapter 13 of Petroleum Equipment Institute Standard PEI/RP 200-96 prior to dispensing any regulated substances from the tank.
EQ-744	Mayville Engineering Company, Inc.	Michael Wicke	920/387-4500 Ext. 6477	2/02/2010	Double-Wall UL Listed Sub-Base Aboveground Storage Tank, UL File No. MH74278	Approved as an aboveground storage tank and containment system in the State of Florida provided that the tanks are equipped with approved spill containment, overfill protection, and interstitial release detection prior to dispensing product. The storage tanks shall be tested in accordance with Chapter 13 of Petroleum Equipment Institute Standard PEI/RP 200-96 prior to dispensing any regulated substances from the tank.

AST/ AST with Secondary Containment Only; Tanks are Required to be Equipped with Approved Overfill Protection, Spill Containment and Interstitial Release Detection (Continued)

<u>File No.</u>	<u>Company Name</u>	<u>Contact</u>	<u>Telephone</u>	<u>Approval Date</u>	<u>Product's Name</u>	<u>Condition(s)</u>
EQ-747	Nogales Highway Iron & Steel, Inc.	Sal Fragozo	520/294-1542	2/12/2010	Double-Wall UL Listed Aboveground Storage Tank, UL File No. MH7760	Approved as an aboveground storage tank and containment system in the State of Florida provided that the tanks are equipped with approved spill containment, overfill protection, and interstitial release detection prior to dispensing product. The storage tanks shall be tested in accordance with Chapter 13 of Petroleum Equipment Institute Standard PEI/RP 200-96 prior to dispensing any regulated substances from the tank.
EQ-752	Atlantic Tank	Kevin Clemmer	540/437-1203	2/24/2010	Double-Wall UL Listed Aboveground Storage Tank, UL File No. MH15058	Approved as an aboveground storage tank and containment system in the State of Florida provided that the tanks are equipped with approved spill containment, overfill protection, and interstitial release detection prior to dispensing product. The storage tanks shall be tested in accordance with Chapter 13 of Petroleum Equipment Institute Standard PEI/RP 200-96 prior to dispensing any regulated substances from the tank.

AST/ AST with Secondary Containment Only; Tanks are Required to be Equipped with Approved Overfill Protection, Spill Containment and Interstitial Release Detection (Continued)

<u>File No.</u>	<u>Company Name</u>	<u>Contact</u>	<u>Telephone</u>	<u>Approval Date</u>	<u>Product's Name</u>	<u>Condition(s)</u>
EQ-766	Hamilton Tanks, LLC	Mike Davis	800/627-8265	4/27/2011	UL-142 Listed Aboveground Tanks for flammable liquids: Vertical Secondary Containment Tanks (Double-Wall), Horizontal Secondary Containment Tanks (Double-Wall), Horizontal Single-Wall Tanks on Saddles, Horizontal Secondary Containment Tanks on Saddles and Skids (Double-Wall), Horizontal Single-Wall and Secondary Containment Tanks on Skids, Open Top Dike Aboveground Tanks for Flammable Liquids, Rectangular Tanks	Approved as an aboveground storage tank and containment system in the State of Florida provided that the tanks are equipped with approved spill containment, overfill protection, and interstitial release detection prior to dispensing product. The storage tanks shall be tested in accordance with Chapter 13 of Petroleum Equipment Institute Standard PEI/RP 200-96 prior to dispensing any regulated substances from the tank.
EQ-768	Southern Fire Protection of Orlando, Inc.	Bobby Caldwell	407/323-4200	5/26/2011	WE-Mac Manufacturing Co. - Pentair Water Double Wall Steel Storage Tanks - UL 142	The tanks must be equipped with approved overfill protection, spill containment and with an interstitial release detection system prior to dispensing product. Installation and leakage testing shall be done according to the manufacturing recommendations.
EQ-792	Metal Products Company	Burcher Gammage	770/945-8383	8/24/2012	Metal Products Company UL 2075 and UL 142 Generator Sub Base AST	Installation and testing shall be in accordance with the manufacturer's recommendations.

