

**TECHNICAL SPECIFICATIONS**

**FLORIDA KEYS AQUEDUCT AUTHORITY**  
**NAVY SYSTEMS UPGRADES – WASTEWATER PUMPING SYSTEMS**

**FKAA PROJECT # 4072-17**

**MARCH 2018**

**MONROE COUNTY**  
**FLORIDA**

## DIVISION 1 - GENERAL REQUIREMENTS

### SECTION 01010

#### SUMMARY OF WORK

#### PART 1 - GENERAL

##### 1.01 WORK COVERED BY CONTRACT DOCUMENTS

- A. The location of the work is on various U.S. Navy properties on Boca Chica Key, Sigsbee Park, and Fleming Key in Monroe County, Florida.
- B. The work for this project consists of:
  - 1. Replacement of discharge piping, valves, and fittings as well as pipe supports, pump railing and chains, and pump base plates at four sewer lift stations with in-kind equipment, except where different specifications are provided by FCAA. The end of the replacement work will occur at the first appurtenance or fitting outside the discharge side of the lift station valve pits or after the bypass pumping tie-in point, whichever is the farthest downstream. The four lift stations are referred to as A-647 (Boca Chica Key), A-939 (Boca Chica Key), V-4155 (Sigsbee Park), and K-100 (Fleming Key).
  - 2. Replacement of valve vault at K-100 with new 48-inch by 72-inch valve vault.
  - 3. Sandblasting, patching, and lining of lift station K-100 with IET SYSTEMS "SYSTEM 3" wet well lining.
  - 4. Cutting and capping of an existing 8-inch gravity overflow line at lift station V-4155.
- C. While work is performed, all of the included lift stations are required to remain operational 24-hours per day by means of sound-attenuated bypass pumping systems. The Contractor shall be responsible for the operation and maintenance of the bypass pumping systems, including response to any abnormalities, equipment failures, and/or alarms.
- D. Except as specifically noted, the Contractor shall provide and pay for:

1. Labor, materials, tools, construction, equipment, and machinery.
  2. All costs related to dewatering of excavation sites to ensure work is performed in the dry, including the cost of any permits for disposal.
  3. By-pass pumping equipment, including a stand-by pump, alarm dialer system and fuel.
  4. Other facilities and services necessary for the proper execution and completion of the work.
  5. Any incurred costs related to registration with and requirements of the Defense Biometric Identification System (DBIDS), which is required for all workers and subcontractors to access the work sites.
- E. The Contractor shall prosecute the work under the FKAA's Minimum Design and Construction Standards and Specifications, except as noted. A copy of which is available from the FKAA Department of Engineering.
- F. The Contractor shall comply with all applicable codes, ordinances, rules, regulations, and orders; and, the requirements of the FKAA and U.S. Navy. This includes registration of all workers and subcontractors on the work sites with the DBIDS system which is required for access to the work sites.

## 1.02 LOCATIONS OF UTILITIES

- A. Information shown on the drawings as to the location of existing utilities has been prepared from the most reliable data available to the FKAA; however, this information is not guaranteed and it shall be the Contractor's responsibility to determine the location, character, and depth of any existing utilities. Extreme caution shall be exercised to eliminate any possibility of any damage to utilities resulting from his activities. The Contractor shall be fully responsible for any damage to utilities resulting from his operation.
- B. The Contractor shall determine any conflicts between existing utilities, or other structures or facilities, with the alignment or gradient of the proposed work, and report such conflicts to the FKAA, sufficiently in advance of his construction operations so that proper adjustments in the alignment or gradient of the proposed work may be planned by the FKAA to avoid such conflicts. The FKAA shall not be liable for any cost or added

expenses to the Contractor for delays, or for the necessary adjustment of previously installed work to avoid such conflicts, due to the Contractor's failure to advise the FKAA of such conflicts adequately in advance of his construction operations.

- C. The Contractor shall excavate and uncover all existing force mains and gravity lines to determine the exact elevations, locations, type, and size of the mains and service lines sufficiently in advance of his work, and prior to submittal of applicable shop drawings, to ensure that all required materials are available when connections to the existing mains and services are to be made.
- D. The Contractor shall be responsible for furnishing such fittings, couplings, adaptors, and specials as required to make connections to the existing force mains and gravity lines in accordance with the details shown on the Drawings. No claims for delay or extra cost will be allowed due to changes in the location, elevation, type, or size of the force mains or gravity lines from those shown on the Drawings.

#### 1.03 CONSTRUCTION SEQUENCE

- A. The Contractor shall fully coordinate and obtain the approval of the FKAA of his proposed construction sequence. The proposed construction sequence must prioritize the completion of work at Lift Station V-4155.
- B. The Contractor's dewatering plan shall be submitted to and approved by FKAA prior to the commencement of any digging or excavation.
- C. The Contractor shall submit applications for a dig permit to FKAA, who will submit the application to U.S. Navy for approval. Dig permits can take more than 30 days to process and approve. No additional claims for delay or extra cost will be allowed due to the processing time for dig permits to be approved.
- D. All work is to be performed in such a manner and sequence that interruptions of service to the existing customers shall be kept at a minimum. The Contractor shall fully coordinate and obtain the approval of the FKAA of his proposed sequence of operations for making connections to the existing force mains and gravity lines.
- E. It is required that all lift stations in the scope of work remain operational by means of bypass pumping. The Contractor shall be responsible for the operation and maintenance of the bypass pumping systems; the proposed construction sequence will account

for this responsibility and no additional claims for delay or extra cost will be allowed due to operation and maintenance of bypass equipment. Bypass pumping systems shall remain in place and operational until the new piping and equipment have been satisfactorily installed, existing pumps and electric are placed back into service, and operational testing is approved by FKAA personnel.

- F. All work is to be performed in such a manner and sequence that interruption of service to existing collection system operations shall be kept to a minimum.

1.04 PROPERTY OWNER'S APPROVAL (not used)

1.05 SILTATION AND BANK EROSION

The Contractor shall take adequate precautions as directed by FKAA or regulatory agencies to minimize siltation and bank erosion in the vicinity of wetlands or coastline, in discharging well point systems, or during other construction activities (including flushing and disinfection of mains).

1.06 STORAGE OF MATERIALS

- A. Suitable storage facilities shall be furnished by the Contractor. All materials, supplies and equipment intended for use in the work shall be suitably stored by the Contractor to prevent damage from exposure, admixture with foreign substances, or vandalism or other cause. The FKAA will refuse to accept, or sample for testing, materials, supplies or equipment that have been improperly stored, as determined by the FKAA. Materials found unfit for use shall not be incorporated in the work and shall immediately be removed from the construction or storage site. Materials may be strung out along the line of construction as approved by the FKAA and U.S. Navy.
- B. When storing materials on private property, the Contractor shall submit in writing the property owner's authorization to do so and provide any and all permits that may be required at no expense to the FKAA.

1.07 PRESERVATION OF PROPERTY

- A. The Contractor shall preserve from damage all property along the line of the work, or which is in the vicinity of or is in any way affected by the work, the removal or destruction of which is not called for by the Drawings. Wherever such property is damaged due to the activities of the Contractor, it shall be immediately

restored to its original condition by the Contractor at no cost to the FCAA.

- B. The Contractor shall be responsible for the removal, storage, and reinstallation of existing pumps, electrical, and control systems.

#### 1.08 CLEAN UP

- A. The Contractor shall keep the construction site free of rubbish and other materials and restore to their original conditions those portions of the site not designated for the alternation by the Contract Documents. Clean up and restoration shall be accomplished daily throughout the contract period and in such a manner as to maintain a minimum of nuisance and interference to the general public and residents in the vicinity of the work. The Contractor shall also remove, when no longer needed, all temporary structures and equipment used in his operation. It is the intent of this Specification that the construction areas and those other areas not designated for alteration by the Contract Documents shall be immediately restored to original condition. All clean-up is subject to approval by the FCAA.
- B. As soon as possible, the premises and grounds shall be restored to conditions existing prior to the pipe installation, as far as practicable. Any holes or depressions, caused by the Contractor's work, shall be filled with sand or other suitable fill material, and all surfaces shall be left smooth. Any damage to buildings, shrubs, trees, plantings or paving shall be repaired, and any damaged areas of lawn shall be re-sodded. The Contractor shall answer to any complaints of occupants or property owners.

#### 1.09 PUBLIC SAFETY AND CONVENIENCE

The Contractor shall at all times so conduct his work as to ensure the least possible obstruction to traffic, or inconvenience to the general public and residents in the vicinity of the work. No road or street shall be closed, except with the permission of the FCAA and U.S. Navy. Fire hydrants on or adjacent to the work shall be kept accessible. Provisions shall be made by the Contractor to ensure public access to sidewalks, public telephones, and the proper functioning of all gutters, sewer inlets, drainage ditches, and irrigation ditches. No open excavation shall be left overnight. All open excavation within the roadway shall be backfilled and a temporary asphalt patch applied prior to darkness each day. A temporary cold asphalt patch is acceptable.

#### 1.10 SAFETY AND OSHA COMPLIANCE

- A. The Contractor shall comply in all respects with all Federal, State and Local safety and health regulations. Copies of the Federal regulations may be obtained from the U.S. Department of Labor, Occupation Safety and Health Administration (OSHA), Washington, DC 20210 or their regional offices.
- B. The Contractor shall comply in all respects with the applicable Workman's Compensation Law.
- C. The workplace contains permit spaces and permit space entry is allowed only through compliance with a permit space program meeting the requirements of 29 CFR 1910.146.

1.11 CONTRACTOR'S USE OF PREMISES

- A. Coordinate use of premises under direction of the FKAA.
- B. Assume full responsibility for the protection and safekeeping of equipment and materials stored on the site.
- C. Move any stored products, under Contractor's control, which interfere with operations of the FKAA, U.S. Navy or separate Contractor.

1.12 SALVABLE MATERIALS

All salvable pipe fittings, valve boxes, or other miscellaneous materials removed during construction and not used in the work shall be cleaned and delivered to the FKAA maintenance facility office, at the Contractor's expense, and shall remain the property of the FKAA. All other materials shall be disposed of by the Contractor at his own expense. No separate payment for this work shall be allowed.

PART 2 - PRODUCTS (not used)

PART 3 - EXECUTION

3.01 WORK SCOPE

All piping materials to be used at lift stations K-100 and V-4155 shall be high-density polyethylene (HDPE) in accordance with Technical Specification 15018. Replacement piping materials at lift stations A-647 and A-939 shall be HDPE or Schedule 80 Polyvinyl Chloride (PVC) in accordance with Technical Specification 15018 and 15012, respectively.

All isolation valves shall be replaced with quarter-turn plug valves in accordance with Technical Specification 15100. All pipe hardware shall

be in accordance with Technical Specification 15000 and other specifications provided. All replacement materials must conform to the Technical Specifications provided.

After removal of existing equipment, condition assessment by FKAA personnel, and any additional wet well repairs have been performed, all work is to be performed “in the dry”.

1. Lift Station A-647 – Scope of Work

- a) Contractor to provide for 24-hour station operation via bypass pumping as required. A bypass pumping plan will be submitted at the time of bid submission. Pumping capacity per-pump has been included on the drawings.
- b) Site dewatering, trenching, shoring, and soil erosion measures, where required, will be the responsibility of the Contractor. Permit for dewatering shall be the responsibility of the Contractor.
- c) Contractor shall remove and/or secure the existing electrical systems, float controls, submersible pumps, access hatches, and other equipment present as required to ensure their preservation for reuse. All removed items shall be cleaned and disinfected prior to storage in order to maintain a sanitary environment. The Contractor shall note any damage to equipment prior to removal for FKAA to review. The Contractor shall be responsible for damage to this equipment as a result of removal, storage, and reinstallation.
- d) Contractor shall remove all piping, valves, fittings, other appurtenances, guide rails, brackets, lift chains, pipe supports, and pump base plates. Items shall be disposed of properly.
- e) Contractor shall pressure clean and disinfect emptied wet well for condition assessment by FKAA personnel. If any additional work is added to the scope as the result of the assessment, contingency funds shall be used to fund such work.
- f) Contractor shall furnish and install 4-inch discharge piping, fittings, plug valves, check valves, and emergency pump out connection.
- g) Contractor shall furnish and install 316 stainless steel guide rails, brackets, and pipe supports. Contractor shall furnish and install new pump base plates.
- h) Contractor shall connect new piping to existing force main at the first fitting outside the discharge side of the valve box or after the bypass pumping tie-in point, whichever is the farthest downstream and field modify, as required, to match field conditions. All disturbed pipe penetrations must be re-sealed using a method approved by FKAA.

- i) Contractor shall reinstall and reconnect the electrical systems, float controls, and submersible pumps. Operational and pressure testing shall occur in the presence of the Engineer.

2. Lift Station A-939 – Scope of Work

- a) Contractor to provide for 24-hour station operation via bypass pumping as required. A bypass pumping plan will be submitted at the time of bid submission. Pumping capacity per-pump has been included on the drawings.
- b) Site dewatering, trenching, shoring, and soil erosion measures, where required, will be the responsibility of the Contractor. Permit for dewatering shall be the responsibility of the Contractor.
- c) Contractor shall remove and/or secure the existing electrical systems, float controls, submersible pumps, access hatches, and other equipment present as required to ensure their preservation for reuse. All removed items shall be cleaned and disinfected prior to storage in order to maintain a sanitary environment. The Contractor shall note any damage to equipment prior to removal for FKAA to review. The Contractor shall be responsible for damage to this equipment as a result of removal, storage, and reinstallation.
- d) Contractor shall remove all piping, valves, fittings, other appurtenances, guide rails, brackets, lift chains, pipe supports, and pump base plates. Items shall be disposed of properly.
- e) Contractor shall pressure clean and disinfect emptied wet well for condition assessment by FKAA personnel. If any additional items are added to the work scope as the result of the assessment, contingency shall be used to fund such work.
- f) Contractor shall furnish and install 4-inch discharge piping, fittings, plug valves, check valves, and emergency pump out connection.
- g) Contractor shall furnish and install 316 stainless steel guide rails, brackets, and pipe supports. Contractor shall furnish and install new pump base plates.
- h) Contractor shall connect new piping to existing force main at the first fitting outside the discharge side of the valve box or after the bypass pumping tie-in point, whichever is the farthest downstream and field modify, as required, to match field conditions. All disturbed pipe penetrations must be re-sealed using a method approved by FKAA.
- i) Contractor shall reinstall and reconnect the electrical systems, float controls, and submersible pumps. Operational and pressure testing shall occur in the presence of the Engineer.

3. Lift Station V-4155 – Scope of Work

- a) Contractor to provide for 24-hour station operation via bypass pumping as required. A bypass pumping plan will be submitted at the time of bid submission. Pumping capacity per-pump has been included on the drawings. Noise attenuated bypass pumping will be necessary, due to the proximity to Sigsbee Charter School and adjacent residences.
- b) Site dewatering, trenching, shoring, and soil erosion measures, where required, will be the responsibility of the Contractor. Permit for dewatering shall be the responsibility of the Contractor.
- c) Contractor shall remove and/or secure the existing electrical systems, float controls, submersible pumps, access hatches, and other equipment present as required to ensure their preservation for reuse. All removed items shall be cleaned and disinfected prior to storage in order to maintain a sanitary environment. The Contractor shall note any damage to equipment prior to removal for FKAA to review. The Contractor shall be responsible for damage to this equipment as a result of removal, storage, and reinstallation.
- d) Contractor shall remove all piping, valves, fittings, other appurtenances, guide rails, brackets, lift chains, pipe supports, and pump base plates. Items shall be disposed of properly.
- e) Contractor shall pressure clean and disinfect emptied wet well for condition assessment by FKAA personnel. If any additional items are added to the work scope as the result of the assessment, contingency shall be used to fund such work.
- f) Contractor shall cut and cap an existing 8-inch PVC gravity overflow line for abandonment.
- g) Contractor shall furnish and install 10-inch discharge piping, fittings, plug valves, check valves, emergency pump out connection, and downspouts for influent lines including 4-inch influent line where a downspout is not currently present.
- h) Contractor shall furnish and install 316 stainless steel guide rails, brackets, and pipe supports. Contractor shall furnish and install new pump base plates.
- i) Contractor shall connect new piping to existing force main at the first fitting outside the discharge side of the valve box or after the bypass pumping tie-in point, whichever is the farthest downstream and field modify, as required, to match field conditions. All disturbed pipe penetrations must be re-sealed using a method approved by FKAA.
- j) Contractor shall reinstall and reconnect the electrical systems, float controls, and submersible pumps. Operational and pressure testing shall occur in the presence of the Engineer.

#### 4. Lift Station K-100 – Scope of Work

- a) Contractor to provide for 24-hour station operation via bypass pumping as required. A bypass pumping plan will be submitted at the time of bid submission. Pumping capacity should meet or exceed the performance of two (2) Pentair WG50H-03-35 pumps.
- b) Site dewatering, trenching, shoring, and soil erosion measures, where required, will be the responsibility of the Contractor. Permit for dewatering shall be the responsibility of the Contractor.
- c) Contractor shall remove and/or secure the existing electrical systems, float controls, submersible pumps, access hatches, and other equipment present as required to ensure their preservation for reuse. All removed items shall be cleaned and disinfected prior to storage in order to maintain a sanitary environment. The Contractor shall note any damage to equipment prior to removal for FKAA to review. The Contractor shall be responsible for damage to this equipment as a result of removal, storage, and reinstallation.
- d) Contractor shall remove all piping, valves, fittings, other appurtenances, guide rails, brackets, lift chains, pipe supports, and pump base plates. Items shall be disposed of properly.
- e) Contractor shall remove and dispose of existing valve vault. Items shall be disposed of properly.
- f) Contractor shall pressure clean and disinfect emptied wet well for condition assessment by FKAA personnel. If any additional items are added to the work scope as the result of the assessment, contingency shall be used to fund such work.
- g) Contractor shall perform sandblasting and minor leak patching as required and furnish and install IET SYSTEMS "SYSTEM 3" polymorphic resin wet well liner in accordance with the manufacturer's specifications.
- h) Contractor shall furnish and install valve vault, 4-inch discharge piping, fittings, plug valves, check valves, and emergency pump out connection.
- i) Contractor shall furnish and install 316 stainless steel guide rails, brackets, and pipe supports. Contractor shall furnish and install new pump base plates.
- j) Contractor shall connect new piping to existing force main at the first fitting outside the discharge side of the valve box or after the bypass pumping tie-in point, whichever is the farthest downstream and field modify, as required, to match field conditions. All disturbed pipe penetrations must be re-sealed using a method approved by FKAA.
- k) Contractor shall reinstall and reconnect the electrical systems, float controls, and submersible pumps. Operational and pressure testing shall occur in the presence of the Engineer.

END OF SECTION

SECTION 01019

PERMITS AND FEES

PART 1 - GENERAL

1.01 GENERAL

- A. Obtain and pay for all permits and licenses as provided for in the General Conditions, except as otherwise provided herein.
- B. Schedule all inspections and obtain all written approvals of the agencies required by the permits and licenses.
- C. Comply with all conditions specified in each of the permits and licenses.

1.02 DEWATERING ACTIVITIES

- A. Within 10 calendar days after Notice-to-Proceed, submit a dewatering plan. The dewatering plan shall outline the dewatering method, pump capacities, pumping duration, noise abatement, point of discharge and associated water quality protection, methods of bypass associated with ditch crossings, and other pertinent information that may be required by South Florida Water Management District.
- B. The Contractor shall coordinate with the South Florida Water Management District regarding the applicable rules and regulations. A dewatering permit is required for this project. The Contractor shall prepare an application to the District and pay any fee. **The dewatering permit must be secured by the Contractor before any gravity sewer excavation is started.**
- C. Within 45 calendar days of Notice-to-Proceed, Contractor shall submit and obtain SFWMD Dewatering Permit for the project.
- D. With 45 calendar days of Notice-to-Proceed, Contractor shall submit and obtain FDEP Shallow Injection Well Permit.

END OF SECTION

## SECTION 01025

### MEASUREMENT AND PAYMENT

#### PART 1 - GENERAL

##### 1.01 PROVISIONS OF PAYMENT

- A. The Contractor shall receive and accept the compensation as provided in the Bid Form and the Contract in full payment for performing all operations necessary to complete the work under the Unit Price and Aggregate Sum portions of this Contract, and also in full payment for all loss or damages arising from the nature of the work, until the final acceptance by the FKAA.
- B. The Unit Prices and Aggregate Sums stated in the Bid Form include all costs and expenses for labor, equipment, materials, commissions, transportation, changes, expenses, patent fees and royalties, labor for handling materials during inspection, together with any and all costs and expenses in performing and completing the work as ordered and as shown on Contract Drawings and details and specified herein. Measurement and payment for an item at a Unit Price or Aggregate Sum shown in the Bid Form shall be in accordance with the description of that item in this section.
- C. The Contractor's attention is called to the fact that the quotations for the various items of work are intended to establish a total price for completing the work in its entirety. Should the Contractor feel that the cost for any item has not been established by the Bid Form, or this section, he shall include the cost for that work in an applicable bid item, so that his bid reflects his total Unit Prices and Aggregate Sums for completing the work in its entirety. It is the intent of this Contract that the Contractor provide a completed operating system, and any item required to accomplish this shall be included to establish a total cost.
- D. The quantities for payment under this Contract shall be determined by actual measurement of the completed items, in place, ready for service and accepted by the FKAA, in accordance with the applicable method of measurement contained herein. The Contractor shall designate and provide a representative to be present at, to witness, and to assist in the making of field measurements for payment.

## 1.02 DESCRIPTION OF BID ITEMS

### A. General Conditions - Bid Item No. 1

#### a. Site Mobilization & Demobilization

Payment for mobilization and demobilization, scheduling and temporary facilities, construction trailers and utilities (see Section 01510), permits and all other activities necessary will be made at the contract lump sum price bid for the item, which price shall be full compensation for all materials, labor, equipment, tools and all other incidentals necessary to complete this item. Includes all required mobilizations/demobilizations for all items.

This also includes coordination between the Contractor and Power Company/Phone Company in regard to any power poles or anchors that may need to be temporarily held during construction. This includes all costs for securing the poles and anchors.

Refer to Specifications Section 01510 for description of temporary facilities required that shall be paid under this Payment Item.

**Payment item for site mobilization/demobilization shall not exceed two percent (5%) of the contract price. Should the bid price for this item exceed two percent (5%) of the Contract amount, any amount over the 5% will be paid with the Contractor's final payment application.**

#### b. Bonds and Insurance

Payment for bonds and insurance will be made at the contract lump sum price bid for the item. The contractor shall provide proof of payment for all bonds and insurance.

#### c. Maintenance of Traffic (MOT)

The quantity of traffic control to be considered for payment shall be equivalent to the percentage of the project determined by the Engineer to be complete as of the date of the pay request submitted. The percent completion of the project shall be based on the percent of the total project actually constructed and not on the percent of the Contract price completed.

Payment for traffic control shall be made on the basis of a percentage (as determined above) of the Lump Sum Price. The contract unit

price shall include compensation for required labor, materials, and equipment necessary to keep roadways and property accesses in service during construction activities in accordance with the Contract Documents.

A detailed MOT plan will need to be provided by the Contractor for each Phase of construction.

This item includes maintenance of traffic plan, traffic control, flagman, detour signs, barricades, temporary signage, construction and removal of temporary access driveways to residential homes for driveway maintenance, etc. in order to provide safety and traffic access in accordance with local and state requirements.

d. As-Built Record Drawings

Payment for this item shall be on a Lump Sum Basis. One set of full size design drawings on reproducible material and an electronic file of the design drawings on compact disk and will be furnished to the Contractor by FCAA. The contractor is responsible to GPS all fittings, valves, bends, flush-out assemblies, connections to existing sewer mains, sewer connections, etc. with required coordinate plane and must use compatible software to that of the FCAA's. The Contractor shall maintain full size (24 x 36) field drawings to reflect the "as-built" items of work as the work progresses. Contractor shall provide Owner with copies of monthly updates to as-built drawings as part of pay application process. Failure to provide updates may delay payment until updates are submitted. Upon completion of the work, the contractor shall prepare a record set of "as-built" drawings on full size, reproducible material and an electronic file in AutoCAD 2007 or latest version. No final payment will be made for "as-built" drawings until both the reproducible and electronic files are received and accepted by the FCAA.

Place a full size set of contract documents in the Contractor's field office to be used for marking the actual installation location of the work and noting changes in the work. Assign one person to be in charge of the compiling and maintaining on a daily basis.

The signed and sealed As-built drawings prepared by professional surveyor are required to be submitted with each pay request. Partial payment will be made for this item based upon the percentage of work completed. All survey work shall be performed by an independent third party surveyor, licensed to practice in the State of Florida. The surveyor shall be retained by the Contractor and

approved by the Engineer.

This item does not include surveying work required for layout and alignment of utility and roadway improvements.

B. Rehabilitation of Lift Station A-647 – Bid Item No. 2

a. Lift Station A-647 Equipment Removal and Storage

Payment for this item shall be made at the contract lump sum price bid for the item. The contract price shall include the removal, cleaning and disinfection, storage, and security of (2) submersible pumps, electrical conduit, float controls, access hatch(es), and other removed equipment to be preserved. This cost includes the Contractor's responsibility for the aforementioned equipment as well as the Contractor's responsibility to notate any existing damage at the time of removal. No additional payment will be made for the repair or replacement of any equipment with damage beyond which is noted at the time of removal by the Contractor and accepted by the FKAA.

b. Lift Station A-647 Bypass

Payment for this item shall be made at the contract lump sum price bid for the item. The contract price shall include all temporary bypass piping, installation of the bypass pipe, pipe fusion, temporary plugs, cleanup, electric generation and placing of all materials, labor, tools, equipment, and preparation of the existing pipe and/or manhole to receive the bypass piping; all excavation; removal and disposal of excavated fill material; all sheeting, shoring and bracing; all diking, bailing, draining and dewatering; the protection of existing utilities and structure; the furnishing and installation of temporary piping, joint restraint, and temporary traffic control and protection of bypass piping; all work necessary for the connection to existing sanitary sewer force main system and/or manholes with water right connections; all backfilling including the placing and compacting of granular backfill in all excavations; and any other necessary work to complete the project. The cost includes bypass plan(s) submittal to FKAA for review and approval. Bypass shall not be installed until plan is approved by the Engineer. The cost of by-pass pumping, mobilization(s), erosion control, traffic control shall be considered incidental to the cost of bypass installation and shall not be paid separately.

c. Lift Station A-647 Mechanical Work

Payment for this item shall be made at the contract lump sum price bid for the item. The contract price shall include all materials, equipment, tools, labor, and incidentals necessary for all excavation; removal and disposal of excavated material; pipe abandonment, removal and disposal; all sheeting, shoring and bracing; all diking, bailing, draining and dewatering; the protection of existing utilities and structures; the furnishing and installation of piping, supports, hardware, fittings, joint restraints and valves as shown on the Contract Documents; electrical and control work; all work necessary for the connection to existing sanitary sewer force main system with water tight connections; all backfilling including the placing and compacting of granular backfill in all excavations; re-establishing grade; and all other work required for complete Lift Station A-647 Mechanical Work modifications and sanitary sewer force main installation. The cost of any necessary mobilization, erosion control, traffic control, abandonment, and testing shall be considered incidental to the cost of the bid item and shall not be paid for separately.

d. Lift Station A-647 Pump and Control Re-Connection and Testing

Payment for this item shall be made at the contract lump sum price bid for the item. The contract price shall include all costs of installation and electrical connection of (2) pumps previously removed and stored; installation and electrical connection of float controls; operational testing of pump station operation; and pressure testing of the installed piping. Pressure testing of installed piping shall occur in the presence of the Engineer. The Contractor shall be responsible for any deficiencies noted before payment shall be made. The cost of any correction of deficiencies shall not be paid separately.

e. Lift Station A-647 Site Restoration

Payment for this item shall be made at the contract lump sum price bid for the item. The contract price shall include all costs to restore all conditions to in-kind pre-construction conditions. This includes any impacted landscaping, topsoil, fertilizer, seed, erosion matting, watering, and other necessary materials, equipment and labor to complete the work.

C. Rehabilitation of Lift Station A-939 – Bid Item No. 3

a. Lift Station A-939 Pump and Control Removal and Storage

Payment for this item shall be made at the contract lump sum price bid for the item. The contract price shall include the removal, cleaning and disinfection, storage, and security of (2) submersible pumps, electrical conduit, float controls, access hatch(es), and other removed equipment to be preserved. This cost includes the Contractor's responsibility for the aforementioned equipment as well as the Contractor's responsibility to notate any existing damage at the time of removal. No additional payment will be made for the repair or replacement of any equipment with damage beyond which is noted at the time of removal by the Contractor and accepted by the FKAA.

b. Lift Station A-939 Bypass

Payment for this item shall be made at the contract lump sum price bid for the item. The contract price shall include all temporary bypass piping, installation of the bypass pipe, pipe fusion, temporary plugs, cleanup, electric generation and placing of all materials, labor, tools, equipment, and preparation of the existing pipe and/or manhole to receive the bypass piping; all excavation; removal and disposal of excavated fill material; all sheeting, shoring and bracing; all diking, bailing, draining and dewatering; the protection of existing utilities and structure; the furnishing and installation of temporary piping, joint restraint, and temporary traffic control and protection of bypass piping; all work necessary for the connection to existing sanitary sewer force main system and/or manholes with water right connections; all backfilling including the placing and compacting of granular backfill in all excavations; and any other necessary work to complete the project. The cost includes bypass plan(s) submittal to FKAA for review and approval. Bypass shall not be installed until plan is approved by the Engineer. The cost of by-pass pumping, mobilization(s), erosion control, traffic control shall be considered incidental to the cost of bypass installation and shall not be paid separately.

c. Lift Station A-939 Mechanical Work

Payment for this item shall be made at the contract lump sum price bid for the item. The contract price shall include all materials, equipment, tools, labor, and incidentals necessary for all excavation; removal and disposal of excavated material; pipe abandonment, removal and disposal; all sheeting, shoring and bracing; all diking, bailing, draining and dewatering; the protection of existing utilities and structures; the furnishing and installation

of piping, supports, hardware, fittings, joint restraints and valves as shown on the Contract Documents; electrical and control work; all work necessary for the connection to existing sanitary sewer force main system with water tight connections; all backfilling including the placing and compacting of granular backfill in all excavations; re-establishing grade; and all other work required for complete Lift Station A-939 Mechanical Work modifications and sanitary sewer force main installation. The cost of any necessary mobilization, erosion control, traffic control, abandonment, and testing shall be considered incidental to the cost of the bid item and shall not be paid for separately.

d. Lift Station A-939 Pump and Control Re-Connection and Testing

Payment for this item shall be made at the contract lump sum price bid for the item. The contract price shall include all costs of installation and electrical connection of (2) pumps previously removed and stored; installation and electrical connection of float controls; operational testing of pump station operation; and pressure testing of the installed piping. Pressure testing of installed piping shall occur in the presence of the Engineer. The Contractor shall be responsible for any deficiencies noted before payment shall be made. The cost of any correction of deficiencies shall not be paid separately.

e. Lift Station A-939 Site Restoration

Payment for this item shall be made at the contract lump sum price bid for the item. The contract price shall include all costs to restore all conditions to in-kind pre-construction conditions. This includes any impacted landscaping, topsoil, fertilizer, seed, erosion matting, watering, and other necessary materials, equipment and labor to complete the work.

D. Rehabilitation of Lift Station V-4155 – Bid Item No. 4

a. Lift Station V-4155 Pump and Control Removal and Storage

Payment for this item shall be made at the contract lump sum price bid for the item. The contract price shall include the removal, cleaning and disinfection, storage, and security of (2) submersible pumps, electrical conduit, float controls, access hatch(es), and other removed equipment to be preserved. This cost includes the Contractor's responsibility for the aforementioned equipment as well as the Contractor's responsibility to notate any existing

damage at the time of removal. No additional payment will be made for the repair or replacement of any equipment with damage beyond which is noted at the time of removal by the Contractor and accepted by the FKAA.

b. Lift Station V-4155 Bypass

Payment for this item shall be made at the contract lump sum price bid for the item. The contract price shall include all temporary bypass piping, installation of the bypass pipe, pipe fusion, temporary plugs, cleanup, electric generation and placing of all materials, labor, tools, equipment, and preparation of the existing pipe and/or manhole to receive the bypass piping; all excavation; removal and disposal of excavated fill material; all sheeting, shoring and bracing; all diking, bailing, draining and dewatering; the protection of existing utilities and structure; the furnishing and installation of temporary piping, joint restraint, and temporary traffic control and protection of bypass piping; all work necessary for the connection to existing sanitary sewer force main system and/or manholes with water tight connections; all backfilling including the placing and compacting of granular backfill in all excavations; and any other necessary work to complete the project. The cost includes bypass plan(s) submittal to FKAA for review and approval. Bypass shall not be installed until plan is approved by the Engineer. The cost of by-pass pumping, mobilization(s), erosion control, traffic control shall be considered incidental to the cost of bypass installation and shall not be paid separately.

c. Lift Station V-4155 Mechanical Work

Payment for this item shall be made at the contract lump sum price bid for the item. The contract price shall include all materials, equipment, tools, labor, and incidentals necessary for all excavation; removal and disposal of excavated material; pipe abandonment, removal and disposal; all sheeting, shoring and bracing; all diking, bailing, draining and dewatering; the protection of existing utilities and structures; the furnishing and installation of piping, supports, hardware, fittings, joint restraints and valves as shown on the Contract Documents; electrical and control work; all work necessary for the connection to existing sanitary sewer force main system with water tight connections; all backfilling including the placing and compacting of granular backfill in all excavations; re-establishing grade; and all other work required for complete Lift Station A-4155 Mechanical Work modifications and sanitary sewer force main installation. The cost of any necessary mobilization,

erosion control, traffic control, abandonment, and testing shall be considered incidental to the cost of the bid item and shall not be paid for separately.

d. Lift Station V-4155 Cut and Cap of 8-inch Overflow Line

Payment for this item shall be made at the contract lump sum price bid for the item. The contract price shall include all costs of installation and electrical connection of (2) pumps previously removed and stored; installation and electrical connection of float controls; operational testing of pump station operation; and pressure testing of the installed piping. Pressure testing of installed piping shall occur in the presence of the Engineer. The Contractor shall be responsible for any deficiencies noted before payment shall be made. The cost of any correction of deficiencies shall not be paid separately.

e. Lift Station V-4155 Pump and Control Re-Connection and Testing

Payment for this item shall be made at the contract lump sum price bid for the item. The contract price shall include all costs of installation and electrical connection of (2) pumps previously removed and stored; installation and electrical connection of float controls; and operational testing of pump station operation. This shall include operational testing of the lift station in the presence of the Engineer and FKAA Wastewater Operations personnel. Satisfactory operational testing shall include verification of pump and control operations and the absence of visually observed leakage within the wet well, valve pit, and piping up to the end of pipe replacement work. The Contractor shall be responsible for any deficiencies noted before payment shall be made. The cost of any correction of deficiencies shall not be paid separately.

f. Lift Station V-4155 Site Restoration

Payment for this item shall be made at the contract lump sum price bid for the item. The contract price shall include all costs to restore all conditions to in-kind pre-construction conditions. This includes any impacted landscaping, topsoil, fertilizer, seed, erosion matting, watering, and other necessary materials, equipment and labor to complete the work.

E. Rehabilitation of Lift Station K-100 – Bid Item No. 5

a. Lift Station K-100 Pump and Control Removal and Storage

Payment for this item shall be made at the contract lump sum price bid for the item. The contract price shall include the removal, cleaning and disinfection, storage, and security of (2) submersible pumps, electrical conduit, float controls, access hatch(es), and other removed equipment to be preserved. This cost includes the Contractor's responsibility for the aforementioned equipment as well as the Contractor's responsibility to notate any existing damage at the time of removal. No additional payment will be made for the repair or replacement of any equipment with damage beyond which is noted at the time of removal by the Contractor and accepted by the FKAA.

b. Lift Station K-100 Bypass

Payment for this item shall be made at the contract lump sum price bid for the item. The contract price shall include all temporary bypass piping, installation of the bypass pipe, pipe fusion, temporary plugs, cleanup, electric generation and placing of all materials, labor, tools, equipment, and preparation of the existing pipe and/or manhole to receive the bypass piping; all excavation; removal and disposal of excavated fill material; all sheeting, shoring and bracing; all diking, bailing, draining and dewatering; the protection of existing utilities and structure; the furnishing and installation of temporary piping, joint restraint, and temporary traffic control and protection of bypass piping; all work necessary for the connection to existing sanitary sewer force main system and/or manholes with water right connections; all backfilling including the placing and compacting of granular backfill in all excavations; and any other necessary work to complete the project. The cost includes bypass plan(s) submittal to FKAA for review and approval. Bypass shall not be installed until plan is approved by the Engineer. The cost of by-pass pumping, mobilization(s), erosion control, traffic control shall be considered incidental to the cost of bypass installation and shall not be paid separately.

c. Lift Station K-100 Sandblasting, Patching, and Lining

Payment for this item shall be made at the contract lump sum price bid for the item. The contract price shall include all materials, equipment, tools, labor, and incidentals necessary for the sandblasting, patching, and lining of Lift Station K-100 with IET SYSTEMS "SYSTEM 3" wet well lining according to the manufacturer's specifications. The cost of any necessary mobilization shall be considered incidental to the cost of the bid

item and shall not be paid for separately.

- d. Lift Station K-100 New 48-inch by 72-inch Valve Vault  
Payment for this item shall be made at the contract lump sum price bid for the item. The contract price shall include all materials, equipment, tools, labor, and incidentals necessary for all excavation; removal and disposal of excavated material; all sheeting, shoring and bracing; all diking, bailing, draining and dewatering; the protection of existing utilities and structures; removal and disposal of existing valve vault; the furnishing and installation of a new 48-inch by 72-inch valve vault; all backfilling including the placing and compacting of granular backfill in all excavations; re-establishing grade; and all other work required for complete Lift Station K-100 New 48-inch by 72-inch Valve Vault replacement and installation. The cost of any necessary mobilization, erosion control, traffic control, abandonment, and testing shall be considered incidental to the cost of the bid item and shall not be paid separately.

- e. Lift Station K-100 Mechanical Work

Payment for this item shall be made at the contract lump sum price bid for the item. The contract price shall include all materials, equipment, tools, labor, and incidentals necessary for all excavation; removal and disposal of excavated material; pipe abandonment, removal and disposal; all sheeting, shoring and bracing; all diking, bailing, draining and dewatering; the protection of existing utilities and structures; the furnishing and installation of piping, supports, hardware, fittings, joint restraints and valves as shown on the Contract Documents; electrical and control work; all work necessary for the connection to existing sanitary sewer force main system with water tight connections; all backfilling including the placing and compacting of granular backfill in all excavations; re-establishing grade; and all other work required for complete Lift Station K-100 Mechanical Work modifications and sanitary sewer force main installation. The cost of any necessary mobilization, erosion control, traffic control, abandonment, and testing shall be considered incidental to the cost of the bid item and shall not be paid for separately.

- f. Lift Station K-100 Pump and Control Re-Connection and Testing

Payment for this item shall be made at the contract lump sum price bid for the item. The contract price shall include all costs of installation and electrical connection of (2) pumps previously

removed and stored; installation and electrical connection of float controls; operational testing of pump station operation; and pressure testing of the installed piping. Pressure testing of installed piping shall occur in the presence of the Engineer. The Contractor shall be responsible for any deficiencies noted before payment shall be made. The cost of any correction of deficiencies shall not be paid separately.

g. Lift Station K-100 Site Restoration

Payment for this item shall be made at the contract lump sum price bid for the item. The contract price shall include all costs to restore all conditions to in-kind pre-construction conditions. This includes any impacted landscaping, topsoil, fertilizer, seed, erosion matting, watering, and other necessary materials, equipment and labor to complete the work.

F. \$30,000 Contingency Allowance - Bid Item No. 6

FKAA may utilize this pay item, as needed, to modifying scope of work, for unforeseen circumstances of authorized additional work, at the Owner's sole discretion, and solely with prior authorization by the Owner in writing.

PART 2 - PRODUCTS (not used)

PART 3 - EXECUTION (not used)

END OF SECTION

## **SECTION 01090 REFERENCE STANDARDS**

### **PART 1 - GENERAL**

#### 1.01 REQUIREMENTS INCLUDED

- A. Abbreviation and acronyms used in Contract Documents to identify reference standards.

#### 1.02 QUALITY ASSURANCE

- A. Application: When a standard is specified by reference, comply with requirements and recommendations stated in that standard, except when requirements are modified by the Contract Documents, or applicable codes establish stricter standards.
- B. Publication Date: The publication in effect on the date of issue of Contract Documents, except when a specific publication date is specified.

#### 1.03 ABBREVIATIONS, NAMES, AND ADDRESSES OR ORGANIZATIONS

- A. Obtain copies of referenced standards direct from publication source, when needed for proper performance of Work, or when required for submittal by Contract Documents.

AA	Aluminum Association 818 Connecticut Avenue, N.W. Washington, DC 20006
AABC	Associated Air Balance Council 1000 Vermont Avenue, N.W. Washington, DC 20005
AASHTO	American Association of State Highway & Transportation Officials 444 North Capitol Street, N.W. Washington, DC 20001
ACI	American Concrete Institute Box 19150 Redford Station Detroit, MI 48219

ADC	Air Diffusion Council 435 North Michigan Avenue Chicago, IL 60611
AI	Asphalt Institute Asphalt Institute Building College Park, MD 20740
AISC	American Institute of Steel Construction 1221 Avenue of the Americas New York, NY 10020
AISI	American Iron and Steel Institute 1000 16th Street, N.W. Washington, DC 20036
AMCA	Air Movement and Control Association 30 West University Drive Arlington Heights, IL 60004
ANSI	American National Standards Institute 1430 Broadway New York, NY 10018
ARI	Air-Conditioning and Refrigeration Institute 1815 North Fort Myer Drive Arlington, VA 22209
ASHRAE	American Society of Heating, Refrigerating & Conditioning Engineers 345 East 47th Street New York, NY 10017
ASME	American Society of Mechanical Engineers 345 East 47th Street New York, NY 10017
ASPA	American Sod Producers Association Association Building Ninth and Minnesota Hastings, NE 68901
ASTM	American Society of Testing & Materials 1916 Race Street Philadelphia, PA 19103

AWWA	American Water Works Association 6666 W. Quincy Avenue Denver, CO 80235
AWI	Architectural Woodwork Institute 2310 South Walter Reed Drive Arlington, VA 22206
AWPA	American Wood-Preserver's Association 7735 Old Georgetown Road Bethesda, MD 20014
AWS	American Welding Society 2501 NW 7th Street Miami, FL 33125
CDA	Cooper Development Association 57th Floor, Chrysler Building 405 Lexington Avenue New York, NY 10017
CLFMI	Chain Link Fence Manufacturers Institute 1101 Connecticut Avenue Washington, DC 20036
CRSI	Concrete Reinforcing Steel Institute 180 North LaSalle Street, Suite 2110 Chicago, IL 60601
MF	Factory Mutual System 1151 Boston Providence Turnpike Norwood, MA 02062
FS	Federal Specification General Services Administration Specifications and Consumer Information Distribution Section (WFSIS) Washington Navy Yard, Bldg. 197 Washington, DC 20407
GA	Gypsum Association 1603 Orrington Avenue Evanston, IL 60201

MIL	Military Specification Naval Publications and Forms Center 5801 Tabor Avenue Philadelphia, PA 19120
MLSFA	Metal Lath/Steel Framing Association 221 North LaSalle Street Chicago, IL 60601
NAAMM	National Association of Architectural Metal Manufacturers 221 North LaSalle Street Chicago, IL 60601
NEBB	National Environmental Balancing Bureau 8224 Old Courthouse Road Vienna, VA 22180
NEMA	National Electrical Manufacturer's Association 2101 L Street, N.W. Washington, DC 20037
NFPA	National Fire Protection Association 470 Atlantic Avenue Boston, MA 02210
NFPA	National Forest Products Association 1619 Massachusetts Avenue, N.W. Washington, DC 20036
NTMA	National Terrazzo and Mosaic Association 3166 Des Plains Avenue Des Plains, Il 60018
PCA	Portland Cement Association 5420 Old Orchard Road Skokie, IL 20076
PCI	Prestressed Concrete Institute 20 North Wacker Drive Chicago, IL 60606
PS	Product Standard U.S. Department of Commerce Washington, DC 20203

RCSHSB Red Cedar Shingle & Handsplit Shake Bureau  
515 116th Avenue  
Bellevue, WA 98004

SDI Steel Deck Institute  
Box 3812  
St. Louis, MO 63122

SDI Steel Door Institute  
712 Lakewood Center North  
Cleveland, OH 44107

SIGMA Sealed Insulating Glass  
Manufacturers Association  
111 East Wacker Drive  
Chicago, IL 60601

SJI Steel Joist Institute  
1703 Parham Road, Suite 204  
Richmond, VA 23229

SMACNA Sheet Metal and Air Conditioning Contractors' National  
Association  
8224 Old Court House Road  
Vienna, VA 22180

TAS Technical Aid Series  
Construction Specifications Institute  
1150 Seventeenth Street, N.W.  
Washington, DC 20036

TCA Tile Council of America, Inc.  
Box 326  
Princeton, NJ 08540

UL Underwriter's Laboratories, Inc.  
333 Pfingston Road  
Northbrook, IL 60062

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

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

END OF SECTION

## SECTION 01200

### PROJECT MEETINGS

#### PART 1 - GENERAL

##### 1.01 FKAA RESPONSIBILITIES

- A. FKAA shall schedule and administer a pre-construction meeting, periodic progress meetings, and specially called meetings throughout progress of the work. FKAA will conduct the following:
  - 1. Prepare agenda for meetings.
  - 2. Distribute written notice of each meeting four days in advance of meeting date.
  - 3. Make physical arrangements for meetings.
  - 4. Preside at meetings.
  - 5. Record the minutes; include significant proceedings and decisions.
  - 6. Reproduce and distribute copies of minutes within three days after each meeting.
    - a. To participants in the meeting.
    - b. To parties affected by decisions made at the meeting.
- B. Representatives of contractors, subcontractors and suppliers attending meetings shall be qualified and authorized to act on behalf of the entity each represents.