AST/ Vault System

<u>File No.</u>	<u>Company Name</u>	<u>Contact</u>	<u>Telephone</u>	<u>Approval Date</u>	<u>Product's Name</u>	<u>Condition(s)</u>
EQ-419	ConVault Florida	Jim Remington	800/642-1540	1/14/2000	FuelVault™ System	
EQ-568	Guardian Containment, Corp.	Kelly Stanton	800/797-8265	12/11/2003	UL Listed Armor Vault System File Number MH18494	Conditional Approval
EQ-765	Western International	Tim Doling	203/-847-4300	4/15/2011	Transcube 30TCG & Transcube 50TCG ASTs with ENVIROconnect equipment cabinet - UL and ULC 142 listed under UL File No. MH45322	Approved in the State of Florida as a secondarily contained UL 142 listed AST with spill containment and dispensing system containment.

AST/ AST with Secondary Containment and Spill Containment; These Tanks are Required to be Equipped with Approved Overfill Protection and Interstitial Release Detection

<u>File No.</u>	<u>Company Name</u>	<u>Contact</u>	<u>Telephone</u>	<u>Approval Date</u>	<u>Product's Name</u>	<u>Condition(s)</u>
EQ-385	American Access Technologies, Inc. (Formerly Genco, Inc.)	Steve Watkins	352/473-5400	8/30/1999	Genco Double-Wall Sub Base Generator Tank	Tanks are required to be equipped with approved overfill protection and interstitial release detection prior to dispensing products
EQ-413	Control Equipment & Sales, Inc.	Robert Melton	205/989-0090	11/22/1999	Wedlake Fabricating Double-Wall Sub-Base Generator Tank	Tanks are required to be equipped with approved overfill protection and interstitial release detection prior to dispensing products. The storage tank shall be tested in accordance with Chapter 13 of Petroleum Equipment Institute Standard PE1/RP 200-96 prior to dispensing product.
EQ-427	TAW Custom Equipment	Daniel Barron	813/621-5661	3/16/2000	Taw Custom Equipment Double-Wall Sub-Base Generator Tank	Tanks are required to be equipped with approved overfill protection and interstitial release detection prior to dispensing products.

AST/ AST with Secondary Containment and Spill Containment; These Tanks are Required to be Equipped with Approved Overfill Protection and Interstitial Release Detection (Continued)

<u>File No.</u>	<u>Company Name</u>	<u>Contact</u>	<u>Telephone</u>	<u>Approval Date</u>	<u>Product's Name</u>	<u>Condition(s)</u>
EQ-432	Prichard Brown of Florida, Inc. (Formerly Electric Specialty, Inc.)	Charles Gears	800/866-9486	3/28/2000	Electric Specialty double-Wall closed dike generator base tank	Tanks are required to be equipped with approved overfill protection, and interstitial release detection prior to dispensing products. The storage tank shall be tested in accordance with Chapter 13 of Petroleum Equipment Institute Standard PEI/RP 200-96 prior to dispensing product.
EQ-460	Chillicothe Metal Co., Inc.	Jeff Bessler	309/274-5421	10/12/2000	Double-Wall & closed top dike tank	Tanks are required to be equipped with approved overfill protection and interstitial release detection prior to dispensing products. The storage tank shall be tested in accordance with Chapter 13 of Petroleum Equipment Institute Standard PEI/RP 200-96 prior to dispensing product.
EQ-478	Bendel Corporation	Bill Beaver	704/596-5112	2/09/2001	Double-Wall Generator Base Tank	Tanks are required to be equipped with approved overfill protection and interstitial release detection prior to dispensing products. The storage tank shall be tested in accordance with Chapter 13 of Petroleum Equipment Institute Standard PEI/RP 200-96 prior to dispensing product.

AST/ AST with Secondary Containment and Spill Containment; These Tanks are Required to be Equipped with Approved Overfill Protection and Interstitial Release Detection (Continued)

<u>File No.</u>	<u>Company Name</u>	<u>Contact</u>	<u>Telephone</u>	<u>Approval Date</u>	<u>Product's Name</u>	<u>Condition(s)</u>
EQ-482	Wilson MFG., Inc.	Greg Lepine	800/446-3500	2/12/2001	UL 142 Double-Wall and UL-142 Closed Top Diked Generator Base Tanks	Tanks are required to be equipped with approved overfill protection and interstitial release detection prior to dispensing products. The storage tank shall be tested in accordance with Chapter 13 of Petroleum Equipment Institute Standard PEI/RP 200-96 prior to dispensing product.
EQ-483	Isom Brothers, Inc.	Scott Frerichs	208/459-6077	2/27/2001	UL 142 Double-Wall Base Tank and UL 2085 Double-Wall Vault Tank	Tanks are required to be equipped with approved overfill protection and interstitial release detection prior to dispensing products. The storage tank shall be tested in accordance with Chapter 13 of Petroleum Equipment Institute Standard PEI/RP 200-96 prior to dispensing product.
EQ-484	Prichard Brown of Florida, Inc.	Frank Miller	352/742-7125	2/27/2001	UL-142 Double-Wall Tank, PB Style	Tanks are required to be equipped with approved overfill protection and interstitial release detection prior to dispensing products. The storage tank shall be tested in accordance with Chapter 13 of Petroleum Equipment Institute Standard PEI/RP 200-96 prior to dispensing product.

AST/ AST with Secondary Containment and Spill Containment; These Tanks are Required to be Equipped with Approved Overfill Protection and Interstitial Release Detection (Continued)

<u>File No.</u>	<u>Company Name</u>	<u>Contact</u>	<u>Telephone</u>	<u>Approval Date</u>	<u>Product's Name</u>	<u>Condition(s)</u>
EQ-496	BN Manufacturing	Erik Kientz	800/684-9096	4/17/2001	Double-wall Generator Base Tank	Tanks are required to be equipped with approved overfill protection and interstitial release detection prior to dispensing product. The storage tanks shall be tested in accordance with Chapter 13 of Petroleum Equipment Institute Standard PEI/RP 200-96 prior to dispensing product.
EQ-497	JRS, Inc.	Greg Linton	352/351-2100	5/10/2001	Double-Wall Generator Base Tank	Tanks are required to be equipped with approved spill containment, overfill protection and interstitial release detection prior to dispensing product. The storage tanks shall be tested in accordance with Chapter 13 of Petroleum Equipment Institute Standard PEI/RP 200-96 prior to dispensing product.

AST/ AST with Secondary Containment and Spill Containment: These Tanks are Required to be Equipped with Approved Overfill Protection and Interstitial Release Detection (Continued)

<u>File No.</u>	<u>Company Name</u>	<u>Contact</u>	<u>Telephone</u>	<u>Approval Date</u>	<u>Product's Name</u>	<u>Condition(s)</u>
EQ-504	Bob Gerena Fabricating, Inc.	Robert Gerena	863/425-1771	9/27/2001	UL-142 Double-Wall Sub-Base Generator Tank	Tanks are required to be equipped with approved overfill protection and interstitial release detection prior to dispensing products. The storage tank shall be tested in accordance with Chapter 13 of Petroleum Equipment Institute Standard PEI/RP 200-96 prior to dispensing product.
EQ-518	Lecturus Corporation (formerly D.T.S., Inc.)	Adam Aasen	605/368-5306	2/19/2002	UL 142 Double-Wall Sub-Base Generator Tank	Tanks are required to be equipped with approved overfill protection device and with an interstitial release detection system prior to dispensing product. The storage tanks shall be tested in accordance with Chapter 13 of Petroleum Equipment Institute Standard PEI/RP 200-96 prior to dispensing product.

AST/ AST with Secondary Containment and Spill Containment: These Tanks are Required to be Equipped with Approved Overfill Protection and Interstitial Release Detection (Continued)

<u>File No.</u>	<u>Company Name</u>	<u>Contact</u>	<u>Telephone</u>	<u>Approval Date</u>	<u>Product's Name</u>	<u>Condition(s)</u>
EQ-528	Total Energy Systems, LLC	Christopher Stiles	888/548-1400	4/29/2002	Double-Wall Generator Base Tank with Spill Containment	Tanks are required to be equipped with approved overfill protection device and with an interstitial release detection system prior to dispensing product. The storage tanks shall be tested in accordance with Chapter 13 of Petroleum Equipment Institute Standard PEI/RP 200-96 prior to dispensing product.
EQ-533	Advanced Manufacturing & Power Systems, Inc.	Jim Sanders	386/822-5565	5/23/2002	Double-Wall Generator Base Tank with Spill Containment	Tanks are required to be equipped with approved overfill protection device and with an interstitial release detection system prior to dispensing product. The storage tanks shall be tested in accordance with Chapter 13 of Petroleum Equipment Institute Standard PEI/RP 200-96 prior to dispensing product.