##### 1.02 RELATED REQUIREMENTS

- A. Section 01300: Submittals
- B. Section 01700: Contract Closeout

##### 1.03 PRE-CONSTRUCTION MEETING

- A. The preconstruction meeting shall be scheduled within 10 days after effective date of the Contract.
- B. A central site for the meeting, convenient for all parties, shall be designated by the FKAA.
- C. The following shall attend:
  - 1. FKAA's representatives.
  - 2. Contractor's superintendent.

3. Major subcontractors.
4. Representatives from various utilities.
5. Others as appropriate and approved by the FKAA.

- D. The suggested agenda shall be as follows:
1. Distribution and discussion of:
    - a. List of major subcontractors and suppliers.
    - b. Projected construction schedules.
  2. Critical work sequencing.
  3. Major equipment deliveries and priorities.
  4. Project coordination and designation of responsible personnel.
  5. Procedures and processing of:
    - a. Field decisions.
    - b. Proposal requests.
    - c. Submittals.
    - d. Change orders.
    - e. Applications for payment.
  6. Adequacy for distribution of Contract Documents.
  7. Procedures for maintaining Record Documents.
  8. Use of premises.
    - a. Office, work, and storage areas.
    - b. Owner's requirements.
  9. Construction facilities, controls, and construction aids.
  10. Temporary utilities.
  11. Safety and first-aid procedures.
  12. Security procedures.
  13. Housekeeping procedures.
  14. Emergency phone numbers.
  15. Miscellaneous.

#### 1.04 PROGRESS MEETINGS

- A. FKAA shall schedule regular periodic meetings, as required.
- B. FKAA shall hold called meetings as required by progress of the work.
- C. Progress meetings shall be held at the project field office of the Contractor or other site directed by the FKAA.
- D. The following shall attend:
  1. FKAA representatives.
  2. Contractor's superintendant
  3. Subcontractors as appropriate to the agenda.
  4. Suppliers as appropriate to the agenda.
  5. Others.

- E. The suggested agenda shall be as follows:
1. Review, approval, of minutes of previous meeting.
  2. Review of work progress since previous meeting.
  3. Field observations, problems, conflicts.
  4. Problems which impede construction schedule.
  5. Review of off-site fabrication delivery schedules.
  6. Corrective measures and procedures to regain projected schedule.
  7. Revisions to construction schedule.
  8. Progress, schedule, during succeeding work period.
  9. Coordination of schedules.
  10. Review of submittal schedules; expedite as required.
  11. Maintenance of quality standards.
  12. Pending changes and substitutions.
  13. Review proposed changes for:
    - a. Effect on construction schedule and on completion date.
    - b. Effect on other contracts relating to the project.
  14. Review of record drawings.
  15. Other business.

PART 2 - PRODUCTS (not used)

PART 3 - EXECUTION (not used)

END OF SECTION

## SECTION 01300

### SUBMITTALS

#### PART 1 - GENERAL

##### 1.01 REQUIREMENTS

Submittals include the preconstruction audio-video recording, traffic control plan, project schedule, shop drawings, product data and samples, and record documents including as-built drawings.

##### 1.02 RELATED REQUIREMENTS

- A. Definitions and additional responsibilities of parties: General Conditions of the Contract.
- B. Section 01390: Preconstruction Audio-Video Recordings
- C. Section 01570: Traffic Control
- D. Section 01700: Contract Closeout

##### 1.03 PROJECT SCHEDULE

- A. Prior to the preconstruction meeting, the Contractor shall submit to the FKAA for review and approval, a project schedule showing the approximate dates on which each part or division of the work is expected to start and finish.
- B. The schedule shall be updated and submitted to the FKAA at the end of each month, whenever the work deviates substantially from the schedule, or any time the FKAA requests an updated schedule.

##### 1.04 SHOP DRAWINGS

- A. Shop drawings shall be presented in a clear and thorough manner. Details shall be identified by reference to sheet and detail and schedule.
- B. Minimum sheet size shall be 8½ x 11 inches.

##### 1.05 PRODUCT DATA AND SAMPLES

- A. Preparation

1. Clearly mark each copy to identify pertinent products or models.
2. Show performance characteristics and capacities.
3. Show dimensions and clearances required.
4. Show wiring or piping diagrams and controls.

B. Manufacturer's standard schematic drawings and diagrams:

1. Modify drawings and diagrams by deleting information which is not applicable to the work.
2. Supplement standard information to provide information specifically applicable to the work.

1.06 ADDITIONAL SUBMITTALS

Submittal of the preconstruction audio-video recording, traffic control plan, and record documents are described in Sections 01390, 01570, and 01700, respectively.

1.07 CONTRACTOR'S RESPONSIBILITIES

A. Review shop drawings, product data, and samples prior to submission.

B. Determine and verify:

1. Field measurements
2. Field construction criteria
3. Catalog numbers and similar data
4. Conformance with specifications

C. Coordinate each submittal with requirements of the work and of the Contract Documents.

D. Notify the FKAA in writing, at the time of submission, of any deviations in the submittals from requirements of the Contract Documents.

E. Begin no fabrication or work which requires approved submittals until return of submittals by the FKAA.

F. Provide a submittal register listing all anticipated submittals.

1.08 SUBMISSION REQUIREMENTS

A. Make submittals in such sequence as to cause no delay in the work.

B. Number of submittals required:

1. Electronic Shop drawings and product data: Submit four (4) copies, plus whatever the Contractor requires to be returned, maximum of eight (8).
2. Samples: Submit the quantity stated in each specification section.

C. Submittals shall contain:

1. The date of submission and the dates of any previous submissions.
2. The project title and number.
3. Contract identification.
4. The names of:
  - a. Contractor
  - b. Supplier
  - c. Manufacturer
5. Identification of the product, with the specification section number.
6. Field dimensions, clearly identified as such.
7. Relation to adjacent or critical features of the work or materials.
8. Applicable standards, such as ASTM or federal specification numbers.
9. Identifications of deviations from Contract Documents.
10. Identification of revisions on resubmittals.
11. CONTRACTOR'S stamp initialed or signed, certifying review of submittal, verification of products, field measurements and field construction criteria, and coordination of the information within the submittal with requirements of the work and of Contract Documents.

1.09 RESUBMISSION REQUIREMENTS

- A. Make any corrections or changes in the submittals noted by the FCAA and resubmit unless otherwise noted.
- B. Shop drawings and product data:
  1. Revise initial drawings or data, and resubmit as specified for the initial submittal.
  2. Indicate any changes which have been made other than those suggested by the FCAA.
- C. Samples: Submit new samples as required for initial submittal.

1.10 FCAA'S DUTIES

- A. Review submittals within 20 working days or in accord with schedule.
- B. Affix stamp and initials or signature, and indicate status of submittal.

- C. Return submittals to Contractor for distribution, or resubmission.
- D. Review initial submittals and one resubmittal. Resubmittals that cannot be approved will be returned. Additional resubmittals will be reviewed by the FKAA, and costs for time and materials for reviewing resubmittals will be back charged by the FKAA to the Contractor.

PART 2 - PRODUCTS (not used)

PART 3 - EXECUTION (not used)

END OF SECTION

## SECTION 01390

### PRECONSTRUCTION AUDIO-VIDEO RECORDINGS

#### PART 1 - GENERAL

##### 1.01 REQUIREMENTS

- A. The Contractor shall provide a color audio-video recording showing the entire preconstruction site. All videos shall be taken by a professional commercial video photographer. The video photographer shall be an established enterprise that routinely provides these services. The videos shall be in standard DVD format, indicating the date, project name, and a brief description of the location where the video was taken. The Contractor shall submit one (1) copy of the preconstruction audio-video to the FKAA.
- B. No construction shall begin prior to the review and approval of the preconstruction DVD by the FKAA.

##### 1.02 RELATED REQUIREMENTS

Section 01300: Submittals

#### PART 2 - PRODUCTS

##### 2.01 GENERAL

The total audio-video recording system and the procedures employed in its use shall be such as to produce a finished product that will fulfill the technical requirements of the project. The video portion of the recording shall produce bright sharp, and clear pictures with accurate colors and shall be free from distortion, and any other form of picture imperfection. All video recordings shall, by electronic means, display on the screen the time of day, the month, day, and year of the recording.

#### PART 3 - EXECUTION

##### 3.01 GENERAL

- A. The following shall be included with the audio-video documentation:
  - 1. Coverage is required within and adjacent to the right of way, easements, storage, and staging areas where the work is to be constructed.
  - 2. Documentation of the conditions of the adjacent properties or any

affected structures as a result of the impending construction.

3. Videos shall be properly identified by DVD number and project name. DVD video shall include direction of coverage, the name of the streets or easements, engineering station numbers, date and time of coverage.
  4. Provide a written DVD video log to aid in locating any section of the construction site that may be in question.
  5. The DVD video log shall include sufficient detailed to determine the existing pavement striping and markings to aid in the replacement and restoration of these facilities.
- B. There will be no separate payment for this preconstruction audio-video recording. The cost shall be included in the unit price for the installation of the pipeline.

END OF SECTION

## SECTION 01510

### TEMPORARY FACILITIES

#### PART 1 - GENERAL

##### 1.01 THE REQUIREMENT

- A. The Contractor shall provide for utilities and services for his own operations and for the Owner's Representative. These shall include temporary offices, electrical power, water, ventilation, and telephone service. The Contractor shall furnish, install and maintain all temporary utilities during the contract period including removal upon completion of the work. Such facilities shall comply with regulations and requirements of the National Electrical Code, OSHA, Florida Keys Electric Cooperative, and applicable Federal, State and local codes, etc.
- B. Prior to installation of field offices and storage trailers, consult with the Engineer on acceptable locations, access and related facilities.

##### 1.02 POWER AND LIGHTING

The Contractor shall arrange with the local power company for construction period service and pay all costs for the installation work and power including temporary wiring, switches, connections, and meters.

- A. Construction Lighting
  - 1. In addition to providing for a safe construction period distribution system, the Contractor shall provide a safe and adequate artificial lighting system for work areas which do not have sufficient natural light.
  - 2. All Work conducted at night or under conditions of deficient daylight shall be suitably lighted to insure proper Work and to afford adequate facilities for inspection and safe working conditions. Temporary lighting shall be maintained during nonworking periods if the area is subject to access by the public or plant personnel.
- B. Electrical Connections
  - 1. All temporary connections for electricity shall be subject to review by the Engineer, the Owner, and the power company representative, and shall be removed in like manner at the Contractor's expense prior to final acceptance of the Work.
- C. Separation of Circuits

1. Unless otherwise permitted by the Engineer, circuits separate from lighting circuits shall be used for all power purposes.

D. Construction Wiring

1. All wiring for temporary electric light and power shall be properly installed and maintained and shall be securely fastened in place. All electrical facilities shall conform to the requirements of Subpart K of the OSHA Safety and Health Standards for Construction.

1.03 WATER SUPPLY

- A. The Contractor shall supply all water used for construction, flushing, and testing. The Contractor shall provide and maintain all meters, piping, fittings, adapters, and valving required to use the water supply sources. Care shall be exercised in the use of potable water, and provisions shall be made to protect the potable water supply from contamination and indiscriminate use by unauthorized persons.

B. Potable Water

1. All drinking water on the site during construction shall be furnished by the Contractor and shall be bottled water or water furnished in suitable dispensers. Notices shall be posted conspicuously throughout the site warning the Contractor's personnel that piped water may be contaminated.

C. Removal of Water Connections

1. Before final acceptance of the Work on the project, all temporary connections and piping installed by the Contractor shall be entirely removed, and all affected improvements shall be restored to their original condition, or better, to the satisfaction of the Engineer and to the Owner.

1.04 TEMPORARY SANITARY FACILITIES

- A. Contractor shall provide temporary sanitary facilities during construction. Facilities shall be maintained and emptied on a regular basis so as to not create a nuisance.

1.05 TEMPORARY VENTILATION

- A. The Contractor shall provide and maintain adequate ventilation for a safe working environment. In addition, forced air ventilation shall be provided for the curing of installed materials, humidity control, and the prevention of hazardous accumulations of dust, gases, or vapors.

## 1.06 COMMUNICATIONS

- A. The Contractor shall provide and maintain at all times during the progress of the Work not less than two (2) telephone lines in good working order, one at its own field construction office, at or near the site of the Work included in the Contract, and one at the Engineers/Owners trailer. Each such telephone shall be connected to an established exchange for toll service and with all other telephones utilized by the Contractor. Contractor shall pay all fees associated with telephone line hookup, maintenance and operation.

## PART 2 - PRODUCTS (NOT USED)

## PART 3 - EXECUTION

### 3.01 PREPARATION

- A. Fill and grade sites for temporary structures to provide surface drainage.

### 3.02 INSTALLATION

- A. Construct temporary field office and storage trailers on proper foundations. Provide connections for utility services.
  - 1. Secure portable or mobile buildings when used.
  - 2. Provide safely constructed steps and landings at entrance doors.
- B. Mount thermometer at convenient outside location, not in direct sunlight.

### 3.03 MAINTENANCE AND CLEANING

- A. Provide periodic maintenance and cleaning for temporary structures, furnishings, equipment and services.

### 3.04 REMOVAL

- A. Remove temporary field offices, storage trailers, contents and services when the project has been completed.
- B. Remove foundations and debris.
- C. Grade the site to required elevations and clean the areas.

END OF SECTION

## SECTION 01530

### BARRIERS

#### PART 1 - GENERAL

##### 1.01 REQUIREMENTS

Furnish, install, and maintain suitable barriers as required to prevent public entry, and to protect the work, existing facilities, trees, and plants from construction operations; remove when no longer needed, or at completion of work.

##### 1.02 RELATED REQUIREMENTS

Section 01010 Summary of Work.

#### PART 2 - PRODUCTS

##### 2.01 MATERIALS, GENERAL

Materials may be new or used, suitable for the intended purpose, but must not violate requirements of applicable codes and standards.

##### 2.02 FENCING

Minimum fence height shall be four feet. Open-mesh orange plastic fence shall be used to prohibit entry to the construction zone.

##### 2.03 BARRIERS

Materials are Contractor's option, as appropriate to serve required purpose.

#### PART 3 - EXECUTION

##### 3.01 GENERAL

- A. Install facilities of a neat and reasonably uniform appearance, structurally adequate for the required purposes.
- B. Maintain barriers during entire construction period.
- C. Relocate barriers as required by the progress of construction.

### 3.02 FENCES

- A. Provide and maintain fences necessary to assure security of the site during construction to keep unauthorized people and animals from the site when construction is not in progress.
- B. Provide additional security measures as deemed necessary and approved by the FKAA.

### 3.03 TREE AND PLANT PROTECTION

- A. Preserve and protect existing trees and plants at site which are designated to remain, and those adjacent to site.
- B. Consult with the FKAA, and remove agreed-on roots and branches which interfere with construction. Employ a qualified tree surgeon to remove branches and treat cuts.
- C. Protect root zones of trees and plants:
  - 1. Do not allow vehicular traffic or parking.
  - 2. Do not store materials or products.
  - 3. Prevent dumping of refuse or chemically injurious materials or liquids.
  - 4. Prevent puddling or continuous running water.
- D. Carefully supervise excavating, grading and filling, and other construction operations, to prevent damage.
- E. Replace, or suitably repair, trees and plants designated to remain which are damaged or destroyed due to construction operations.

### 3.04 REMOVAL

- A. Completely remove barricades when construction has progressed to the point that they are no longer needed and when approved by the FKAA.
- B. Repair damage caused by construction. Fill and grade areas of the site to the required evaluations, and clean up the area.

END OF SECTION

## SECTION 01570

### TRAFFIC CONTROL

#### PART 1 - GENERAL

##### 1.01 REQUIREMENTS

- A. Provide, operate, and maintain equipment, services, and personnel with traffic control and protective devices, as required to expedite vehicular traffic flow around the construction area in accordance with FDOT and Monroe County requirements.
- B. Remove temporary equipment and facilities when no longer required, restore grounds to original, or to specified conditions.

##### 1.02 REFERENCES

Traffic control shall be in accordance with F.D.O.T. Roadway and Traffic Design Standards Series 600, Latest Edition, Manual on Uniform Traffic Control Devices, Latest Ed., and FDOT Standard Specifications, latest Ed.

##### 1.03 TRAFFIC CONTROL PLAN

- A. The Contractor is to prepare a traffic control plan and/or policy statement for each phase of construction. This plan is to be presented to the FKAA at or before the pre-construction meeting, and is subject to approval by the FDOT, City of Key West, FKAA, and Monroe County.
- B. Several streets in the project area are narrow. The Contractor shall describe in the Traffic Control Plan provisions for emergency access at all times.
- C. All proposed traffic control plans and policy statements shall be complete and in compliance with Section 1.02.

##### 1.04 TRAFFIC SIGNALS AND SIGNS

- A. Provide and operate traffic control and directional signals required to direct and maintain an orderly flow of traffic in all areas under Contractor's control, or affected by Contractor's operations.
- B. Provide traffic control and direction signs, post mounted, at all areas required by Section 1.02.

- C. All existing traffic signs shall remain visible throughout construction activities unless superseded by required construction signing.

#### 1.05 FLAGMEN

Provide qualified and suitably equipped flagmen when construction operations encroach on traffic lanes, as required for regulation of traffic.  
(See Section 1.02)

#### 1.06 FLARES AND LIGHTS

- A. Provide lights as required by Section 1.02.
  - 1. To clearly delineate traffic lanes and to guide traffic as required in Section 1.02
  - 2. For use by flagmen in directing traffic.
- B. Provide illumination of critical traffic and parking areas as required in Section 1.02.

#### 1.07 CONSTRUCTION PARKING CONTROL

- A. Control vehicular parking to preclude interference with public traffic or parking, access by emergency vehicles, FKAA's operations, or construction operations.
- B. Monitor parking of construction personnel's private vehicles.
  - 1. Maintain free vehicular access to and through parking areas and driveways.
  - 2. Prohibit parking on or adjacent to access roads, or in non-designated areas.

#### 1.08 CONSTRUCTION VEHICLES

- A. All slow moving construction vehicles shall have a slow moving sign visible from the rear of the vehicle.
- B. All vehicles used for construction activities shall have audible back-up warning devices.

#### 1.09 ROAD CLOSURES

- A. No road shall be closed prior to receiving approval from FKAA and U.S.

Navy.

- B. Prior to any proposed road closure, the contractor shall submit to the FKAA a complete traffic control plan. This plan shall include the following minimum information:
  - 1. Sketch of work site and all area roads, streets and mark driveways.
  - 2. Proposed detour route.
  - 3. All necessary traffic control devices to be used.
  - 4. Emergency contractor contact person name and phone to be available 24 hours a day.
  - 5. Estimated times/dates of road closure.

#### PART 2 - PRODUCTS

- A. All traffic control devices shall meet or exceed FDOT certification standards.
- B. All traffic signs shall have high intensity face material.

#### PART 3 - EXECUTION

- A. Upon notification by the owner either verbally or in writing, the contractor shall correct any noted deficiencies within one hour.
- B. Inspection of all traffic control items shall be accomplished at least twice per day. One of these inspections shall be at the end of the work day or at night.

END OF SECTION

## SECTION 01700

### CONTRACT CLOSEOUT

#### PART 1 - GENERAL

##### 1.01 REQUIREMENTS

Contract completion includes substantial completion, final inspection after completion, final cleaning, contractor's closeout submittals, and final adjustment of accounts.

##### 1.02 SUBSTANTIAL COMPLETION

- A. When Contractor considers work has reached substantial completion, he shall submit to the FKAA the following:
  - 1. Written notice that the work is substantially complete in accordance with Contract Documents.
  - 2. A list of items yet to be completed or corrected and explanations thereof.
- B. Within a reasonable time upon receipt of such notice, the FKAA will make an inspection, if necessary, to determine the status of completion.
- C. Should the FKAA determine that the work is not substantially complete:
  - 1. The FKAA will promptly notify the Contractor in writing, giving the reasons thereof.
  - 2. Contractor shall remedy the deficiencies in the work and send a second written notice of Substantial Completion to the FKAA.
  - 3. Upon receipt of the second notice, the FKAA will re-inspect the work.
- D. When the FKAA finds that the Work is substantially complete he will issue a Certificate of Substantial Completion with a tentative list of items to be completed or corrected before final inspection.

##### 1.03 FINAL INSPECTION AFTER COMPLETION

- A. When Contractor considers the Work is complete with all minor deficiencies

completed or corrected, he shall submit written certification that:

1. Contract Document requirements have been met.
  2. Work has been inspected for compliance with Contract Documents.
  3. Work has been completed in accordance with Contract Documents.
  4. All minor deficiencies have been corrected or completed and the Work is ready for final inspection.
  5. Project record documents are complete and submitted.
- B. Within a reasonable time upon receipt of such certification, the FKAA will make an inspection to verify the status of completion.
- C. Should the FKAA determine that the work is incomplete or defective:
1. The FKAA will promptly notify the Contractor in writing, listing the incomplete or defective work.
  2. Contractor shall remedy the deficiencies in the work and send a second written certification to the FKAA that the work is complete.
  3. Upon receipt of the second certification, the FKAA will reinspect the Work.
- D. When the FKAA determines that the work is acceptable, under the Contract Documents, he shall request the Contractor to make closeout submittals.

#### 1.04 FINAL CLEANING

- A. Execute final cleaning prior to final inspection.
- B. Clean site; sweep paved areas, rake clean other surfaces.
- C. Remove waste and surplus materials, rubbish, and construction facilities from the Project and from the site.

#### 1.05 CONTRACTOR'S CLOSEOUT SUBMITTALS

- A. Project Record Documents

1. At Contract Closeout, submit documents with transmittal letter containing date, project title, Contractor's name and address, list of documents, and signature of Contractor.
2. Drawings legibly marked to record actual constructions. Horizontal and vertical locations of underground utilities and appurtenances shall be referenced to permanent surface improvements.
3. Specifications and addenda legibly mark each Section to record.
4. Changes made by Field Order or by Change Order.