AST/ AST with Secondary Containment and Spill Containment: These Tanks are Required to be Equipped with Approved Overfill Protection and Interstitial Release Detection (Continued)

<u>File No.</u>	<u>Company Name</u>	<u>Contact</u>	<u>Telephone</u>	<u>Approval Date</u>	<u>Product's Name</u>	<u>Condition(s)</u>
EQ-544	Victory Industrial Products, Inc.	Dale Freeman	800/732-9240	11/05/2002	Double-Wall Generator Base Tank With Spill Containment, UL File Number 17934	Tanks are required to be equipped with approved overfill protection device and with an interstitial release detection system prior to dispensing product. The storage tanks shall be tested in accordance with Chapter 13 of Petroleum Equipment Institute Standard PEI/RP 200-96 prior to dispensing product.
EQ-554	Bendel Corporation	William Beaver	704/596-5112	3/21/2003	Tent tank, UL 142 Listed Horizontal Double-Wall Tank With Spill Containment, UL File Number MH8552 Vol. 2	Tanks are required to be equipped with approved overfill protection device and with an interstitial release detection system prior to dispensing product. The storage tanks shall be tested in accordance with Chapter 13 of Petroleum Equipment Institute Standard PEI/RP 200-96 prior to dispensing product.

AST/ AST with Secondary Containment and Spill Containment; These Tanks are Required to be Equipped with Approved Overfill Protection and Interstitial Release Detection (Continued)

<u>File No.</u>	<u>Company Name</u>	<u>Contact</u>	<u>Telephone</u>	<u>Approval Date</u>	<u>Product's Name</u>	<u>Condition(s)</u>
EQ-565	United Alloy, Inc.	Mark Gossens	608/758-4717 Ext. 109	10/23/2003	United Alloy's UL-142 Listed Sub-Base Double-Wall Tank With Spill Containment, UL File Number MH28874	Tanks are required to be equipped with approved overfill protection device and with an interstitial release detection system prior to dispensing product. The storage tanks shall be tested in accordance with Chapter 13 of Petroleum Equipment Institute Standard PEI/RP 200-96 prior to dispensing product.
EQ-565R	United Alloy, Inc.	Mark Gossens	608/758-4717 Ext. 109	10/23/2003	United Alloy's UL-142 Listed Sub-Base Double-Wall Tank With Spill Containment, UL File Number MH28847 (Correction of UL File Number MH28874 to MH28847)	Tanks are required to be equipped with approved overfill protection device and with an interstitial release detection system prior to dispensing product. The storage tanks shall be tested in accordance with Chapter 13 of Petroleum Equipment Institute Standard PEI/RP 200-96 prior to dispensing product.

AST/ AST with Secondary Containment and Spill Containment; These Tanks are Required to be Equipped with Approved Overfill Protection and Interstitial Release Detection (Continued)

<u>File No.</u>	<u>Company Name</u>	<u>Contact</u>	<u>Telephone</u>	<u>Approval Date</u>	<u>Product's Name</u>	<u>Condition(s)</u>
EQ-566	Generac Power Systems, Inc.	Don Vanderbrook	262/544-4811 Ext. 2372	10/23/2003	Generac's UL-142 Listed Sub-Base Double-Wall Tank With Spill Containment, UL File Number MH18459	Tanks are required to be equipped with approved overfill protection device and with an interstitial release detection system prior to dispensing product. The storage tanks shall be tested in accordance with Chapter 13 of Petroleum Equipment Institute Standard PEI/RP 200-96 prior to dispensing product.
EQ-567	Global Power Components Corporation	Mark Hopkins	414/475-3000	11/28/2003	Global Power Components' UL-142 Listed Sub-Base Double-Wall Tank With Spill Containment, UL File Number MH18481	Tanks are required to be equipped with approved overfill protection device and with an interstitial release detection system prior to dispensing product. The storage tanks shall be tested in accordance with Chapter 13 of Petroleum Equipment Institute Standard PEI/RP 200-96 prior to dispensing product. The Department Final Order EQ-246 issued on April 5, 1996 is no longer in effect.

AST/ AST with Secondary Containment and Spill Containment; These Tanks are Required to be Equipped with Approved Overfill Protection and Interstitial Release Detection (Continued)

<u>File No.</u>	<u>Company Name</u>	<u>Contact</u>	<u>Telephone</u>	<u>Approval Date</u>	<u>Product's Name</u>	<u>Condition(s)</u>
EQ-572	Heatec, Inc.	Terry Rutlege	423/821-5200	1/16/2004	Heatec, Inc.'s UL-142 Listed Double-Wall Tank with Spill Containment, UL File Number MH14038	Tanks are required to be equipped with approved overfill protection device and with an interstitial release detection system prior to dispensing product. The storage tanks shall be tested in accordance with Chapter 13 of Petroleum Equipment Institute Standard PEI/RP 200-96 prior to dispensing product. The Department Final Order EQ-246 issued on April 5, 1996 is no longer in effect.

AST/ AST with Secondary Containment and Spill Containment; These Tanks are Required to be Equipped with Approved Overfill Protection and Interstitial Release Detection (Continued)

<u>File No.</u>	<u>Company Name</u>	<u>Contact</u>	<u>Telephone</u>	<u>Approval Date</u>	<u>Product's Name</u>	<u>Condition(s)</u>
EQ-593	JRS Custom Fabrication, Inc.	Greg Linton	352/351-2100	9/24/2004	JRS Fill Spill Containment for ASTs,	Approved for use for spill containment for double-walled sub-base generator aboveground tanks that were approved under Department file number EQ-497 on May 10, 2001 in the State of Florida.
EQ-595	Acoustical Control Systems, Inc.	Ron Schulz	252/243-0150	9/30/2004	ACS's UL-142 Listed Double-Wall Sub-Base Generator Tank with Spill Containment	Tanks must be equipped with approved overfill protection and with an interstitial release detection system if Acoustical Control System Inc. provides the spill containment devices prior to dispensing product. If not, the tanks must be equipped with approved overfill protection, spill containment system and with an interstitial release detection system if the spill containment is not provided by Acoustical Control Systems, Inc. The storage tanks shall be tested in accordance with Chapter 13 of the Petroleum Equipment Institute's Standard PEI/RP 200-96 prior to dispensing product.

AST/ AST with Secondary Containment and Spill Containment; These Tanks are Required to be Equipped with Approved Overfill Protection and Interstitial Release Detection (Continued)

<u>File No.</u>	<u>Company Name</u>	<u>Contact</u>	<u>Telephone</u>	<u>Approval Date</u>	<u>Product's Name</u>	<u>Condition(s)</u>
EQ-609	TankSafe, Inc.	Reinhard Schuetz	403/291-3937	4/08/2005	UL Listed Double-Wall Tank with Spill Containment, UL File Number MH29775	The tanks are required to be equipped with approved overfill protection and with an interstitial release detection system prior to dispensing product. The storage tanks shall be tested in accordance with manufacturer's instruction attached as Exhibit A prior to dispensing product.
EQ-620	Robinson Custom Enclosures	Jim Birkholz	920/615-3406	11/23/2005	External Fuel Fill box used with the Aboveground Storage Tank, UL File No. MH26813	Spill containment device used with the aboveground storage tank that was approved under Department File Number EQ-616 issued on September 12, 2005, State of Florida.
EQ-625	Phoenix Products, LLC	Pete Slater	904/354-1858	12/27/2005	The Phoenix Fire Steel UL-142 and UL 2085 Listed Double-Wall Sub-Base Generator Tank with Spill Containment, UL File Number MH15322	Refer to the Final Order
EQ-636	Advanced Manufacturing & Power Systems, Inc.	Jim Sanders	386/822-5565	3/29/2006	UL 2085 Listed Double-Walled Sub-Base Generator Aboveground Storage Tank with Spill Containment, UL File Number MH16661	The tanks are required to be equipped with approved overfill protection and with an interstitial release detection system prior to dispensing product. The storage tanks shall be tested in accordance with Chapter 13 of the Petroleum Equipment Institute's Standard PEI/RP 200-96 prior to dispensing product.

AST/ AST with Secondary Containment and Spill Containment; These Tanks are Required to be Equipped with Approved Overfill Protection and Interstitial Release Detection (Continued)