B. Evidence of payment and Release of Liens.

1.06 FINAL ADJUSTMENT OF ACCOUNTS

- A. Submit a final statement of accounting to the FKAA.
- B. Statement shall reflect all adjustments to the Contract Sum.
  1. The original Contract sum.
  2. Additions and deductions resulting from:
    - a. Previous change orders or written amendment.
    - b. Allowances
    - c. Unit prices
    - d. Deductions for uncorrected work.
    - e. Deductions for liquidated damages
    - f. Other adjustments
  3. Total contract sum as adjusted
  4. Previous payments
  5. Sum remaining due

PART 2 - PRODUCTS (not used)

PART 3 - EXECUTION (not used)

END OF SECTION

## **SECTION 02010 SUBSURFACE INVESTIGATION**

### **PART 1 - GENERAL**

#### 1.01 RESPONSIBILITY

- A. Subsurface explorations have been made and copies of the results are included herein for information only. Data on indicated subsurface conditions is not intended as representative or a warranty of accuracy or continuity between soil borings. It is expressly understood that Owner and Engineer will not be responsible for interpretations or conclusions drawn by Contractor from the soils investigation report. Data is made available only for convenience of Contractor. No claim for extra compensation or for extension of time will be allowed on account of subsurface conditions inconsistent with the data shown. Additional test borings and other exploratory operations may be performed by Contractor, at the Contractor's option; however, no change in the Contract Sum will be authorized for such additional exploration.
  
- B. Data in the soft-dig reports was used for the basis of design and is available to the Contractor for information only. Conditions are not intended as representations or warranties of accuracy or continuity of pot-hole locations. The Owner and Engineer will not be responsible for interpretations or conclusions drawn from this data by Contractor. The Contractor is required to provide pot-holing in order to field verify location of all utility crossings, including paralleling of utilities, prior to construction of the proposed work. This is to be accounted for in the Pay Items for pipe installation.

### **PART 2 - PRODUCTS**

#### 2.01 SOIL BORINGS

- A. Copies of the following are included herein:
  - 1. Soil boring data.

#### 2.02 SOFT DIG REPORTS

- A. Copies of the following are included herein:
  - 1. Test hole reports.

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

END OF SECTION

**SECTION 02012**  
**PROTECTING EXISTING UNDERGROUND UTILITIES**

**PART 1 - GENERAL**

1.01 DESCRIPTION

- A. This section includes materials and procedures for protecting existing underground utilities.

1.02 RELATED WORK SPECIFIED ELSEWHERE

- A. Section 02220: Excavation, Backfilling, and Compacting

**PART 2 - MATERIALS**

2.01 REPLACEMENT IN KIND

- A. Except as indicated below or as specifically authorized by the Owner's Representative, reconstruct utilities with new material of the same size, type, and quality as that removed.

**PART 3 - EXECUTION**

3.01 GENERAL

- A. Replace in kind street improvements, such as curbs and gutters, barricades, traffic islands, signalization, fences, signs, etc., that are cut, removed, damaged, or otherwise disturbed by the construction.
- B. Where utilities are parallel to or cross the construction but do not conflict with the permanent work to be constructed, follow the procedures given below and as indicated in the drawings. Notify the utility owner 48 hours in advance of the crossing construction and coordinate the construction schedule with the utility owner's requirements. For utility crossings not shown in the drawings, refer to the General Conditions and the instructions of the Owner's Representative for guidance.
- C. Determine the true location and depth of utilities and service connections which may be affected by or affect the work. Determine the type, material, and condition of these utilities. In order to provide sufficient lead-time to resolve unforeseen conflicts, order materials and take appropriate measures to ensure that there is no delay in work.

**D. Expose utilities 200 feet in advance of the pipeline construction.**

**3.02 PROCEDURES**

- A. **Protect in Place:** Protect utilities in place, unless abandoned, and maintain the utility in service, unless otherwise specified in the drawings or in the specifications.
- B. **Cut and Plug Ends:** Cut abandoned utility lines and plug the ends. Plug storm drains and sewers with an 8-inch wall of brick and mortar. Cap waterlines with a cast-iron cap or install a 3-foot-long concrete plug. Dispose of the cut pipe as unsuitable material.
- C. **Remove and Reconstruct:** Where so indicated in the drawings or as required by the Owner's Representative, remove the utility and, after passage, reconstruct it with new materials. Provide temporary service for the disconnected utility.

**3.03 COMPACTION**

- A. **Utilities Protected in Place:** Backfill and compact under and around the utility so that no voids are left.
- B. **Utilities Reconstructed:** Prior to replacement of the utility, backfill the trench and compact to an elevation 1 foot above the top of the ends of the utility. Excavate a cross trench of the proper width for the utility and lay, backfill, and compact.

END OF SECTION

## **SECTION 02140 DEWATERING**

### **PART 1 - GENERAL**

#### 1.01 WORK INCLUDED

- A. The work covered by this Section consists of furnishing all permits, labor, equipment, appliances and materials, and performing all operations required for dewatering excavations as required to ensure that all work is performed in the dry.
- B. The Contractor shall not discharge water from dewatering operations in any manner that will:
  - 1. Adversely affect the water quality of adjoining water bodies.
  - 2. Violate federal, state or local laws and regulations.
  - 3. Allow discharge to flow onto private property.
  - 4. Hamper the movement of traffic.
  - 5. Damage portions of the work previously constructed.
- C. **Furnish the services of a licensed professional engineer registered in the State of Florida, to prepare the dewatering system design and submittals. These must be signed and sealed by a professional engineer.**

#### 1.02 STATUTORY REQUIREMENTS

- A. **All State and local permits associated with the dewatering are the responsibility of the Contractor. Obtain and pay for all permits required for temporary dewatering systems. Contractor will need to secure Dewatering Permit for this project from SFWMD within 60 days of Notice-to-Proceed. Contractor will need to secure Shallow Injection Well Permit from FDEP within 60 days of Notice-to-Proceed.**
- B. Original permits shall be prominently displayed on the site prior to constructing dewatering systems.

#### 1.03 RELATED WORK

- A. Section 02220: Excavation, Backfilling and Compacting (piping)
- B. Division 15: Mechanical

#### 1.04 SUBMITTALS

- A. Administrative Submittals: Discharge permits.
- B. **Shop Drawings: Water Control Plan, including dewatering pumps, stilling basin, shallow injection wells and means of sound attenuation. Dewatering operations shall not commence until Owner and Engineer have reviewed and approved this plan and permits have been issued by SFWMD and FDEP.**

#### 1.05 WATER CONTROL PLAN

- A. As a minimum, include descriptions of proposed groundwater and surface water control facilities including, but not limited to, equipment, methods, standby equipment and power supply, pollution control facilities, discharge locations to be utilized, and provisions for immediate temporary water supply as required by this Section.

### **PART 2 - PRODUCTS**

#### 2.01 PUMP DRIVERS

- A. Sound attenuated pumps as manufactured by Thompson Pumps with "Silent Knight" canopy, or approved equal shall be used for all dewatering activities that require a pumping system. Contractor shall demonstrate, measure and record the dB levels at the time of initial set-up. The Contractor shall record the dB levels weekly.

### **PART 3 - EXECUTION**

- A. The Contractor's proposed method for dewatering pipe trenches and manhole excavations shall be reviewed by the Engineer prior to instituting any such operations. Methods may include wellpoints, sump pumps, bedding rock, **shallow injection wells** or other methods approved by the Engineer. The Contractor is responsible for means and methods of construction dewatering activities.
- B. In areas of deep trench where dewatering and maintenance of vehicular traffic is required, the Contractor shall bench down the sides of the trench in order to cover the dewatering well point heads with temporary steel plating.
- C. The Contractor shall provide all labor, materials, tools and equipment necessary to properly control the quality of the discharge from dewatering operations. The Contractor shall comply with all applicable laws, rules and regulations governing the discharge of water from dewatering operations.

- D. The impact of anticipated subsurface soil/water conditions shall be considered when selecting methods of excavation and temporary dewatering and drainage systems. Where groundwater levels are above the proposed bottoms of excavations, a pumped dewatering system is expected for pre-drainage of the soils prior to excavation to final grade and for maintenance of the lowered groundwater level until construction has been completed to such an extent that the foundation, structure, pipe, conduit, or fill will not be floated or otherwise damaged. Type of dewatering system, spacing of dewatering units and other details of the work are expected to vary with soil/water conditions at a particular location.
- E. The Contractor is responsible for controlling the bacteriological quality of well point discharges into existing bodies of water. The maximum allowable level for fecal coliform in the wellpoint discharge is a mean MPN of 14 per 100 ML with not more than ten percent (10%) of the samples exceeding an MPN of 43 per 100 ML.
- F. Protection of Property - Contractor shall make an assessment for dewatering induced settlement and shall provide devices or systems, including but not limited to re-injection wells, infiltration trenches and cutoff walls, necessary to prevent damage to existing facilities, completed Work and adjacent facilities.
- G. Control surface water and groundwater such that excavation to final grade is made in the dry, and bearing soils are maintained undisturbed. Prevent softening, or instability of, or disturbance to, the sub-grade due to water seepage.
- H. Provide protection against flotation for all work.
- I. Wellpoints shall not be set in such a way that undermines or jeopardizes paved areas; if the setting of wellpoints undermines or impacts paved areas, the impacted areas shall be removed and restored equal to or better than their original condition at the expense of the Contractor.
- J. Pipe and conduit shall not be installed in water or allowed to be submerged prior to backfilling. Pipe and conduit which becomes submerged shall be removed and the excavation dewatered and restored to proper conditions prior to reinstalling the pipe and conduit.
- K. Collect and properly dispose of all discharge water from dewatering and drainage systems in accordance with State and local requirements and permits. As a minimum, no discharge or run-off of groundwater or surface water that is contaminated with any petroleum products (gasoline, diesel fuel, oil, grease, hydraulic fluid, etc.) and/or sanitary waste shall be made to surface water systems such as lakes, rivers, streams, the Intracoastal Waterway or "on-site" retention ponds that secondarily discharge to these surface water systems. **Shallow injection wells are required for this project.**
- L. Dewatering systems shall be designed to allow for localized variations in the depths of the excavations.

- M. Do not allow water to accumulate in excavations. Remove water to prevent softening of foundation bottoms, undercutting footings, and soil changes detrimental to stability of sub-grades and foundations. Provide and maintain pumps, well points, sumps, suction and discharge lines, and other dewatering system components necessary to convey water away from excavations.
- N. Establish and maintain temporary drainage ditches and other diversions outside excavation limits to convey rainwater and water removed from excavations to collecting or runoff areas. Do not use trench excavations as temporary drainage ditches.
- O. As the wellpoints are withdrawn, the locations of the voided areas shall backfilled by jetting approved backfill material (grout) into the voids until they are completely filled. These restored wellpoint voids are subject to random density verification testing.
- P. Comply with Monroe County's Noise Ordinance.

END OF SECTION

## **SECTION 02211 SITE GRADING**

### **PART 1 - GENERAL**

#### 1.01 WORK INCLUDED

- A. Remove topsoil and stockpile on site for later use.
- B. Excavate sub-soil and reform to grades, contours and levels.
- C. Excavate or fill for roadways, walks, curbs, gutters, parking areas, landscaped areas and as shown on the Drawings.

#### 1.02 RELATED WORK

- A. Section 02220: Excavation, Backfilling and Compacting.
- B. Section 02513: Asphaltic Concrete Paving.

#### 1.03 EXISTING CONDITIONS

- A. Known underground, surface and aerial utility lines, and buried objects are based on best available data and indicated on the Drawings. Contractor shall verify all locations.

#### 1.04 PROTECTION

- A. Protect trees, shrubs and lawns and other features remaining as part of final landscaping.
- B. Protect bench marks, and existing structures, fences, roads, sidewalks, paving and curbs against damage from equipment and vehicular traffic.
- C. Protect aerial, surface, or underground utility lines or appurtenance which are to remain.
- D. Repair any damage, at no cost to Owner.

### **PART 2 - PRODUCTS**

## 2.01 MATERIALS

- A. Excavated fill material: Soil free from roots, rocks larger than 3-inches, and building debris.
- B. Additional fill material: Shall be approved by the Engineer.

## **PART 3 - EXECUTION**

### 3.01 PREPARATION

- A. Establish and identify required lines, levels, contours and datum.
- B. Maintain bench marks, monuments, and other reference points. Re-establish if disturbed or destroyed, at no cost to Owner.
- C. Before start of grading, establish the location and extent of utilities in the work areas. Notify utilities to remove and relocate lines which are in the way of construction.
- D. Maintain, protect, reroute or extend as required existing utilities to remain which pass through the work area.

### 3.02 REMOVAL OF TOPSOIL

- A. Topsoil of horticultural value shall be stripped from areas of construction under this contract and stockpiled in area designated by Engineer. Said material shall be stockpiled separately from fill material.
- B. Do not permit topsoil to be mixed with subsoil
- C. Do not strip topsoil when wet.
- D. Do not drive heavy equipment over stockpiled topsoil.

### 3.03 ROUGH GRADING

- A. Rough grade site to required levels, profiles, contours and elevations ready for finish grading and surface treatment. Maintain the following:
  - 1. Sodded areas - 4 1/2-inches below finished grade elevation.
  - 2. Seeded areas - 6-inches below finished grade.
  - 3. Paved areas - 18-inches below finished grade elevations.

4. Shrub beds - 24-inches below finished grade elevations.
  5. Flower beds - 18-inches below finished grade elevations.
  6. Concrete sidewalks - 8-inches below finished grade elevations.
- B. Prior to placing fill material over undisturbed subsoil, scarify surface to depth of 6-inches.

3.04 SURPLUS MATERIAL

- A. Remove surplus materials from site.
- B. Dispose of surplus material at no cost to Owner.

END OF SECTION

## **SECTION 02215 EARTHWORK**

### **PART 1 - GENERAL**

#### **1.01 DESCRIPTION**

- A. This section includes materials, testing, and installation of earthwork for excavations, fills and embankments for structures, pavements, rights-of-way, and sites.
  
- B. Standards
  - 1. Determine the density of soil in place by the sand cone method, ASTM D 1556; by nuclear methods, ASTM D2922; or by the rubber balloon method, ASTM D2167.
  - 2. Determine optimum laboratory moisture-density relations of cohesive soils by ASTM D1557 (modified Proctor).
  - 3. Sample backfill materials by ASTM D75.
  - 4. For cohesive and non-cohesive soils, "relative density" is the ratio, expressed as a percentage, of the in place dry density to the laboratory maximum dry density as determined by ASTM D1557 (modified Proctor).
  - 5. Determine the relative density of cohesionless soils by ASTM D2049.

#### **1.02 DEFINITIONS**

- A. Subgrade: The undisturbed material immediately below the bottom of an excavation, below an area of fill, or below a structure.
  
- B. Excavation and Trenching: Removal of earth or buried material, either temporarily or permanently, as specified or as necessary for construction of the project.
  
- C. Overexcavation: Excavation exceeding that specified or shown on the plans.
  
- D. Backfill: Earth material placed permanently in an excavated area.
  
- E. Fill: Earth material placed permanently above the existing grade.
  
- F. Borrow: Earth material brought from off the site to be used as fill or backfill.
  
- G. Structures: Buildings, foundations, and other man-made, stationary features above and below ground.

1.03 SUBMITTALS

- A. Submit copies of a certification from a testing laboratory that the material used for all backfills, fills and structural backfills meets the specified criteria and contain less than 1% by weight asbestos.
- B. Submit certification for sheeting, shoring and bracing.

**PART 2 - MATERIALS**

2.01 BACKFILL AND FILL

- A. Backfill and fill shall be excavated material or borrow that is free from clayballs larger than 2 inches in their largest dimension and contains no more than 15% by weight passing the No. 200 sieve, no more organic matter (peat, humus, leaves, and carbon compounds) than 1% by weight, and no cobbles larger than 2 inches in their largest dimension. The gradation of this granular material shall be such as to achieve the specified compaction.
- B. In the event there is insufficient satisfactory material from the excavation to meet the requirements for backfill or fill material, obtain borrow which meets the requirements for backfill material from sources secured by the Contractor.
- C. All material shall contain less than 1% by weight asbestos.

2.02 STRUCTURAL BACKFILL

- A. Structural backfill shall consist of clean, fine to medium sand, contain less than 1% by weight asbestos or organic matter (peat, humus, leaves, and carbon compounds), and conform to the following gradation requirements:

<b>Sieve Size (Square openings)</b>	<b>Weight Percent Passing Square Mesh Sleeves</b>
No. 4 (4.75 mm)	95 to 100
No. 10 (2.00 mm)	90 to 100
No. 40 (0.420 mm)	70 to 95
No. 60 (0.250 mm)	40 to 80
No. 100 (0.149 mm)	5 to 40
No. 200 (0.074 mm)	less than 5

- B. The structural backfill material may consist of either on-site granular material free of any sludge material, imported fill from sources secured by the Contractor or a blend of suitable on-site and imported fill material satisfying the requirements for structural backfill.

### 2.03 WATER FOR COMPACTION

- A. Water shall be free of acid, alkali, or organic materials and shall have a pH of 7.0 to 9.0. Provide all water needed for earthwork. Provide temporary piping, valves, and trucks to convey water from the source to the point of use. Provide any meters required if the water is taken from a public water system.

## **PART 3 - EXECUTION**

### 3.01 DEWATERING

- A. Provide and operate equipment adequate to keep excavations and trenches free of water. Dewater subgrade to a minimum of 3 feet below the bottom of the excavation. Remove water during periods when concrete is being deposited, during the placing of backfill, and for proper inspection and/or testing of the exposed subgrade. Avoid settlement or damage to adjacent property. Dispose of water in a manner that will not damage adjacent property or interfere with normal drainage. When dewatering open excavations, dewater from outside the structural limits and from a point below the bottom of the excavation. Obtain and comply with all required discharge permits from appropriate regulatory authorities.
- B. When dewatering open excavations, dewater from outside the structural limits and from a point below the bottom of the excavation.
- C. Obtain and comply with all required discharge permits from appropriate regulatory authorities. Dispose of water in a manner that will not damage adjacent property or interfere with normal drainage.

### 3.02 EXCAVATION

- A. Excavate to the elevations shown on the drawings, to the bottom elevations of the slabs, structures and foundations or the bottom of the roadway subbase (top of subbase if only to be compacted), whichever is the lowest elevation.
- B. Perform all excavation regardless of the type, nature, or condition of the material encountered to accomplish the construction. Excavate for foundations to a point at least 5 feet horizontally beyond the outside face of footings and base mats.
- C. After the excavation has been completed, the Owner or his representative will observe the exposed subgrade to determine the need for any additional excavation. It is intended that additional excavation be conducted in all areas

within the influence of the structure where unacceptable subgrade materials exist at the exposed sub-grade. Overexcavation shall include the removal of all such unacceptable material that exists directly beneath the hole or structure for the full width of the hole or structure and to a depth required to reach suitable foundation material. Refill the overexcavated areas with structural backfill. All such overexcavation and refilling shall be executed in accordance with a change order payment for overexcavation and refill shall be made in accordance with the General Conditions.

- D. No additional payment will be received for overexcavation or refill material used for convenience or which is not authorized by the Owner or his representative.
- E. Review and be aware of existing conditions and locate all structures and utilities within the project area in order to avoid conflicts.
- F. Protect any pipes, cables, mains, footings or other underground structures encountered in trenching/excavating/backfilling from damage or displacement. Replace any pipes, cables, mains, footings or other structures disturbed during construction.
- G. Contact all utility companies with utilities in the project area and obtain their assistance in locating facilities prior to excavation.
- H. Excavate sufficiently in advance of pipe laying to discover obstructions in time to modify alignment if necessary, to avoid the obstruction. The Owner or his representative must review such alignment modifications.

### 3.03 LIMITS OF EXCAVATION FOR PLACING FOUNDATIONS

- A. Excavate to the depths and widths specified, shown on the plans, or necessary to accomplish the construction. Allow space for forms, working space, structural backfill, and site grading. Do not carry excavation for footings, slabs or conduits deeper than the elevations shown on the plans. Backfill overexcavations below the elevations shown to the proper elevation with compacted structural backfill material. Correct cuts below grade by similarly cutting adjoining areas and creating a smooth transition.

### 3.04 PREPARATION OF SUBGRADE PRIOR TO PLACING FOUNDATIONS

- A. Excavate, shape and compact the subgrade to line, grade, and cross section. Remove soft material encountered and replace with structural backfill. Fill holes and depressions to the required line, grade and cross sections with structural backfill. The finished subgrade shall be within a tolerance of  $\pm 0.02$  feet of the grade and cross section shown, smooth and free from irregularities, and at the specified relative density.

- B. Proof roll the in-situ subsoils by surface rolling with a vibratory compactor that imparts a dynamic drum force of at least 35,000 pounds. Each section of the subgrade shall be subjected to overlapping coverages of the compactor, with the compactor operated at its full vibrational frequency and a travel speed not more than 2 fps. The rolling shall continue until no further settlement can be visually discerned at the subgrade surface. However, in no case shall any section of the subgrade receive less than 25 overlapping coverages with the compactor. Densification operations shall extend at least 10 feet beyond the sides of the structures or 10 feet beyond the edge of the pavement. Make observations of the subgrade during the densification process for signs of weaving and/or pumping. Should such conditions be observed, remove any compressible soils and replace with compacted backfill.

### 3.05 PLACING FILL OR BACKFILL

- A. Remove loosened and disturbed materials at the subgrade.
- B. Remove form materials and trash before placing any fill or backfill. Obtain the specified compressive strength and finish of concrete work before backfilling.
- C. Do not operate earthmoving or excavation equipment within 5 feet of existing structures or newly completed structures. Place and compact fill or backfill adjacent to concrete walls with hand-operated tampers or other equipment that will not damage the structure.
- D. Fill or backfill around water-holding basins and channels only after specified leakage tests have been conducted.
- E. Use material meeting the requirements for backfill and fill, and use structural backfill where shown on the drawings or specified.

### 3.06 EXCAVATED MATERIAL

- A. During excavation, place the excavated material only within the project area. Do not obstruct any roadways or streets. Conform to federal, state and local codes governing the safe loading of trenches with excavated material. Separate suitable and unsuitable material.
- B. Remove unsuitable or cleared material resulting from the facility installation from the work site and dispose of at location secured by the Contractor.
- C. Stockpile excess suitable material on the site.

### 3.07 DRAINAGE, EROSION AND SEDIMENTATION

- A. Maintain all existing drainage patterns and control run-off from the construction area to prevent erosion, sedimentation, or flooding due to the construction.

### 3.08 SHEETING, SHORING AND BRACING OF EXCAVATIONS

- A. Install adequate sheeting, shoring and bracing to prevent damage to property and injury to persons. Comply with all applicable safety regulations and laws.
- B. Remove sheeting when the excavation has been backfilled to at least one-half its depth or when removal will not endanger structures.
- C. When conditions or plans and specifications require that sheeting be left in place, cut off the top at an elevation 2.5 feet below finished grade, unless otherwise specified.
- D. When the performance of the Work requires the use of shoring, sheet piling, bracing and other special construction related to excavation, the Contractor shall cause the design of said shoring, sheet piling and other special construction to be performed by a registered professional engineer licensed in the State of Florida. The Contractor shall submit, as a shop drawing, a certification by the registered engineer, stating that he has complied with this requirement.