<u>File No.</u>	<u>Company Name</u>	<u>Contact</u>	<u>Telephone</u>	<u>Approval Date</u>	<u>Product's Name</u>	<u>Condition(s)</u>
EQ-647	Superior Systems & Technologies, Ltd.	Zachary Hoover	325/690-6248	8/08/2006	UL 142 Listed Double-Walled Sub-Base Generator Aboveground Storage Tank with Spill Containment, UL File Number MH10272	Approved as an aboveground storage tank with secondary containment and with spill containment in the State of Florida. The tanks must be equipped with approved overfill protection and with an interstitial release detection system prior to dispensing product. The storage tanks shall be tested in accordance with Chapter 13 of the Petroleum Equipment Institute's Standard PEI/RP 200-96 prior to dispensing product.
EQ-655	Safe-T-Tank Corp.	Amy Bartis	203/237-6320	10/30/2006	UL 142 Listed Double-Walled Sub-Base Generator Aboveground Storage Tank with Spill Containment, UL File Number MH16800	Approved as an aboveground storage tank with secondary containment and with spill containment in the State of Florida. The tanks must be equipped with approved overfill protection and with an interstitial release detection system prior to dispensing product. The storage tanks shall be tested in accordance with Chapter 13 of the Petroleum Equipment Institute's Standard PEI/RP 200-96 prior to dispensing product.

AST/ AST with Secondary Containment and Spill Containment; These Tanks are Required to be Equipped with Approved Overfill Protection and Interstitial Release Detection (Continued)

<u>File No.</u>	<u>Company Name</u>	<u>Contact</u>	<u>Telephone</u>	<u>Approval Date</u>	<u>Product's Name</u>	<u>Condition(s)</u>
EQ-662	Tramont Corporation	Logan Tatem	414/906-2041	2/09/2007	the UL 142 Listed Double-Walled Sub-Base Generator Aboveground Storage Tank with Spill Containment, UL File Number MH17470	The tanks are required to be equipped with approved overfill protection and with an interstitial release detection system prior to dispensing product. The storage tanks shall be tested in accordance with Chapter 13 of the Petroleum Equipment Institute's Standard PEI/RP 200-96 prior to dispensing product. The Department Final Order EQ-228 issued on October 25, 1995 is no longer in effect.
EQ-736	Pryco, Inc.	Dan Lyons	217/364-4467	7/23/2009	DEP Approval of the UL 142 Listed Pryco's double wall day tank with spill containment, UL File Number MH12807	The tanks must be equipped with approved overfill protection and with an interstitial release detection system prior to dispensing product. The storage tanks shall be tested in accordance with Chapter 13 of the Petroleum Equipment Institute's Standard PEI/RP 200-96 prior to dispensing product.

AST/ AST with Secondary Containment and Spill Containment; These Tanks are Required to be Equipped with Approved Overfill Protection and Interstitial Release Detection (Continued)

<u>File No.</u>	<u>Company Name</u>	<u>Contact</u>	<u>Telephone</u>	<u>Approval Date</u>	<u>Product's Name</u>	<u>Condition(s)</u>
EQ-750	ConVault, Inc.	Dan Rockefeller	800/642-1540	2/22/2010	UL 142 Listed double wall aboveground tank with spill containment, UL File Number MH15966	The tanks must be equipped with approved overfill protection and with an interstitial release detection system prior to dispensing product. The storage tanks shall be tested in accordance with Chapter 13 of the Petroleum Equipment Institute's Standard PEI/RP 200-96 prior to dispensing product. The Department Final Orders EQ-201 issued on May 3, 1995, is no longer in effect.
EQ-785	Freeman Enclosure Systems, LLC	Dale Freeman	877/411-8555	4/11/2012	Special purpose AST Tanks under UL Listings UL142 & UL2085 Reference File #s: MH47836 Vol. 1; MH47836 Vol. ST1; MH47836 Vol. ST2; MH47836 Vol. CN1; MH48714 Vol. ST1; and MH48714 Vol. CN1	The listed special purpose ASTs are to be used primarily as stand-by generator tanks. Installation shall be made in accordance with the manufacturer's recommendations.

AST/ AST with Secondary Containment and Spill Containment; These Tanks are Required to be Equipped with Approved Overfill Protection and Interstitial Release Detection (Continued)

<u>File No.</u>	<u>Company Name</u>	<u>Contact</u>	<u>Telephone</u>	<u>Approval Date</u>	<u>Product's Name</u>	<u>Condition(s)</u>
EQ-754	Del Zotto Products of Florida	Donald Trumble	352/351-3834	03/11/2010	UL 142, and UL 2085, Listed double wall aboveground tank with spill containment, UL File Numbers MH17021 and MH16810	The tanks must be equipped with approved overfill protection and with an interstitial release detection system prior to dispensing product. The storage tanks shall be tested in accordance with Chapter 13 of the Petroleum Equipment Institute's Standard PEI/RP 200-96 prior to dispensing product. The Department Final Orders EQ-043 issued on September 17, 1991, is no longer in effect.

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