### 3.09 COMPACTION

- A. Unless otherwise specified or shown on the drawings, compact backfill and fill areas to at least the following minimum compaction requirements:
  - 1. Structural Backfill: 95% relative density in 6-inch maximum layers.
  - 2. Subgrade Under Fill or Backfill: 95% relative density to a depth of 12 inches.
  - 3. Subgrade Under Structural Backfill or Structures: 95% relative density to a depth of 60 inches.
  - 4. Backfill or Fill Under Pavement: 98% relative density in 9-inch maximum layers.
  - 5. All Other Areas: 95% relative density in 9-inch maximum layers.
- B. During the compacting operations, maintain within +2% of optimum moisture. Aerate material containing excessive moisture by blading, disking, or harrowing to hasten the drying process.

### 3.10 STRUCTURAL BACKFILL

- A. Place structural backfill where specified and in over-excavation areas, to the lines and grades shown or specified. Compact each lift. Stop structural backfill at least 6 inches below finished grade in all areas where topsoil is to be replaced. Moisten material as necessary to aid compaction.

### 3.11 SITE GRADING

- A. Perform earthwork to the lines and grades shown on the drawings. Round tops of banks to circular curves to not less than a 6-foot radius. Neatly and smoothly trim rounded surfaces. Do not overexcavate and backfill to achieve the proper grade. Shape the surface of earthwork to conform to lines, grades and cross sections that existed prior to beginning work or as shown on the drawings, within 1/10 of a foot.

### 3.12 DISPOSAL OF EXCESS EXCAVATION

- A. Remove excess, unsuitable, or cleared material resulting from the facility installation from the work site and dispose of at locations secured by the Contractor.

### 3.13 DRAINAGE, EROSION AND SEDIMENTATION

- A. Maintain all existing drainage patterns and control run-off from the construction area to prevent erosion, sedimentation, or flooding due to the construction.

### 3.14 PROTECTION OF PROPERTY

1. Protect the trunks of trees adjacent to this work by enclosure with padding or wood. Operate excavating machinery and cranes with care to prevent damage to trees, particularly to overhanging branches and limbs.
2. Do not cut branches, limbs and roots unless they are within six inches of the facility under construction.  
  
Make all necessary cuts smoothly and neatly without splitting or crushing. Neatly trim and cover the tree with healing paint at all cut or damaged portions.
3. Do not cut or operate on paved surfaces any equipment with treads or wheels that will cut or otherwise damage paved surfaces. Provide adequate protective measures to avoid damages to the paved surfaces.
4. As promptly as practicable, restore existing property or structures. Do not leave restoration until the end of the construction period.

### 3.15 TESTING

- A. Field density tests will be made in locations reviewed by the Owner, normally in each vertical layer, and using the following approximate spacing:
  1. Under structures, pavements, and slabs, one per 2,500 square feet with at least two per structure or area.
  2. In all other areas, one per 7,500 square feet.

- B. If any field density tests are below the specified relative density, recompact or re-excavate, rebackfill and recompact the area until the specific density is obtained. Make a minimum of two field density tests per recompact and/or re-excavated area, but do not exceed the spacing specified above.

### 3.16 ACCEPTANCE

- A. After the specified density tests have been successfully completed, the Owner or his representative may cross section the excavation and/or fill area to verify that the excavation or fill area conforms to the lines and grades shown on the plans and to determine quantities of material. Correct deviations from line and grade in excess of the tolerances specified at the Contractor's expense.

END OF SECTION

**SECTION 02220**  
**EXCAVATION, BACKFILLING AND COMPACTING (PIPING)**

**PART 1 - GENERAL**

1.01 WORK INCLUDED

- A. Work included under this section consists of clearing, excavating, backfilling, and grading required for the construction of all sanitary sewer system, force mains, lift stations, water mains, reclaimed water mains, structures, and appurtenances, as shown on the Drawings and specified herein.

**PART 2 - PRODUCTS**

2.01 MATERIALS

- A. Backfill - All backfill material shall be clean and free from all organic material, clay, marl or unstable materials, debris, lumps, or paving materials. No rocks or stones larger than three inches in diameter shall be allowed in any backfill.
- B. Select Bedding - Select bedding shall be utilized for 8" thick compacted pipe bedding and within the pipe zone to 8-inches above the pipe. Select bedding, as described in these specifications or required by the drawings, shall be a granular material free of rocks, clay, and organic material. Select bedding shall meet the requirements of FDOT #57 stone.
1. When excessive water is encountered in the trench and pumping is not practical due to field conditions, the FCAA Field Representative may require a crushed limerock bedding. In such a circumstance, the bedding shall be a uniformly graded crushed limerock with a maximum particle size of 3/8 inch. The material shall be washed and free of all fines and silts and shall be used as bedding as described above or to a point above the water table as directed by the FCAA Field Representative whichever is greater. Bedding above that point shall meet the requirements of select bedding as described previously.
- C. Flowable Fill - When the specified compaction requirements cannot be met in service line trenches, flowable fill shall be substituted for the trench backfill zone. The flowable fill shall meet the requirements of Section 121, FDOT Specifications and shall be proportioned to produce a 28 day compressive strength of approximately 75 to 100 psi.

## **PART 3 - EXECUTION**

### **3.01 CLEARING**

- A. The Contractor shall perform all necessary clearing for the proper installation of all water mains, structures, and appurtenances in the locations shown on the Drawings.
- B. Clearing shall be minimized as much as possible. Plantings, shrubbery, trees, utility poles, or structures subject to damage resulting from the excavation shall be transplanted, relocated, braced, shored, or otherwise protected and preserved unless otherwise directed by the FKAA.

### **3.02 EXCAVATION**

- A. General
  - 1. The Contractor shall satisfy himself as to the character and amount of different soil materials, groundwater, and the subsurface conditions to be encountered in the work to be performed. Information and data, when furnished, are for the Contractor's general information. However, it is expressly understood that any interpretation or conclusion drawn therefrom is totally the responsibility of the Contractor.
  - 2. The Contractor shall perform all excavation of every description and of whatever substances encountered, to the dimensions and depth shown on the drawings, or as directed. All excavations shall be made by open cut unless specified otherwise in other sections of these specifications. All existing utilities such as pipes, poles, and structures shall be carefully supported and protected from injury, and in case of damage, they shall be restored at no cost to the FKAA.
  - 3. Trench walls shall be kept as nearly vertical as possible, and, if required to protect the safety of workmen, the general public, this or other work or structures, or to maintain trench widths within the limits required to meet O.S.H.A. standards or as hereinafter specified, shall be properly sheeted and braced. Where wood sheeting or certain designs of steel sheeting is used, the sheeting shall be cut-off at a level above the top of the installed pipe and that portion below that level shall be left in place. Any sheeting left in place shall be cut off two feet (2.0') below grade. If interlocking steel sheeting, of a design approved by the FKAA is used, it may be removed providing removal can be accomplished without disturbing the bedding or alignment of the pipe. Any damage to the pipe bedding, pipe, or alignment of the constructed pipeline caused by removal of sheeting shall be cause for rejection of the affected portion of the work.

4. Pipe trenches shall be excavated to a width, within the limits of the top of the pipe and the trench bottom, so as to provide a clearance on each side of the pipe barrel, measured to the face of the excavation, or sheeting if used, of not less than six inches.
5. Materials removed from the trenches shall be stored and disposed of in such a manner that they will not interfere unduly with traffic on public streets and sidewalks and they shall not be placed on private property. In congested areas, such materials as cannot be stored adjacent to the trench or used immediately as backfill shall be removed to convenient places of storage. Excess materials and material unsuitable for backfill shall be removed to a suitable disposal area, as directed by the FKAA, at the Contractor's expense, immediately after backfill has been placed.

B. Removal of Water

1. It is a basic requirement of these specifications that excavations shall be free from water before pipe or structures are installed, unless alternate methods of construction are requested by the Contractor and approved by the FKAA.
2. The Contractor shall provide all necessary pumps, under drains, well point systems, and other means for removing water from trenches and other parts of the work. Before the pipes are laid or structures are built, the trenches and other excavations shall be free from water. The Contractor shall continue dewatering operations until the backfill has progressed to a sufficient depth over or around the installed work to prevent floatation or movement of the work. Water from the trenches and other excavations shall be disposed of in such a manner as will not cause injury to public health, to public or private property, to the work completed or in progress, to the surface of the streets, or cause any interference with the use of the same by the public.
3. All dewatering operations shall comply with Florida Department of Environmental Protection, South Florida Water Management Division, and U.S. Army Corps of Engineers requirements.

C. Excavation for Underground Utilities

1. Trenches for water, wastewater and reclaimed water pipeline installation shall be excavated to provide sufficient clearance on each side of the pipe for proper installation and jointing. The depth of excavation shall be sufficient for the installation of the pipe at the required elevation, depth or minimum cover, as shown on the Drawings, or as required for the installation of the pipe in accordance with profile elevations, where shown on the Drawings.
2. Where sandy soil conditions are encountered, the bottom of pipeline trenches shall be shaped, smoothed and leveled so that the lower one-third of the installed pipe receives continuous, uniform support throughout its length. Excavation at pipe couplings shall be made by hand, sufficient for the proper

installation of the coupling and to provide sufficient clearance under the coupling so that it does not rest on the trench bottom.

3. For sandy soil conditions, the Contractor, at his option, may undercut the trench excavation to a depth of at least four inches below the level of the outside bottom of the proposed pipe barrel. The trench shall then be backfilled with select backfill material, compacted to ninety percent (90%) maximum density. The trench bottom shall then be shaped, smoothed and leveled, ready to receive the pipe, as specified hereinabove.
4. Where intermittent or continuous rock formations are encountered in trench bottoms, the excavation shall be carried to a depth of at least eight inches below the level of the outside bottom of the proposed pipe barrel, and shall be backfilled in accordance with Paragraph 3.03.
5. Excavation for thrust blocks shall be made by hand digging in such a manner so that, when concrete is placed, it will bear against a firm, undisturbed, vertical trench wall with bearing area in accordance with the schedule shown on the Drawings.

D. Trench Stabilization

1. No claims for extras, or additional payment, will be considered for cost incurred in the stabilization of trench bottoms which are rendered soft or unstable as a result of construction methods, such as improper or inadequate sheeting, de-watering or other causes. In no event shall pipe be installed when such conditions exist and the contractor shall correct such conditions so as to provide proper bedding or foundations for the proposed installation at no additional cost to the FKAA.

E. Alternate Methods of Construction

1. In the event extremely porous sub-strata and relatively high ground water table exists at the site of the proposed work, it is recognized that it may be very difficult and costly to de-water excavations. In view of this, the foregoing requirements for de-watering may be waived if the Contractor, at his option, chooses to employ an alternate method of construction. Prior to his selection of an alternate method of construction, the Contractor shall obtain the concurrence of the FKAA that the method selected is applicable to the conditions existing in the particular area.
2. Any alternate method of construction proposed by the Contractor shall include provision such that the trenches shall be undercut a minimum of 8 inches. The resulting excavation shall then be backfilled with approved pipe bedding material, ready to receive the pipe, as specified under Paragraph 2.01 (B).

3. No additional payment will be made to the Contractor for excavation, backfill, sheeting or any costs incurred for work or materials, or any other costs incurred, as a result of alternate methods of construction selected by the Contractor, but the prices established in the quotation form shall be full payment for the various items of work to be done.
4. The alternate method of construction, if selected by the Contractor, shall in no way be construed as relieving the Contractor of his basic responsibility for satisfactory completion of the work in accordance with these Contract Documents.

F. Excavation for Structures

1. Shall be as specified herein, and as may be further specified for particular structures in other sections of these specifications. Excavation for structures shall be sufficient for the proper installation and construction of the proposed work in accordance with the elevations and dimensions shown on the Drawings. Adequate clearance and working space shall be provided between the outer surfaces of structures and the embankment, or bulkheads, sheeting or shoring used to support the embankment.
2. Excavations shall be free of water before the installation and construction of the proposed structures is commenced. De-watering operations shall be scheduled and maintained so that all installation and construction is performed above water, until backfill operations can be completed as specified below, and to protect the structure from damage, movement or floatation.

3.03 BACKFILL

A. General

1. All road crossings shall be backfilled immediately, made passable, and maintained with asphalt cold patch until the permanent repair is made.
2. All utility trenches shall be backfilled to the level of the bottom of the proposed base course for utilities to be located in proposed paving areas, to the level of the bottom of temporary paving for utilities to be located in existing paved areas, or to the level of finished grade for utilities to be located in areas to remain unpaved. The Contractor shall provide a sufficient quantity of backfill material for this purpose from trench excavations or from adjacent project areas, or other sources, at no additional cost or expense to the FKAA.
3. Any excess excavation below the levels specified shall be backfilled and compacted as specified below for backfill above pipe, at no additional cost to the FKAA.

B. Placement

1. Where the trench has been dewatered, backfilling must progress sufficiently before pumps are shut off to prevent floatation of pipe. Any pipe that has been displaced perceptibly from its correct position shall be removed and relaid properly at the Contractor's expense. Backfilling shall follow pipe laying within 100 feet, unless otherwise directed by the FKAA, but shall not be performed in any case until the FKAA has approved the line for backfilling.
2. Bedding around pipe - Select bedding below the pipe shall be 8" thick to provide a firm, stable, and uniform support for the full length of the pipe and fittings before the pipe is installed. Bell holes shall be provided at each joint to permit proper assembly and pipe support. After pipe placement, backfilling and compacting of select bedding shall proceed uniformly, on each side and 8 inches above the pipe. Particular attention shall be paid in obtaining thorough support for all valves, fittings, water service connections and to preserve the alignment and gradient of the installed pipe.
3. Backfill above pipe - after the placement of the select bedding around the pipe, as specified above, the remainder of the backfill shall be placed. Backfilling shall proceed by placing backfill in depths of uniform layers and thoroughly compacting with mechanical vibrators or other suitable equipment to the densities specified below. The depth of layers of this backfill shall not exceed the ability of the compacting equipment employed to obtain the specified densities, and in no event shall exceed a depth of 12 inches. The mechanical compacting equipment employed, and its operation shall be such that no displacement of pipe alignment or gradient or damage to installed materials, pipe or pipe linings results from its use. Any installed material so displaced or damaged shall be replaced by the Contractor, at no additional cost to the FKAA.

3.04 COMPACTION

- A. Backfill shall be placed in layers as specified for the particular application, and each layer shall be compacted to the specified density before the next layer is placed. Densities shall be performed in accordance with "Compaction and Densities". Hydraulic methods of settling and compacting backfill may be employed along with specified hand tamping and mechanical compaction as an aid to obtain specified densities. The Contractor shall obtain the approval of the FKAA for his selected method of backfill.
- B. For pipe lines not located under existing or proposed pavement, backfill over the installed pipe shall be compacted to obtain not less than ninety-five percent (95%) minimum density ASTM modified proctor.

- C. For pipe lines located under existing pavement, for which pavement replacement will be required, or in areas of proposed paving, backfill shall be placed and compacted as specified above, except that the top 12 inches, measured downward from the level of the bottom of the required base course restoration, or proposed base course, shall be Miami Limerock, in accordance with Section 911 D.O.T. Specifications compacted to not less than ninety-eight percent (98%) density ASTM modified proctor.
- D. Any settlement noted in backfill or within the limits of the excavation within the 1-year warranty period upon final acceptance, will be considered to be caused by improper compaction methods and shall be corrected at no cost to the FKAA. Pavement or structures damaged by settlement shall be restored to their original condition by the Contractor at no cost to the FKAA.
- E. Backfill above pipe in service line trenches shall meet the requirements listed in A, B, and C. If these requirements cannot be met, the trench shall be backfilled with flowable fill as specified in paragraph 2.01 (C) at no additional cost to the FKAA.

END OF SECTION

## **SECTION 02507 PRIME AND TACK COATS**

### **PART 1 - GENERAL**

#### **1.01 WORK INCLUDED**

- A. The work includes the application of bituminous material on previously prepared bases.

### **PART 2 - PRODUCTS**

#### **2.01 MATERIALS**

- A. Prime Coat: The material used for the prime coat shall be one of the following:
  - 1. Cutback asphalt, Grade RC-70 or RC-250 shall meet the requirements of AASHTO Specifications M81 except that the penetration range shall be from 60-120.
  - 2. Emulsified Asphalt SS-1 or CSS-1, SS-1H diluted in equal proportions with water and shall meet the requirements of AASHTO Specification M208.
  - 3. Emulsified Asphalt, grades AE-60, AE-90, AE-150 or AE-200 shall meet the requirements of AASHTO Specification M140.
- B. Tack Coat: The material used for the tack coat shall be one of the following:
  - 1. Emulsified Asphalt Grades SS-1, CSS-1 or AE-60, AE-90, AE-150 or 200 shall meet the requirements of AASHTO M140 or M200.
  - 2. Emulsified Asphalt, grade RS-2 or CRS-2 shall meet the requirements of AASHTO Specification M208.

#### **2.02 EQUIPMENT**

- A. The pressure distributor used for placing the tack or prime coat shall be equipped with pneumatic tires having sufficient width of rubber in contact with the road surface to avoid breaking the bond of or forming a rut in the surface. The distance between the centers of openings of the outside nozzles of the spray bar shall be equal to the width of the application required, within an allowable variation of 2-inches. The outside nozzle at each end of the spray bar shall have an area of opening of not less than 25 percent, nor more than 75 percent in excess of the other nozzles which shall have uniform openings. When the application

covers less than the full width, the normal opening of the end nozzle at the junction line may remain the same as those of the interior nozzle.

## **PART 3 - EXECUTION**

### **3.01 PREPARATION**

- A. Before applying any bituminous material, all loose material, dust, dirt, and foreign material, which might prevent proper bonding with the existing surface, shall be removed. Particular care shall be taken to clean the outer edges of the strip to be treated in order to insure that the prime or tack coat will adhere.
- B. When the prime or tack coat is applied adjacent to curb and gutter, or any other concrete surface (except where they are to be covered with a bituminous wearing course) such concrete surfaces shall be protected by heavy paper or other protective material while the prime or tack coat is being applied. Any bituminous material deposited on such air temperature is less than 50°F in the shade, or when the weather conditions or the condition of the existing surface is unsuitable. In no case shall bituminous material be applied while rain is falling or when there is water on the surface to be covered.

### **3.02 APPLICATION OF PRIME COAT**

- A. After the base has been finished, the full width of surface shall be swept with a power broom supplemented with hand coat. Care shall be taken to remove loose dust, dirt and objectionable matter. If deemed necessary, the base shall be lightly sprinkled with water immediately in advance of the prime coat.
- B. The temperature of the prime material shall be such as to insure uniform distribution. The material shall be applied with a pressure distributor as specified above. The amount to be applied shall be sufficient to coat the surface thoroughly and uniformly without any excess to form pools or to flow off the base. For limerock base, the rate of application shall not be less than 0.10 gallons per square yard.
- C. If the roadway is to be opened for use following the application of the prime material, a light uniform application of clean sand shall be applied and rolled. The sand shall be non-plastic, shall be free from silt and rock particles and shall not contain any sticks, vegetation, grass, roots or organic matter. After the sand covering has been applied, the surface may be opened to traffic.

### **3.03 APPLICATION OF TACK COAT**

- A. Tack coat is required between layers of bituminous surfaces.

- B. Tack coat shall not be applied until the surface has been cleaned and is free from sand, dust or other objectionable material.
- C. The tack coat shall be heated to a suitable consistency and applied in a thin uniform layer at the rate of between 0.02 gallons and 0.08 gallons per square yard and applied as specified above.
- D. The tack coat shall be applied sufficiently in advance of the laying of the asphaltic concrete to permit drying, but shall not be applied so far in advance or over such an area as to lose its adhesiveness as a result of being covered with dust or other foreign material. Suitable precautions shall be taken by the Contractor to protect the surface while the tack coat is drying and until the wearing surface is applied.
- E. Tack coat in quantities prescribed by 3.03 C above shall be applied prior to the application of any asphaltic concrete leveling course.

END OF SECTION

## **SECTION 02513 ASPHALTIC SURFACES**

### **PART 1 - GENERAL**

#### 1.01 WORK INCLUDED

- A. The work specified in this section consists of the construction of an asphaltic concrete base course, asphaltic concrete leveling course, asphaltic concrete surface course in accordance with the specifications and in conformity with the line, grades, widths, and thickness indicated in contract documents. Asphaltic concrete shall be Type S-III.

#### 1.02 QUALITY ASSURANCE

- A. Construction of an asphaltic concrete base course, leveling course and surface course shall be in accordance with the 2000 Standard Specifications for Road and Bridge Construction, of the Florida Department of Transportation (FDOT).
- B. The FDOT specifications are hereby made a part of the Contract to the extent they are applicable thereto and shall be binding upon the Contract as though reproduced herein in their entirety.
- C. Laboratory analysis by a Certified Testing Laboratory on all materials shall be complete prior to placement. The result of the laboratory analysis shall be submitted to the Engineer upon request.

### **PART 2 - PRODUCTS**

#### 2.01 MATERIALS

- A. Bituminous Material: Asphalt cement, Viscosity Grade AC-20 or AC-30, shall conform with the requirements of FDOT Specifications, Section 916-1.
- B. Coarse Aggregate: Coarse aggregate, stone or slag shall conform with the requirements of FDOT Specifications, Section 901.
- C. Fine Aggregate: Fine aggregate shall conform with the requirements of FDOT Specifications, Section 902 and 332-2.2.3.
- D. Mineral Filler: Mineral filler shall conform with the requirements of FDOT Specifications, Section 917.

2.02 MIXTURES

A. The bituminous mixture shall be composed of a combination of aggregate (coarse, fine, or mixtures thereof), mineral filler, if required, and bituminous material. The several aggregate fractions shall be sized, uniformly graded and combined in such proportions that the resulting mixture will meet the grading and physical properties of the approved job mix formula. The composition of mixture will conform to FDOT Specifications in Sections 333-3.2, 333-3.3, 333-3.3, 333-3.4, 333-3.5.

B. B. In all cases, the job mix formula shall be within the design ranges specified in the following table. Gradation Design Range Percent by Weight Passing

<u>Sieve Size</u>	<u>Gradation Design Range % by Weight Passing Type S-III</u>
1/2-inch	100
3/8-inch	88-100
No. 4	60-90
No. 10	40-70
No. 40	20-45
No. 80	10-30
No. 200	2-6

C. Proportions of silica sand and local materials shall be not more than 25 percent by weight of total aggregate. Local materials shall conform with all requirements of Section 902-6.

2.03 MIX FORMULA

A. The job mix formula shall conform to the requirements of FDOT Specifications, Section 331-4.3. In addition, the job mix formula shall include test data showing that the material as produced meets the requirements of the following table:

<u>Mix Type</u>	<u>Minimum Marshall Stability (#/kN)</u>	<u>Flow (0.01 in/mm)</u>	<u>Minimum VMA (%)</u>	<u>Air Voids (%)</u>	<u>VFA Voids Filled with Asphalt (%)</u>
S-III	1500/6.7	8 - 14/2.0-3.3	15.5	4-6	65-75

B. The minimum effective asphalt content for Type S-III shall be 5.5 percent.

**PART 3 - EXECUTION**

### 3.01 PREPARATION

- A. Bike Path:
  - 1. 1-1/2" Type S-III (Leveling and Surface Courses)
  - 2. 2" Asphaltic Concrete Base Course, or 4" Limerock Base
- B. B. Roads: Type S-III.

### 3.02 ASPHALTIC CONCRETE BASE COURSE

- A. Excavate the area of the construction to the proper lines and grades. The underlying soil shall be compacted to the approximate density of the surrounding soil and primed.
- B. Place asphaltic base course material by mechanical spreading and finishing machine to the specified thickness. Prior to the placement, FKAA may require motor grader leveling. A motor grader may be used in spreading the first course of multiple course bases where the sub-grade will not support the use of a mechanical spreader.
- C. Place the base course separately from the surface course.
- D. Each layer of base course construction shall not be more than three inches on each pass.
- E. The compaction of base courses may be achieved using a steel roller, or a pneumatic tired roller that will effectively exert a compaction effort. The Contractor shall specify what equipment will be used. This must be approved by FKAA prior to the start of work.
- F. The completed asphalt base course shall be contiguous to and level with the existing asphaltic pavement. The Contractor is reminded that while a representative slope from the centerline is not required, a measurable pitch in the road is required to assure adequate drainage.

### 3.03 ASPHALTIC CONCRETE LEVELING COURSE

- A. Requirements
  - 1. Requirements consist of the application of Type S-III asphaltic concrete to provide for leveling as shown on the Plans.
  - 2. Where dips, bumps, surface irregularities, and etc. exist, they shall be filled with an asphalt leveling course to provide a smooth, uniform, and level surface. A site visit by the Contractor prior to bid is vital to determine how much "additional leveling" is needed. This additional

asphalt should be included in the bid item for Asphalt Concrete Leveling Course. It is not the intent of the plans to identify any or all areas where additional leveling may be needed.

3. After a thorough brooming, a tack coat in quantities of 0.02 gallons to 0.08 gallons per square yard shall be applied to the existing pavement prior to the application of the leveling course. If a surfacing course is not applied over the leveling course the same day, a tack coat within the quantities above shall be applied to the leveling course prior to application of the surfacing course.
4. Spreading shall conform to the applicable provisions of FDOT Specifications, Section 330-9.3.
5. Streets have an elevated centerline to insure adequate drainage. Specific percentages of cross slope are not required, however, it is the intent that the application of the leveling course will follow existing cross slope; or where none exists, provide sufficient cross slope to insure adequate drainage.
6. The centerline of a roadway shall be an equal distance from each edge of new pavement.

### 3.04 ASPHALTIC CONCRETE SURFACE COURSE

#### A. Requirements

1. The surface course requirements consist of the application of compacted Type S-III asphaltic concrete to provide for surfacing as shown in the Plans.
2. After a thorough motorized brooming, a tack coat in quantities of .02 gallons to .08 gallons per square yard shall be applied to the base prior to the application of the surfacing course.
3. Spreading: Spreading shall conform to the applicable provisions of FDOT Specifications, Section 330-9.2. The surface course shall be completed in one pass. The longitudinal joint, if required due to the width of the pavement, will be at the center of the total proposed paving width, not offset.
4. Other items, such as materials, mixing, transporting, rolling, joints, etc. shall be as specified by other paragraphs of this section.
5. In cases where only a surface is required on top of a limerock base course, the contractor shall install a compacted asphaltic surface course that has a minimum of 1-1/2”.

### 3.05 TRANSPORTATION OF MIXTURE

- A. The mixture shall be transported in tight vehicles cleaned of all foreign material &, if necessary, each load shall be covered with a waterproof canvas cover of sufficient dimensions to protect it from weather conditions. The inside surface of the truck may be thinly coated with a soapy water, or a mixture of water with not more than 5 percent of lubricating oil, but no excess of either shall be used. After the trucks are coated and before any mixture is placed therein, they shall be raised so that all excess water will drain out. Kerosene, gasoline or similar products shall not be used to prevent adhesion.

### 3.06 LIMITATIONS FOR SPREADING

- A. The mixture shall be spread only when the surface is properly prepared and is intact, firm, cured and dry. No mixture shall be spread when the air temperature is less than 40° F, nor when the spreading cannot be finished and compacted during the daylight hours. The temperature of the mix at the time of spreading shall not be less than 230° F.

### 3.07 PLACING MIXTURE

- A. The mixture shall be placed in accordance with the requirements of FDOT Specifications, Section 330-9.
- B. Thickness of layers for Type S-III asphaltic concrete construction shall be no more than 2" (inches) on each pass for surface and leveling courses.

### 3.08 COMPACTING MIXTURE

- A. The mixture shall be compacted in accordance with the requirements of FDOT Section 330-10, except that any portion of the project being constructed as an asphaltic concrete base shall be compacted as shown in Sec. 280-8.6.

### 3.09 JOINTS

- A. Joints shall conform with the requirements of FDOT Specifications, Section 330-11.

### 3.10 FIELD QUALITY CONTROL

- A. Surface Requirements
  - 1. For the purpose of testing the finished surface, a fifteen foot straightedge (large paved areas), a six foot straightedge (bike path), and a standard

template cut to the true cross-section of the road shall be provided by the Contractor and available at all times. The Contractor shall provide or designate an employee whose duty it is to handle the straightedge and template in checking all rolled surfaces, under the direction of the Engineer or his representative.

2. The finished surface shall be such that it will not vary more than 1/4-inch from the template cut to the cross section of the road/path, nor more than 3/16 inch from the fifteen/six foot straightedge applied parallel to the centerline of the pavement. If necessary, the Contractor shall provide a fifteen foot rolling straightedge to demonstrate whether the leveled surface meets the specified criteria prior to the application of the surface course. Any irregularity exceeding the above limits shall be corrected. Depressions which may develop after the initial rolling shall be remedied by loosening or removing the mixture and adding new material to bring the areas to a true surface. No skin patching shall be done. Such portions of the completed pavement that are defective in surface compaction or in composition, or that do not comply with all other requirements of these specifications, shall be removed and replaced with suitable mixture, properly laid in accordance with these specifications; all at the expense of the Contractor.

- B. Thickness Requirements: The finished thickness of the compacted asphaltic concrete surface course shall be no less than that indicated in the contract documents as determined by the coring. Any surface course found to be less than that thickness shall be removed and replaced.
- C. Protection of Pavement: After the completion of the pavement, no vehicular traffic of any kind shall be permitted on the pavement until it has set sufficiently to prevent rutting or other distortion.

END OF SECTION

# **SECTION 02521 FLOWABLE FILL**

## **PART 1 - GENERAL**

### 1.01 SCOPE OF WORK

- A. This Section specifies the requirements for flowable fill used for trenches, support for pipe structures, culverts, utility cuts and other works where cavities exist and where firm support is needed for pavements and structural elements. Flowable fill may also be used to fill water pipes that need to be abandoned in place and at other locations approved by the Engineer.

### 1.02 REFERENCE SPECIFICATIONS

- A. Section 01010 - Summary of Work
- B. Section 01300 - Submittals
- C. Section 02220 - Excavation, Backfilling and Compacting
- D. Section 02574 - Pavement Removal and Replacement

## **PART 2 - PRODUCTS**

### 2.01 MATERIALS

- A. The materials used shall conform with the requirements specified in Division III of the F.D.O.T. Standard Specification for Road and Bridge Construction, latest edition, and herein. Specific reference are as follows:
  - 1. Portland Cement (Type I, II or III) Section 921
  - 2. Fly Ash, Slag and other Pozzolanic materials for Portland Cement Concrete Section 929
  - 3. Fine Aggregate (Sand)\* Section 902
  - 4. Water Section 923

\*Any clean sand with 100% passing 3/8" sieve and not more than 10% passing with 200 mesh may be used.

## 2.02 MIX PROPORTIONS

- A. The Contractor shall be responsible for producing a flowable mixture using these guidelines and by adjusting his mixture design as called for by circumstances or as may be directed by the Engineer.
- B. Flowable fill material shall be proportioned to produce a 28-day compressive strength of a minimum of 100 psi.
- C. General mix quantities are as follows:

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

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

- D. Weights for fine aggregates and water shall be adjusted for removability, pumpability and flowability. If required, strength test data shall be provided prior to batching.
- E. If required by the Engineer, the flowability can be measured by afflux time determined in accordance with ASTM C 939 and shall be 30 seconds +/- 5 seconds as measured on mortar passing the No. 4 sieve. The equipment required to perform this test shall be provided by the Contractor.

## **PART 3 - EXECUTION**

### 3.01 PRODUCTION AND PLACING

- A. Flowable fill shall be produced and delivered using ready mix concrete trucks and placed easily by chute in a flowable condition directly into the cavity to be filled or into a pump for final placement.
- B. The flowable fill shall be placed to the designated fill line without vibration or other means of compaction. Placement shall be avoided during inclement weather, e.g. rain. The Contractor shall take all necessary precautions to prevent any damages caused by hydraulic pressure of the fill during placement prior to hardening. Also, necessary means to confine the material within the designated space shall be provided by the Contractor.

### 3.02 ACCEPTANCE

- A. The flowable shall be proportioned and placed as specified herein. In general, the strength desired is the maximum hardness that can be excavated at a later date using conventional excavation equipment. No curing protection is required.
- B. The fill shall be left undisturbed until material obtains sufficient strength. Sufficient strength is 250 psi penetration resistance as measured using a hand held penetrometer. The penetrometer shall be provided by the Contractor.
- C. All flowable fill areas subject to traffic loads must have a durable riding surface.
- D. An approved type of accelerator may be approved for the placement of “Flowable Fill” in traffic areas when submitted to the Engineer. Depending on the condition of the cavity, paving can begin from 8-24 hours after placement.

END OF SECTION

**SECTION 02620**  
**POLYETHYLENE SHEET ENCASUREMENT (AWWA C105)**

**PART 1 - GENERAL**

1.01 DESCRIPTION

- A. This section includes materials and installation of a polyethylene sheet encasement for buried Ductile Iron pipe, fittings, and valves.

1.02 SUBMITTALS

- A. Submit shop drawings in accordance with the Standard Conditions.
- B. Submit manufacturer's catalog literature and product data sheets describing the physical, chemical, and electrical properties of the encasement material.

**PART 2 - MATERIALS**

2.01 POLYETHYLENE WRAP

- A. The encasement shall consist of low-density polyethylene wrap of at least 8-mil thickness conforming to AWWA C105. Color: Black.
- B. Polyethylene encasement for ductile-iron pipe shall be supplied as a flat tube meeting the dimensions of Table 1 in AWWA C 105 and shall be supplied by the ductile-iron pipe manufacturer.

2.02 PLASTIC ADHESIVE TAPE

- A. Tape shall consist of polyolefin backing and adhesive which bonds to common pipeline coatings including polyethylene.
- B. Minimum Width: 2 inches.
- C. Products: Canusa Wrapid Tape; Tapecoat 35; Polyken 934; AA Thread Seal Tape, Inc.; or equal.

## **PART 3 - EXECUTION**

### **3.01 APPLYING SHEET COATING TO BURIED PIPING AND FITTINGS**

- A. Apply wrapping per AWWA C 105 as modified herein.
- B. Apply a single wrapping.
- C. Install the polyethylene to completely encase the pipe and fittings to provide a watertight corrosion barrier. Continuously secure overlaps and ends of sheet and tube with polyethylene tape. Make circumferential seams with two complete wraps, with no exposed edges. Tape longitudinal seams and longitudinal overlaps, extending tape beyond and beneath circumferential seams.
- D. Wrap bell-spigot interfaces, restrained joint components, and other irregular surfaces with wax tape or moldable sealant prior to placing polyethylene encasement.
- E. Minimize voids beneath polyethylene. Place circumferential or spiral wraps of polyethylene tape at 2-foot intervals along the barrel of the pipe to minimize the space between the pipe and the polyethylene.
- F. Overlap adjoining polyethylene tube coatings a minimum of 1 foot and wrap prior to placing concrete anchors, collars, supports, or thrust blocks. Hand wrap the polyethylene sheet, apply two complete wraps with no exposed edges to provide a watertight corrosion barrier, and secure in place with 2-inch-wide plastic adhesive tape.
- G. Contractor shall size the Polyethylene Sheet Encasement (wrap) to slide over the fittings and then wrap tight the ends. This may require up to 12 to 16-inch wrap for 8-inch fitting.

### **3.02 APPLYING SHEET COATING TO BURIED VALVES**

- A. Wrap flanges and other irregular surfaces with wax tape or moldable sealant. Press tightly into place leaving no voids underneath and a smooth surface under coating for polyethylene sheet.
- B. Wrap with a flat sheet of polyethylene. Place the sheet under the valve and the flanges or joints with the connecting pipe and fold in half. Extend the sheet to the valve stem and secure the sheet in place with 2-inch-wide plastic adhesive tape. Apply a second layer and secure with tape. Make two complete wraps, with no exposed edges, to provide a watertight corrosion barrier. Secure the sheets with tape around the valve stem below the operating nut and around the barrel of the

connecting pipe to prevent the entrance of water and soil. Place concrete anchor and support blocks after the wrap has been installed.

- C. Contractor shall size the Polyethylene Sheet Encasement (wrap) to slide over the valves and then wrap tight the ends. This may require up to 12 to 16-inch wrap for 8-inch valve.

### 3.03 REPAIR OF POLYETHYLENE MATERIAL

- A. Repair polyethylene material that is damaged during installation. Use polyethylene sheet, place over damaged or tom area, and secure in place with 2-inch-wide plastic adhesive tape.

### 3.04 BACKFILL FOR POLYETHYLENE-WRAPPED PIPE VALVES. AND FITTINGS

- A. Place sand backfill within 1 foot of the pipe, valves, and fittings wrapped with polyethylene encasement.

END OF SECTION

## **SECTION 02682 PRESSURE TESTING OF PIPING**

### **PART 1 - GENERAL**

#### **1.01 DESCRIPTION**

- A. This section specifies the hydrostatic and leakage testing of pressure piping for pumping stations, wastewater collection systems and raw sewage force mains.

#### **1.02 SUBMITTALS**

- A. Submit shop drawings in accordance with the General Terms and Conditions and Section 01300.
- B. Submit test bulkhead locations and design calculations, pipe attachment details, and methods to prevent excessive pipe wall stresses.
- C. Submit six copies of the test records to the Owner's Representative upon completion of the testing.

#### **1.03 TEST PRESSURES**

- A. Test pressures for the various services and types of piping are shown in the Piping Schedule in the specifications.

#### **1.04 TESTING RECORDS**

- A. Provide records of each piping installation during the testing. These records shall include:
  - 1. Date and times of test
  - 2. Identification of pipeline, or pipeline section tested or retested
  - 3. Identification of pipeline material
  - 4. Identification of pipe specification
  - 5. Test fluid
  - 6. Test pressure
  - 7. Remarks: Leaks identified (type and location), types of repairs, or corrections made
  - 8. Certification by Contractor that the leakage rate measured conformed to the specifications

## 1.05 DESCRIPTION

- A. Perform testing of piping systems in accordance with AWWA C600 and as specified below.
- B. Provide instruments required for testing of piping systems.
  - 1. Make instruments available to Engineer to facilitate spot checks during testing.
  - 2. Retain possession of instruments, remove from site at completion of services.
- C. Provide all water required for flushing and testing.
- D. Provide all necessary pumping equipment and other equipment, materials and facilities required for proper completion of the flushing and testing specified.
- E. Source and quality of water, procedure and test equipment shall be by approval of the Engineer.
- F. All tests shall be made in the presence of the Engineer. Notify Engineer at least 72 hours before any Work is to be inspected or tested.
- G. If inspection or test shows defects, the piping system(s) shall be repaired and replaced and inspection repeated, until such piping is acceptable to the Engineer.
- H. Sections of the system may be tested separately, but when so tested it shall be distinctly understood that any defect which may subsequently develop in a section already tested and accepted shall promptly be corrected and that section retested.
- I. Disposal of the water used for testing shall be subject to the approval of the Engineer.

## **PART 2 - MATERIALS**

### 2.01 MANUAL AIR-RELEASE VALVES FOR BURIED PIPING

- A. Provide temporary manual air-release valves at test bulkheads for pipeline test. Construct the pipe outlet in the same manner as for a permanent air valve and after use, seal with a blind flange, pipe cap, or plug and coat the same as the adjacent pipe.

### 2.02 TEST BULKHEADS

- A. Provide blind flanges in pipelines for test bulkheads.

### 2.03 TESTING FLUID

- A. Testing fluid shall be water potable water for hydrostatic testing and flushing.
- B. Submit request for use of water from waterlines of Owner 48 hours in advance.
- C. The Contractor may obtain the water from the Owner at the Owner's rate of charges.

### 2.04 TESTING EQUIPMENT

- A. Provide calibrated pressure gauges, pipes, bulkheads, pumps, and meters to perform the hydrostatic testing.

## **PART 3 - EXECUTION**

### 3.01 TESTING PREPARATION

- A. Pipes shall be in place, backfilled, and anchored before commencing pressure testing.
- B. Conduct pressure tests on exposed and aboveground piping after the piping has been installed and attached to the pipe supports, hangers, anchors, expansion joints, valves, and meters.
- C. For buried piping, the pipe may be partially backfilled and the joints left exposed for inspection during an initial leakage test. Perform the final pressure test, however, after completely backfilling and compacting the trench.
- D. Provide any temporary piping needed to carry the test fluid to the piping that is to be tested. After the test has been completed and demonstrated to comply with the specifications, disconnect and remove temporary piping. Do not remove exposed vent and drain valves at the high and low points in the tested piping; remove any temporary buried valves and cap the associated outlets. Plug taps or connections to the existing piping from which the test fluid was obtained.
- E. Provide temporary drain lines needed to carry testing fluid away from the pipe being tested. Remove such temporary drain lines after completing the pressure testing. Drain the pipes after they have been tested.
- F. Prior to starting the test, the Contractor shall notify the Owner's Representative.

### 3.02 CLEANING

- A. Before conducting hydrostatic tests, flush pipes with water to remove dirt and debris. Maintain a flushing velocity of at least 4 fps for water testing. Flush pipes for time period as given by the formula

$$T = \frac{2L}{4}$$

in which:

T = flushing time (seconds)

L = pipe length (feet).

- B. A pig will be required where minimum velocity cannot be obtained or the pipeline diameter is greater than 12-inches.

### 3.03 LENGTH OF TEST SECTION FOR BURIED PIPING

- A. The maximum length of test section for buried pipe of 12 inches or smaller in diameter is 2,000 feet; for buried pipe larger than 12 inches, 1 mile. Provide intermediate test bulkheads where the pipeline length exceeds these limits.

### 3.04 INITIAL PIPELINE FILLING FOR HYDROSTATIC TESTING

- A. Maximum rate of filling shall not cause water velocity in pipeline to exceed 1 fps. Filling may be facilitated by removing automatic air valves and releasing air manually.

### 3.05 TESTING NEW PIPE WHICH CONNECTS TO EXISTING PIPE

- A. Prior to testing new pipelines that are to be connected to existing pipelines, isolate the new line from the existing line by means of test bulkheads, spectacle flanges, or blind flanges. After the new line has been successfully tested, remove test bulkheads or flanges and connect to the existing piping.

### 3.06 HYDROSTATIC TESTING OF ABOVEGROUND OR EXPOSED PIPING

- A. Open vents at high points of the piping system to purge air while the pipe is being filled with water. Venting during system filling may also be provided by temporarily loosening flanges.
- B. Subject the piping system to the test pressure indicated on the Piping Schedule in the specifications. Maintain the test pressure for a minimum of two hours. Examine joints, fittings, valves, and connections for leaks. The piping system

shall show zero leakage or weeping. Correct leaks and retest until zero leakage is obtained.

### 3.07 HYDROSTATIC TESTING OF BURIED PIPING

- A. Where any section of the piping contains concrete thrust blocks or encasement, do not make the pressure test until at least 10 days after the concrete has been placed. When testing mortar-lined or PVC piping, fill the pipe to be tested with water and allow it to soak for at least 48 hours to absorb water before conducting the pressure test.
- B. Apply and maintain the test pressure by means of a positive displacement hydraulic force pump.
- C. Pressure Piping Systems:
  - 1. All pressure piping shall pass a hydrostatic pressure test and a leakage test as defined below before acceptance. The pressure and leakage test shall be made after all jointing operations are completed and after backfilling is completed. All concrete reaction blocks, or other bracing and restraining facilities, shall be in place at least 24 hours before the initial filling of the line.
  - 2. The pressure and leakage tests may be applied to an individual section of line isolated between the existing line valves, or may be applied to shorter sections or line as approved by the Engineer. If shorter sections are tested, test plugs or bulkheads as required at the ends of the test section shall be furnished and installed by the Contractor at his expense, together with all anchors, braces and other devices required to withstand the hydrostatic pressure on such plug or plugs, without imposing any hydraulic thrust on the pipe line or any part thereof. The Contractor shall be solely responsible for any and all damage to the pipe line, and/or to any other facility, which may result from the failure of test plugs furnished by him or supports therefor, in any case.
  - 3. Tests:
    - a. Hydrostatic Tests:
      - 1) The section of line to be tested shall be slowly filled with water and all air expelled from the pipe. Care shall be taken that all air valves are installed and open in the section being filled, and that the rate of filling does not exceed the venting capacity of the air valves.
      - 2) Hydrostatic test pressure shall be as follows:

<b>Pipe Service</b>	<b>Pipe Material</b>	<b>Testing Fluid</b>	<b>Test Pressure (psi)</b>
FM	PVC	Water	150 psi
FM	HDPE	Water	150 psi
FM	DIP or SS	Water	150 psi
WM	PVC	Water	150 psi
WM	DIP or SS	Water	150 psi

- 3) After the pipe has been laid, all newly laid pipe or any valved section thereof shall be subjected to a hydrostatic pressure as stated in table above.

Test pressure shall:

- i. Not be less than 1.25 times the working pressure at the highest point along the test section.
- ii. Not exceed pipe or thrust-restraint design pressures.
- iii. Be of at least 2-hour duration.
- iv. Not vary by more than + 5 psi (0.35 Bar) for the duration of the test.
- v. Not exceed twice the rated pressure of the valves or hydrants when the pressure boundary of the test section includes closed gate valves or hydrants. NOTE: Valves shall not be operated in either direction at differential pressure exceeding the rated pressure.
- vi. Not exceed the rated pressure of the valves when the pressure boundary of the test section includes closed resilient-seated gate valves or butterfly valves.

Each valved section of pipe shall be filled with water slowly and the specified test pressure based on the elevation of the lowest point of the line or section under test and corrected to the elevation of the test gauge shall be applied by means of a pump connected to the pipe in a manner satisfactory to the owner. Valves shall not be operated in either the opening or closing direction at differential pressures above the rated pressure. It is good practice to allow the system to stabilize at the test pressure before conducting the leakage test.

- 4) Examination. Any exposed pipe, fittings, valves, hydrants, and joints shall be examined carefully during the test. Any damage or defective pipe, fittings, valves, or hydrants that

are discovered following the pressure test shall be repaired or replaced with sound material and the test shall be repeated until it is satisfactory to the Owner.

b. Leakage Test:

- 1) A leakage test shall be conducted concurrently with the pressure test. A leakage shall be defined as the quantity of water that must be supplied into the newly laid pipe, or any valved section thereof, to maintain pressure within 5 psi (0.35 Bar) of the specified test pressure after the air in the pipeline has been expelled and the pipe has been filled with water. Leakage shall not be measured by a drop in pressure in a test section over a period of time.
- 2) No pipe installation will be accepted if the leakage is greater than that determined by the following formula:

$$L = \frac{S \times D \times \sqrt{P}}{148,000} \times \frac{1}{2}$$

in which L is the allowable leakage, in gallons per hour; S is the length of pipe tested in feet; D is the nominal diameter of the pipe in inches; and P is the average test pressure during the leakage test, in pounds per square inch. The leakage test shall be conducted for a period of two hours.

- 3) All visible leaks are to be repaired regardless of the amount of leakage.

D. Repair and retest any pipes showing leakage rates greater than that allowed in the above criteria.

### 3.08 REPETITION OF TEST

- A. If the actual leakage exceeds the allowable, locate and correct the faulty work and repeat the test. Restore the work and all damage resulting from the leak and its repair. Eliminate visible leakage.

### 3.09 BULKHEAD AND TEST FACILITY REMOVAL

- A. After a satisfactory test, remove the testing fluid, remove test bulkheads and other test facilities, and restore the pipe coatings.

END OF SECTION

## **SECTION 02934 SODDING**

### **PART 1 - GENERAL**

#### 1.01 WORK INCLUDED

- A. Provide all labor, materials, and equipment necessary for complete sodding of areas affected by construction, and specifically called for on the Drawings to be replaced. This shall include, but not be limited to: fertilizing, sodding, necessary barriers, tests, and all incidentals to make the work complete.
  - 1. Testing of topsoil.
  - 2. Raking and leveling topsoil as required for sodding.
  - 3. Liming and fertilizing of topsoil.
  - 4. Laying and rolling of sod.
  - 5. Maintaining sod.

### **PART 2 - PRODUCTS**

#### 2.01 MATERIALS

- A. Fertilizer:
  - 1. Fertilizer if necessary shall be commercial fertilizer, as manufactured by International Chemical Company or approved equal.
  - 2. Said fertilizer shall have a 10-20-6 N.P.K. content and contain a minimum of 60% of organic material.
  - 3. It shall be delivered at the site in the original sealed containers.
- B. Sod:
  - 1. The sod shall be as grown by a certified turf nursery and Contractor shall inform the FKAA as to the source of the sod to be utilized prior to ordering and delivery of sod.
  - 2. Sod shall be furnished and installed in rectangular sod strips measuring 12 to 16-inches in width of standard lengths of not less than 2 feet and delivered on pallets.

3. After the preparation of the areas to be sodded has been approved by FKAA sod all previously sodded areas where no permanent construction exists. Supply and install sod which is equal to or approved equal to sod which exists at the project site.
4. St. Augustine Floratam Sod shall be placed in areas within the right of way that will be or is irrigated. Bahia sod shall be placed in areas not irrigated.

## **PART 3 - EXECUTION**

### 3.01 INSTALLATION

- A. These areas shall be fine graded to achieve the finished subgrade after compaction which shall be obtained by rolling, dragging or by an approved method which obtains an equivalent compaction to that produced by a hand roller weighing from 75 to 100 pounds per foot of width. All depressions caused by settlement or rolling shall be filled with additional existing or furnished topsoil and regraded and prepared as specified above until it presents a reasonably smooth and even finish at the required sod sub-grade.
- B. All sod furnished shall be living sod containing at least 70% of thickly matter grasses as specified and free from noxious weeds.
- C. No broken pads or torn or uneven ends will be accepted. Standard size sections of sod shall be strong enough to support own weight and retain their size and shape when suspended vertically with a firm grasp on the upper 10% of the section. Sod shall not be harvested when its moisture content (excessively wet or dry) may adversely affect its survival.
- D. Sod shall be harvested, delivered, and installed within a period of 36 hours. Sod not installed within this time period shall be subject to inspection and rejection by FKAA, and shall be removed from the site and a fresh sod supply shall be furnished at no extra cost to FKAA.
- E. The topsoil shall not be moist at time of installation; however, it shall contain sufficient moisture so as not be powdery or dusty, both as determined by the supplier's representative.
- F. The overlapping of existing lawn with new sod along limit of work lines will not be permitted. Sod shall be laid in strips, edge to edge, with the lateral joints staggered. All minor or unavoidable openings in the sod shall be closed with sod plugs or with topsoil, as directed by FKAA. However, sod laid with joints determined to be too large shall be lifted and 43-laid as specified herein at no extra cost to Engineer.

- G. Immediately after the sod is laid, the sod shall be watered thoroughly by hand or mechanical sprinkling until the sod and at least 2-inch of the top soil bed have been thoroughly moistened.
- H. Contractor shall be responsible to furnish his own supply of water to the site at no extra cost. If possible, the FKAA shall furnish the Contractor, upon request, with a source and supply of water. Contractor shall apply for temporary meter and pay the FKAA for water used at current utility billing rates. However, if the FKAA's water supply is not available or not functioning, Contractor shall be responsible to furnish adequate supplies at his own cost. All work injured or damaged due to the lack of, or the use of too much water, shall be Contractor's responsibility to correct.

### 3.02 MAINTENANCE

- A. Maintain the entire sodded areas until final acceptance at the completion of the Contract. Maintenance shall include watering as specified, weeding and removal of stones which may appear. All bare or dead spots which become apparent shall be properly prepared, limed and fertilized, and resodded at Contractor's expense as many times as necessary to secure a good growth. In the event that the sod installation is not accepted by the FKAA, the entire area shall be maintained and cut by Contractor until final acceptance of the sod installation.
- B. Take whatever measures are necessary to protect the sod while it is developing. These measures shall include furnishing or warning signs, barriers, or any other necessary measures of protection.

END OF SECTION

## **SECTION 02935 LANDSCAPE PLANTING**

### **PART 1 - GENERAL**

#### **1.01 DESCRIPTION**

- A. This section includes soil preparation, fine grading, planting, watering, and plant establishment and maintenance for the replacement of disturbed landscaping.

#### **1.02 SUBMITTALS**

- A. Submit shop drawings and other items in accordance with the General Terms and Conditions and Section 01300.
- B. Work schedule.
- C. Agronomic soils test report. After completion of grading and prior to weed control or soil preparation, the Contractor shall obtain agronomic soils tests for all planting areas. Tests shall be performed by an agronomic soils testing laboratory and shall include a fertility and suitability analysis with written recommendations for soil amendment, fertilizer and chemical conditioner application rates for soil preparation, planting backfill mix, auger hole requirements, and post maintenance fertilization program. The soils report recommendations shall take precedence over the minimum amendment and fertilizer application rates specified herein only when they exceed specified minimums.
- D. Materials list noting product (generic) name and supplier.
- E. Submit plant materials list and supplier's name, address, and phone number to FKAA Project Representative within 30 days of award of contract, giving evidence that Contractor has source for specified plant materials.
- F. Laboratory analysis of each soil amendment material. Submit samples of the import soil to the laboratory for analysis prior to and following placement on the site.
- G. Guarantees/written certifications.

#### **1.03 GUARANTEE**

- A. Immediately remove plant material that does not meet the specifications from the site. Replace these and any other plants that are missing with the same variety and size as originally designated in the plant list.
- B. See General Conditions for one-year guarantee.

#### 1.04 OBSERVATIONS

- A. Request observation by the Project Manager at least 48 hours in advance of the time observation is required.
- B. Observation will be required for the following parts of the work:
  - 1. Prior to completion of grading and soil preparation.
  - 2. Plant material when delivered to the project site.
  - 3. When shrubs and trees are spotted for planting but before planting pits are excavated.
  - 4. When planting and all other indicated or specified work has been completed.
  - 5. Upon completion of maintenance and plant establishment.

### **PART 2 - MATERIALS**

#### 2.01 AMENDMENTS AND FERTILIZERS

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

#### 2.02 WATER FOR GRASSING

- A. Maintain a balanced watering program until the acceptance of work.
- B. Apply water in sufficient quantities and as often as seasonal conditions require to keep the grassed areas moist.

#### 2.03 PLANT MATERIAL

- A. Boxed plant materials may be reviewed by Project Manager prior to delivery to jobsite. Review, when requested, shall be scheduled by the Contractor.

- B. Plant material shall be fresh, vigorous, of normal growth, and free from disease, weeds, insects, insect eggs, or larvae. Plants shall be free from knots, sunscald, injuries, abrasions, or other disfigurements. Container stock shall have grown in containers for at least six months, but not over two years. Tree trunks shall be sturdy and hardened.
- C. Plant materials shall meet the specifications of federal, state, and county laws requiring inspection for plant diseases and insect infestations. Any inspection certificates required by law shall accompany each shipment invoice or order for stock when such plants arrive at the site. File the certificates of inspection with the Owner.
- D. Plants shall be true to name. Tag one plant from each bundle or lot with the name and size of plants in accordance with the standards of practice recommended by the American Association of Nurserymen.
- E. Determine the root condition of plants furnished in containers or flats by removal of earth from the roots. The roots of no less than two plants nor more than 2% of each species or variety from each source shall be reviewed by the Project Manager. The selection of plants to be reviewed will be made by the Project Manager.
- F. Plants rendered unsuitable for planting because of this inspection shall be considered as samples, and replacements shall be provided at no additional cost to the Owner. If the sample plants reviewed are found to be defective, the Project Manager reserves the right to reject the entire lot or lots of plants. Remove rejected plants from the site immediately.
- G. Sod shall be Bahia grass or other type necessary to match existing grown from high quality propagative material (seed, stolons, or plugs); be free from weeds, diseases, and insects; and well matted with grass roots.
  - 1. Sod shall be machine cut and at minimum thickness of 2 inch. Measurement for thickness shall exclude top growth and thatch.
  - 2. Broken pads and tom or uneven ends will not be acceptable.
  - 3. Pads of sod shall be strong enough to support their own weight and retain their size and shape when suspended vertically.
  - 4. Sod shall not be harvested or transplanted when moisture content (excessively dry or wet) may adversely affect its survival.

#### 2.04 TREE SUPPORTS

- A. Tree stakes shall be straight-grained lodgepole pine, treated with copper naphthenate. Stakes shall be free from knots, checks, splits, or disfigurements.

- B. Tree supports shall be new rubber hose and 10-gauge zinc-coated iron wire, cinch tie, or plastic covered steel twist braces.

## 2.05 GUYING MATERIALS

- A. Tree anchors for guying shall be by Maxwell Steel Co., or equal. Place anchor a minimum of 6 inches below finished grade.
- B. Wire shall be solid-core zinc-coated steel, 10 gauge minimum. Wire covering at tree shall be reinforced rubber or plastic two-ply garden hose, 1/2 inch in diameter minimum.

## **PART 3 - EXECUTION**

### 3.01 PRUNING

- A. Persons engaged in this work shall be professional arborists or tree surgeons. Submit proof of qualifications to the Project Manager.
  - 1. Perform pruning in conformance with sound arboricultural practices and methods.
  - 2. Remove hazardous branches, weak limbs, and questionable double trunks.
  - 3. Cuts, including those of roots, shall be neat, square, and free from jagged edges and bruises. Treat cuts 1 inch in diameter and larger with an asphalt varnish which contains an antiseptic.

### 3.02 LANDSCAPE GRADING

- A. Bring planting areas to grade by filling or removing surplus dirt. Remove rock debris over 1 inch in diameter. Bring the surface to a smooth uniform grade. Areas shall slope to drain. Flow lines shall be established to existing road curbs and sidewalks as shown in the drawings.
- B. Final grades for the shrub and ground cover areas shall be 2 inches below the top of adjoining curbs or pathways. Final grades for turf areas shall be 1 inch below the top of adjoining curbs or pathways.

### 3.03 TREE PLANTING

- A. Tree planting pits shall be square with vertical sides.
- B. Do not plant trees if the root ball is broken or cracked either before or during the planting process.
- C. Tree planting pits shall be a maximum of 6 inches deeper than the root ball and twice the diameter of the root ball.

- D. Use prepared soil for backfill and compact before placing the tree in the pit.
- E. Soil to be used as backfill shall be enriched using the following blend per cubic yard (agronomic soils test recommendation shall take precedence over backfill mix herein specified):
  - 1. Six parts by volume onsite soil.
  - 2. Four parts by volume organic amendment.
  - 3. One pound fertilizer per cubic yard of mix.
  - 4. Ten pounds agricultural gypsum per cubic yard of mix.
- F. Plant trees approximately in the center of the tree planting pits. Scarify sides of root ball.
- G. Plant trees with the nursery dirt ring around the trunk 1 inch above finished grade.
- H. As soil is backfilled, water it sufficiently to settle as the tree is planted.
- I. After the tree is planted, stake the tree or guy as shown in the typical tree staking and guying details in the drawings. Prevent injury to the root ball.

### 3.04 PALM PLANTING

- A. Health and Vigor: All palms shall be free of any insects or diseases and shall be sprayed prior to delivery to the site for the disease *Penicillium vennoeseni*.
- B. Digging Requirements: While excavating root balls, keep root mass intact and in a moist condition. Generously apply antidesiccants, such as aerosol pruning paint to root hairs and severed roots throughout the digging process. Wrap root mass with burlap during transportation to site. Wrap crowns and fronds with shade cloth or saran cloth for palms being transported greater than 300 miles.
- C. Pruning Procedure: Remove 35% to 40% of palm fronds during the digging process with hand pruning saws. Remove fronds after palms have been approved by Project Manager and certified to be free of disease. Tie fronds in an upright position with 2-ply twine. Tie twine horizontally across fronds. Twine is to remain during all transportation and planting phases of work.
- D. Loading of Palms: Do not use chains in loading or unloading of palms. Rigging shall consist of wire rope. When rigging is to be in contact with trunk surface or crowns, place 2-inch by 6-inch lumber between rigging and tree surface to avoid any possible scaring to trees.
- E. Planting Requirements: Plant palms within 96 hours of their excavation. Use 100% washed plaster sand backfill. Plant trees plumb. Apply the sand backfill in layers and jet with water. Compaction of 80% minimum is required of planting pit backfill. Any adjustment necessary to straighten palms due to poor compaction

shall be made by the Contractor at no charge to the Owner within 12 months after final acceptance of the project.

- F. Palms shall be warranted by the Contractor for 24 months after final acceptance of the project. Contractor liability shall be the cost of labor, equipment, and material to replace trees of similar size during the warranty period.

### 3.05 SHRUB PLANTING

- A. Dig shrub planting pits square with vertical sides twice the diameter and 6 inches deeper than the root ball.
- B. Use prepared soil for backfill. Place in the bottom of each hole to such a depth that will allow the shrub, when planted, to be at its normal growing depth. Soil to be used as backfill shall be the same as the tree backfill material.
- C. Scarify root ball sides before or after shrub is placed in plant pit.
- D. Add backfill material around and halfway up the root ball. Watering procedure shall be the same as for trees.
- E. Protect the trees and shrubs after planting. Any damage to trees and shrubs due to tamping and other procedures by the Contractor shall be repaired immediately at no expense to the Owner. Protect trees and shrubs from drying out prior to planting.
- F. Water and maintain trees and shrubs during the installation and maintenance periods to assure a vigorous and thriving condition.

### 3.06 GROUND COVER PLANTING

- A. Furnish, deliver, and plant ground cover areas with specified plants at the rate shown in the drawings.
- B. Provide ground cover plants to cover the designated areas at the specified spacing.
- C. Ground cover plantings shall receive one 5-gram fertilizer tablet per plant at a maximum of 3 inches below finish grade.

### 3.07 SOD INSTALLATION - REPLACE IN-KIND

- A. Prepare soil as described under soil preparation section excluding the fertilizer. Fine grade. Area shall be free from weeds and other vegetation. Roll with a 250-pound water ballast roller. Grade shall be 2 inches below walks or curbs. Finish grade of sod, in place, shall be 1 inch below adjoining walk, curb, header, and/or other hard surface. Finished soil surface shall make positive contact with sod soil with a minimum of air spaces.

- B. Before applying fertilizer, the soil pH shall be brought to a range of 6.0 to 7.0.
- C. The fertilizer shall be spread uniformly over the area to be sodded at the rate of 700 pounds per acre, or 16 pounds per 1,000 square feet, by a spreading device capable of uniformly distributing that material at the specified rate. Immediately after spreading the fertilizers shall be mixed with soil to a depth of approximately 4 inches.
- D. On steep slopes, where the use of machine for spreading or mixing is not practicable, the fertilizer shall be spread by hand and raked and thoroughly mixed with the soil to a depth of approximately 2 inches.
- E. The sod shall be placed on the prepared surface, with the edges in close contact with staggered joints and shall be firmly and smoothly embedded by light tamping with appropriate tools.
- F. On slope greater than 2 to 1, the Contractor shall, if necessary, prevent the sod from sliding by means of wooden pegs driven through the sod into firm earth, at suitable intervals.
- G. Sod, which has been cut for more than 74 hours shall not be used unless specifically authorized by the Owners Representative after his inspection thereof. Sod, which is not planted within 24 hours after cutting shall be stacked in an approved manner and maintained and properly moistened. Any pieces of sod which, after placing, show an appearance of extreme dryness shall be removed and replaced by fresh uninjured pieces.
- H. Sod installation shall not be performed when weather and soil conditions are, in the Project Manager's opinion, unsuitable for proper results.
- I. The areas on which the sod is to be placed shall contain sufficient moisture, as determined by the Engineer, for optimum results. After being placed, the sod shall be kept in a moist condition to the full depth of the rooting zone for at least 2 weeks. Thereafter, the Contractor shall apply water as needed until sod roots and starts to grow for a minimum of 60 days (or until final acceptance, whichever is latest).

### 3.08 MAINTENANCE

- A. After planting and during the establishment period. in the event that ground cover or trees and shrubs exhibit iron chlorosis symptoms, apply Fe 138 Geigy or equivalent at manufacturer's recommended rates.
- B. Maintenance work shall include the following plant establishment work:
  - 1. Maintain the entire project for a minimum period of 90 calendar days, after the date of substantial completion. Such maintenance shall include repairing of any damage areas and replacing areas in which the

establishment of the material does not appear to be developing satisfactorily.

2. During this period, keep plants and planted areas well watered and weed-free.
3. Maintain a sufficient number of personnel and adequate equipment to perform the work herein specified from the time any planting is done until the end of the maintenance period.
4. Repair damage to planting areas immediately and throughout the maintenance period.
5. Any planting areas that do not show a prompt establishment of plant material shall be replanted at 10-day intervals.
  - a. Depressions caused by vehicles, bicycles, or foot traffic shall be filled and leveled.
  - b. Replant damaged areas.
  - c. Apply fertilizer at 30-day intervals as recommended by the agronomic soil test.
6. Maintain lawn areas to assure prompt growth.
7. Protect lawn areas and all areas planted with ground cover from damage caused by foot traffic, vandalism, burrowing animals, or erosion. Repair and replant damaged areas.
8. Mow lawn areas at regular intervals with a reel mower. Mow lawns at a height of not less than 1 inch. Do not allow lawn to exceed a height of 2 inches. Remove lawn clippings from the site and dispose. Trim lawn edges to a neat and uniform line. Not less than two mowings shall have been completed prior to acceptance of all lawn areas.
9. Throughout the maintenance period, maintain plants in a disease- and pest-free condition. Use a licensed pest control operator to recommend and apply pesticides, herbicides, and fungicides.
10. Pinch prune shrubs and trees to encourage new growth and to eliminate rank sucker growth.
11. Remove old flowers and dead foliage and limbs. Do no major pruning without the review of the Project Manager.
12. Replanting or repair necessary due to the Contractor's negligence, carelessness or failure to provide routine maintenance shall be at the Contractor's expense.

END OF SECTION

## **SECTION 03000 CONCRETE**

### **PART 1 - GENERAL**

#### **1.01 WORK INCLUDED**

- A. This section covers all work necessary for providing, testing and placing ready mix concrete.
- B. See **GENERAL CONDITIONS** which contain information and requirements which apply to the Work specified herein and are mandatory for this project.

#### **1.02 REFERENCE STANDARDS, CODES AND SPECIFICATIONS**

- A. ACI 214 "Recommended Practice for Evaluation of Compressive Test Results of Field Concrete".
- B. ACI 318 "Building Code Requirement for Reinforced Concrete".
- C. ASTM C31 "Standard Method for Making and Curing Concrete Compressive and Flexure Test Specimens in the Field".
- D. ASTM C33 "Standard Specification for Concrete Aggregates".
- E. ASTM C94 "Standard Specification for Ready-Mix Concrete".

#### **1.03 SUBMITTALS**

- A. Submittals shall be in accordance with the **GENERAL CONDITIONS** and shall include the following:
  - 1. Concrete mix designs and trial mix laboratory reports.
  - 2. Manufacturer's certification of admixtures.
  - 3. Contractor's schedule and sequence of placement.
  - 4. All Test Results.
  - 5. Drawings showing locations of construction joints.

#### **1.04 QUALITY ASSURANCE**

- A. Submit certificates of mill reports on all foreign cements for review by **ENGINEER** before batching concrete.

- B. Secure the services of a reputable manufacturer for counseling regarding the use of any specified admixture, as required.
- C. The Engineer shall have access to and have the right to inspect all batch plants, cement mills, and supply facilities of suppliers, manufacturers, subcontractors, and contractors providing products included in these Specifications. Batch plants shall have current certification that all weighing scales have been tested and are within the tolerances as set forth in the National Bureau of Standards Handbook No. 44.

#### 1.05 CERTIFICATION

- A. Submit batch delivery tickets to the Engineer in compliance with and in accordance to ASTM C94.

#### 1.06 TESTING

- A. Performed by an acceptable Engineering Laboratory at Contractor's expense. Contractor shall assist in the collection of samples. Any retests shall be within the Scope of the Contract.
- B. Criteria:
  - 1. Each test: not less than 5 cylinders; retain one after 28 days.
  - 2. One test for every 50 consecutive cubic yards of concrete cast.
  - 3. Furnish Engineer with 4 certified copies of tests made of 2 at 7 days, and 2 at 28 days.
- C. Questionable strength of in-place concrete:
  - 1. Additional tests may be ordered by the Engineer.
  - 2. Execute the core tests in accordance with ASTM C42 procedure.
  - 3. Costs of additional tests showing strength of in-place concrete conforming to design criteria are the responsibility of the Contractor.
  - 4. Costs of additional tests showing noncompliance with the design criteria are the responsibility of the Contractor.
  - 5. Additional items at Contractor's expense:
    - a. Provide load tests as directed by the Engineer.
    - b. Reinforce structure as directed or remove and replace all under strength concrete structure in place.

## PART 2 - PRODUCTS

### 2.01 MATERIALS

- A. Cement
  - 1. Portland cement Type I or Type II conforming to ASTM C 150. In addition, the tricalcium aluminate content of Type I cement shall not exceed 12 percent.
  - 2. Type I or Type II cement, at the Contractor's option, may be used for nonhydraulic structures, slabs on grade, sidewalks, thrust blocks and miscellaneous.
  - 3. Type II cement or Type I cement, in combination with pozzolan (fly ash) as hereinafter specified, shall be used for all precast sanitary structures.
- B. Water: potable, salt free.
- C. Fine Aggregate: salt free and clean, conforming to ASTM C33.
- D. Coarse Aggregate: salt free and clean, conforming to ASTM C33.
- E. All Aggregate: quarried/mined in fresh water only.

### 2.02 MIXES

- A. Slab on Grade, Thrust Blocks, sidewalks and Miscellaneous Cast-In-Place
  - 1. 28 day compressive strength: 3000 psi
  - 2. Minimum cement content: 5 ½ bags per cubic yard.
  - 3. Admixture: As required below, use only specified product.
  - 4. Slump: 2 to 3 inches.
  - 5. Air Content: (ASTM C231): 4 to 6 percent.
- B. Precast concrete:
  - 1. 28 day compressive strength: 4000 psi, minimum, or as illustrated on the Drawings.
  - 2. Minimum cement content for 4000 psi concrete: 6 bags per cubic yard.
  - 3. Admixture: As required below, use only specified products.
- C. Flowable Fill
  - 1. Cement: 200 lbs/Cy.

2. Pozzolan (Flyash): 0 to 600 lbs/Cy.
3. Fine Aggregate: 2750 lb/Cy.
4. Water: 500 lbs/Cy. (maximum)

### 2.03 ADMIXTURES

- A. Provide air-entraining admixture in all concrete. Admixture shall conform to ASTM C 260, except it shall be nontoxic after 30 days and shall contain no chlorides. Furnish manufacturer's compliance statement for these requirements.
- B. All concrete shall contain a water-reducing admixture. The admixture shall conform to ASTM C 494, Type A or Type D, except it shall contain no chlorides, shall be nontoxic after 30 days, and shall be compatible with the air-entraining admixtures. The amount of admixture added to the concrete shall be in accordance with the manufacturer's recommendations. Furnish a compliance statement that the admixture used satisfies all requirements of this Specification.
- C. The pozzolan to be used in combination with Type I cement, as previously specified, shall be Class C or Class F fly ash conforming to ASTM C 618-78. Furnish test data confirming that the fly ash in combination with the cement to be used meets all strength requirements, is compatible with air-entraining agents and other additives, and provides increased sulfate resistance equivalent to or better than Type II cement.

### 2.04 CURING COMPOUNDS

- A. Normal placement without special finish; approved products:
  1. Master Builders Company: "Masterseal".
  2. Sonneborn-Contech: "Kure-N'Seal".

### 2.05 DEFORMED REINFORCING BARS

- A. ASTM A615: "Standard Specification for Deformed and Plain Billet-Steel Bars for concrete Reinforcement".
  1. Grade: 60
  2. Minimum yield strength: 60,000 psi.
- B. Sizes shall be as indicated on the Drawings.

## 2.06 WELDED WIRE FABRIC

- A. Welded wire fabric shall conform to ASTM A185.

## 2.07 ACCESSORIES

- A. Tie wires shall be 16-gauge, black, soft-annealed wire.
- B. Bar supports shall be of proper type for use intended. Bar supports in beams and slabs exposed to view after stripping shall be galvanized or plastic coated. Use concrete supports for reinforcing in concrete placed on grade.

## **PART 3 - EXECUTION**

### 3.01 EXAMINATION

- A. Place no concrete until all reinforcing steel, pipes, inserts, sleeves, etc., have been set in place and reviewed by the ENGINEER. Notify the ENGINEER of scheduled pours 24 hours prior to placement.

### 3.02 PLACING

- A. Place concrete expeditiously in clean forms that are not hot to the touch; spray forms with water just prior to placing concrete. Before placing concrete directly against earth, install vapor barrier to prevent water absorption, secure reinforcement in position, inspect, and approve before placing concrete. Do not rest runways for transporting concrete on the reinforcing steel. Deposit concrete as nearly as practical in final position; and, do not allow concrete to drop freely more than 5 feet. Place all concrete during daylight, unless otherwise authorized. Where reinforcing steel above the top of the cast is coated with concrete while placing below, remove all concrete from such reinforcing steel after the placing is complete and prior to the next cast.
- B. Place slabs-on-grade carefully to avoid damages to the vapor barrier.
- C. Concrete shall not be placed in the rain or when it looks as if it is going to rain unless specifically authorized by the ENGINEER.

### 3.03 CONSOLIDATION

- A. Consolidate concrete in layers by internal vibrating equipment, supplemented by hand rodding and tamping as required. Do not use vibrators to move the concrete laterally inside the forms.

- B. Maintain internal vibrators at speed of at least 5000 impulses per minute when submerged in concrete. Maintain at least 1 spare vibrator in working condition at site at all times.
- C. Limit duration of vibration to time necessary to produce satisfactory consolidation without causing segregation. In no case more than 15 seconds per square foot of exposed surface. Move the vibrator constantly and place in each specific spot only once.

### 3.04 JOINTS

- A. Construction joints:
  - 1. Locate as illustrated on the Drawings and as reviewed by the ENGINEER for slabs.
  - 2. Key joints.
- B. Expansion Joints. Place pre-formed expansion joints as indicated on the Drawings.

### 3.05 CURING

- A. Begin curing of concrete as soon as practicable after placing, but not more than 3 hours thereafter.
- B. Begin curing of the structural elements immediately after removal of forms.
- C. Apply curing compounds as specified.

### 3.06 FINISHES

- A. Formed surfaces:
  - 1. Patching: immediately after stripping forms, patch all defective areas with mortar similar to the concrete mix; but, without coarse aggregate. Patch minor honeycombs, bulges and other minor defects as designed by the ENGINEER, only where exposed to view. Clean, dampen, and fill all the holes with patching mortar.
    - a. Major defective areas, as judged by the ENGINEER, including those resulting from the leakage of forms, excessive honeycombs, large bulges, and large offsets at form joints: chip away to a depth of at least 1/4 inch; and, the surfaces that are to be patched coat with an epoxy-polysulfide adhesive. Press patching mortar in for a complete bond and finish to match adjacent areas.

- b. Minor defective areas, as judged by the ENGINEER, including honeycombs, air bubbles, holes resulting from removal of ties and those resulting from leakage of forms: patch with grout without resorting to chipping. Minor bulges and offsets at form joints: finish as specified herein below.
  - 2. Finishes; locations:
    - a. Rough or board finish: for all concrete surfaces not exposed to public view.
  - 3. Finishes; definitions:
    - a. Rough or board finish: reasonably true to line and plane. Tie holes and defects patched, and the fins exceeding  $\frac{1}{4}$  inch rubbed down, otherwise, surfaces may be left with texture imparted by forms.
- B. Unformed surfaces (flatwork):
- 1. Finishes:
    - a. General: grade and screed slab to exact elevation, as required. After screeding, tamp mixture thoroughly to drive the coarse aggregate down from surfaces and apply finish specified hereinafter.
    - b. Broom finish: slab on grade.
  - 2. Finishes; definition:
    - a. Broom finish: finish with street type broom as soon as surface water sheen has disappeared.

### 3.07 FIELD QUALITY CONTROL

- A. Only ready mixed concrete in accordance with ASTM C94 will be accepted.
- B. Place all concrete within 1-1/2 hours after introduction of water to mix.
- C. Under no circumstances may additional water be added to mix.
- D. Discard unused concrete older than 1-1/2 hours. Retempering is prohibited.

END OF SECTION

## **SECTION 03051 LEAKAGE TESTING OF HYDRAULIC STRUCTURES**

### **PART 1 - GENERAL**

#### 1.01 DESCRIPTION

- A. This section describes the method of testing concrete hydraulic structures (manholes, wetwells, valve vaults, etc.) for leakage.

### **PART 2 - MATERIALS**

#### 2.01 GENERAL

- A. Provide water, piping, and equipment to test concrete structures for leakage.

### **PART 3 - EXECUTION**

#### 3.01 GENERAL

- A. Hydrostatically test reinforced concrete structures which will contain sewage to determine that they conform to Paragraph 3.02 herein and are free of detectable leaks.
- B. Prior to testing, clean exposed surfaces by thoroughly hosing and removing surface laitance and loose matter from walls and slabs.
- C. Conduct testing before backfill is placed against walls.

#### 3.02 LEAKAGE TEST PROCEDURE

- A. Fill hydraulic structures to be subjected to leakage tests with water to the normal operating liquid level line. Filling shall not exceed 8 feet of water depth per 24-hour period. Filling shall be at a uniform rate over a 24-hour period with continuous monitoring. Repair any running leaks which appear during filling before continuing.
- B. After the structure has been kept full for 24 hours, it will be assumed for the purposes of the test that the absorption of moisture by the concrete in the structure is complete.
- C. During the test period, examine exposed portions of the structure, and mark visible leaks or damp spots. Repair visible leaks or damp spots after dewatering. If the drop in water surface in the 24-hour period exceeds 1/20 of 1% of the

normal volume of liquid contained in the structure, the leakage shall be considered excessive.

- D. The determination of surface moisture evaporation shall be aided with a 24-inch-deep, white-colored, watertight container with not less than 10 square feet of surface area exposure. Position container to experience environmental conditions similar to the structure being tested. Subtract the water loss due to evaporation from the measured water loss in the structure to determine the water loss due to leakage.
- E. If the leakage is excessive, drain the structure, repair leaks and damp spots, and refill the structure and again test for leakage. Continue this process until the drop in water surface in a 24-hour period meets the test requirements.
- F. Repair flowing leaks whether leakage exceeds the allowable leakage or not.
- G. Repairs and additional filling and testing (including the cost of water) shall be made by the Contractor at no additional cost to the Owner.

### 3.03 REPAIR METHODS

- A. Methods for repairing concrete not passing the leakage test shall be as described in Section 03732.

END OF SECTION

**SECTION 03300**  
**CAST-IN-PLACE CONCRETE**

**PART 1 - GENERAL**

1.01 SCOPE

- A. Work Included: Furnish all labor materials, equipment, fabrication incidentals, transportation, placing and supervision necessary to complete all Cast-In-Place concrete work, its finishing, and all related work called for by the Drawings and/or Specifications or reasonable inferable from either or both, including but not limited to the following:
1. Shop Drawings; submit in accordance with Section 01300.
  2. Materials and Storage thereof
  3. Reinforcing - Bar and Fabric.
  4. Accessories of every nature, including Tie System.
  5. Formwork and removal thereof.
  6. Proportions and mixes.
  7. Placing.
  8. Additives and Admixes.
  9. Joints, Metal Joint Screeds, and Joint Fillers.
  10. Finishes of all types.
  11. Protection and curing.
  12. Laboratory testing.
  13. Patching.

1.02 REFERENCES

- A. ACI 301-72 (Revised 1981) "Specifications for Structural Concrete for Buildings" is in all respects part of these specifications, except as modified or specified herein or on the Drawings.
- B. Contractor shall keep a copy of ACI 301-72 on job.
- C. Reinforced Concrete shall conform to ACI 318-83 or latest revision.
- D. Formwork shall conform to ACI 347 (Latest edition) except as modified herein.

## **PART 2 - PRODUCTS**

### **2.01 MODIFICATION AND SUPPLEMENTS**

- A. Comply with ACI 301-72 with modifications and supplements listed herein.
- B. Modifications and supplements to ACI 301-72 (numbers in parentheses are ACI 301-72 designations):
  - 1. Chapter 1 - General:
    - a. (1.1.1) Including foundations, curbs, sidewalks, and utility structures.
  - 2. Chapter 2 - Materials:
    - a. (2.1.1) Portland Cement: ASTM C 150, Type II, Domestic, all of one type and from same source.
    - b. (2.2.1) Following admixtures will be permitted, all others require written approval:
      - 1) Air Entraining Admixtures - Specifications for Air Entraining Admixtures for Concrete (ASTM C-260).
      - 2) "Anti-Hydro" where specified for waterproofing grouts and coves at tank joints. Installed with supervision per manufacturer's written specifications.
    - c. (2.3) Water: Potable only shall be used.
    - d. (2.4) Aggregates: All aggregates quarried/mined in fresh water, aggregates from salt or brackish water unacceptable.
  - 3. Chapter 3 - Proportioning:
    - a. (3.5) Slump shall not exceed four inches. There shall be no waiver from this requirement. The contractor shall be hereby forewarned that any concrete placed with slump in excess of four inches shall be removed at this expense. Any Contractor personnel or ready mix truck operator found adding water without specific permission of the engineer will not be permitted to engage in concreting operations on this project.

## **PART 3 - EXECUTION**

(For Execution, see ACI 301-72 and Modifications as delineated in Part 2 MATERIALS above which references also include Execution.)

END OF SECTION

## **SECTION 03315 GROUT**

### **PART 1 - GENERAL**

#### 1.01 THE REQUIREMENT

- A. The Contractor shall furnish all materials for grout in accordance with the provisions of this Section and shall form, mix place, cure, repair, finish, and do all other Work as required to produce finished grout, all in accordance with the requirements of the Contract Documents.

#### 1.02 REFERENCE SPECIFICATIONS, CODES, AND STANDARDS

- A. Specifications, codes, and standards shall be as specified in Section 03300 entitled "Cast-in-Place Concrete," and as referred to herein.
- B. Additional Commercial Standards  
CRD-C 621 Corps of Engineers Specification for Nonshrink Grout

#### 1.03 SUBMITTALS

- A. The Contractor shall submit certified test results verifying the compressive strength, shrinkage, and expansion requirements specified herein; and manufacturer's literature containing instructions and recommendations on the mixing, handling, placement and appropriate uses for each type of grout used in the work.

### **PART 2 - PRODUCTS**

#### 2.01 PREPACKAGED NON-SHRINK CEMENTITIOUS GROUT

- A. Nonshrink grout shall be a prepackaged, inorganic, non-gas liberating, nonmetallic, cement-based grout requiring only the addition of water. Manufacturer's instructions shall be printed on each bag or other container in which the materials are packaged. The specific formulation for each class of nonshrink grout specified herein shall be that recommended by the manufacturer for the particular application.
- B. Nonshrink grouts shall have a minimum 28 day compressive strength of 5000 psi (ASTM C109, restrained), shall have no shrinkage (0.0 percent) and a maximum 4.0 percent expansion in the plastic state when tested in accordance with ASTM C

827, and shall have no shrinkage (0.0 percent) and a maximum of 0.2 percent expansion in the hardened state when tested in accordance with CRD C 621.

- C. Cement based grout shall be Five Star Grout as manufactured by Five Star Products, Inc., Fairfield, Connecticut, or equal.
- D. Cementitious non-shrink grout shall be used at locations where there are no dynamic loads, the grout will not come in contact with wastewater or wastewater gases, and where non-shrink grout is identified on the Drawings. Applications include, but are not limited to, structural steel column base plates, gate frames and guides, and precast concrete to cast-in-place concrete joints.

## 2.02 PREPACKAGED NON-SHRINK EPOXY GROUT

- A. Epoxy-based non-shrink grout shall be a three component, 100 percent solids, solvent-free system designed for machinery grouting. Applications include, but are not limited to, anchoring, pump and motor bases, and any other equipment imparting dynamic loads to the support system.
- B. When non-shrink grout is identified on the Drawings in submerged (water or wastewater) or under wastewater gas environment, epoxy-based non-shrink grouts shall be used.
- C. The epoxy grout shall be delivered to site as prepackaged, three-component systems composing of the resin, hardener, and specially blended aggregates. The components shall be stored as recommended by the manufacturer until use.
- D. Non-shrink epoxy grout shall be Five Star DP Epoxy Grout by Five Star Products, Inc., Fairfield, Connecticut, or equal.

## 2.03 CEMENT GROUT

- A. Cement grout for fills in the bottom of the clarifiers and other structures shall conform to the requirements specified herein for Class B concrete, except the coarse aggregate shall have 100 percent passing the 1/2-inch sieve and 85 percent passing the 3/8-inch sieves. The grout shall be placed within the tolerances shown on the Drawings for the clearance between the mechanical equipment arms. The mechanical equipment arms of the tanks shall not be operated as a primary screed for moving grout, but may be used in the final screeding operation provided the Contractor assumes full responsibility for any damage to the equipment. Final coating of the clarifier equipment shall occur only after the grout is placed, consolidated, and cured.

#### 2.04 DOWEL/ANCHOR BOLT ADHESIVE SYSTEM

- A. When rebar or anchor bolts are specified to be drilled in and grouted on the Drawings, an adhesive system specified in Section 03300 entitled "Cast-in-Place Concrete" shall be used.

#### 2.05 CURING MATERIALS

- A. Curing materials shall be as recommended by the manufacturer.

#### 2.06 CONSISTENCY

- A. The consistency of grouts shall be that necessary to completely fill the space to be grouted for the particular application. Dry pack consistency is such that the grout is plastic and moldable but will not flow. Where "dry pack" is called for in the Contract Documents, it shall mean a grout of the above described consistency; the type of grout to be used shall be as specified herein for the particular application.

#### 2.07 MEASUREMENT OF INGREDIENTS

- A. Prepackaged grouts shall have ingredients measured by means recommended by the manufacturer.

### **PART 3 - EXECUTION**

#### 3.01 GENERAL

- A. All surface preparation, curing, and protection of cement grout shall be as specified in Section 03300 entitled "Cast-in-Place Concrete." The finish of the grout surface shall match that of the adjacent concrete.
- B. All mixing, surface preparation, handling, placing, consolidation, and other means of execution for prepackaged grouts shall be done according to the instructions and recommendations of the manufacturer.

#### 3.02 CONSOLIDATION

- A. Grout shall be placed in such a manner, for the consistency necessary for each application, so as to assure that the space to be grouted is completely filled.

END OF SECTION

## SECTION 03401

### PRECAST CONCRETE

#### PART 1 -- GENERAL

##### 1.01 DESCRIPTION

This section specifies the materials and labor required for the manufacture and erection of precast concrete including precast boxes, vaults, manholes and other precast structural concrete.

##### 1.02 QUALITY ASSURANCE

###### A. QUALITY CONTROL BY CONTRACTOR:

###### 1. LABORATORY:

To demonstrate conformance with the specified requirements for cast-in-place concrete, the Contractor shall provide the services of an independent testing laboratory which complies with the requirements of ASTM E329. The testing laboratory shall sample and test concrete related materials as required in Section 03300. Costs of testing laboratory services shall be borne by the Contractor.

###### 2. CERTIFICATION:

The contractor shall provide certification from the precast concrete manufacturer that the materials and manufacturer of precast work supplied conforms to these specifications. The certification shall be signed by an officer of the manufacturer's corporation.

The responsibility for furnishing and installing precast concrete conforming to the specifications is solely that of the Contractor.

###### 3. ENGINEER:

Precast concrete manhole drawings and calculations shall be signed and sealed by a professional engineer who is registered in the State of Florida.

###### B. REFERENCE STANDARDS:

The appropriate reference standards are specified in specification Sections 03200 and 03300 of this project manual, and the following documents. They are part of this section as specified and modified. In case of conflict between the requirements of this section and those of the listed documents, the requirements of this section shall prevail.

Reference	Title
AASHTO	Standard Specification for Highway Bridges
ACI 318	Building Code Requirements for Structural Concrete
ASTM C443	Joints for Circular Concrete Sewer and Culvert Pipe, Using Rubber Gaskets
ASTM C478	Precast Reinforced Concrete Manhole Sections
ASTM C891	Installation of Underground Precast Concrete Utility Structures
ASTM E329	Inspection and Testing Agencies for Concrete, Steel, and Bituminous Materials as Used in Construction
AWS D1.1	Structural Welding Code – Steel

### 1.03 SUBMITTALS

In accordance with specification Section 01300 and in addition to the requirements of that section, the following submittals shall be provided:

1. 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. 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. The Owner's Representative 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. 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.

#### A. CONCRETE MIX:

Prior to casting any precast elements, concrete mix design shall be submitted to the Owner's Representative for acceptance.

## B. SHOP DRAWINGS:

Shop drawings shall be submitted showing product location, fabrication details, number identification marks, reinforcement, and connection details including field installed anchor sizes and locations, if required, openings, loose or embedded items and inserts, dimensions and relationship to adjacent materials in sufficient detail to cover manufacture, handling, and erection. Shop drawings shall be accompanied by a letter signed and sealed by a Florida registered Professional Engineer, certifying that the shop drawings submitted represent construction which meets or exceeds the requirements of the Contract Documents and the requirements of codes and agencies having jurisdiction over the Work.

### 1.04 HANDLING AND STORAGE

Unless specified otherwise herein, fabrication, handling and erection of precast elements shall be in accordance with the recommendations made by ACI 318, ASTM C478 and ASTM C891.

Precast elements shall be properly supported off the ground to avoid damage during curing, storage, handling and hauling. Lateral support shall be sufficient to prevent bowing, warping, or permanent set due to creep. Edges of the units shall be adequately protected by padding or other means to prevent staining, chipping or spalling of concrete. Lifting devices shall have a minimum safety factor of 4.

### 1.05 INSPECTION

The quality of all materials, the process of manufacture and the finished sections shall be subject to inspection and review by the Owner's Representative. Such inspection may be made at the place of manufacture or at the site after delivery, or at both places, and the sections shall be subject to rejection at any time for 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. All sections which have been damaged after delivery will be rejected, and if already installed, shall be repaired, or removed and replaced, as directed by the Owner's Representative, entirely at the Contractor's expense.

At the time of inspection, the sections will be carefully examined for compliance with the ASTM designation specified below and these Specifications, and with the approved manufacturer's drawings. All sections shall be inspected for general appearance, dimension, "scratch-strength," blisters, cracks, roughness, soundness, etc. The surface shall be dense and close-textured.

Imperfections may be repaired, subject to the approval of the Owner's Representative, after demonstration by the manufacturer that strong and permanent repairs result. Repairs shall be carefully inspected before final acceptance.

## PART 2 -- PRODUCTS

### 2.01 PERFORMANCE AND DESIGN REQUIREMENTS

#### A. GENERAL:

Precast concrete manhole bases, barrels and eccentric top sections shall conform to ASTM C478, the detailed drawings, the specifications and the following additional requirements:

1. The minimum wall thickness for the various size barrel sections shall be 8 inches.
2. The date of manufacture and the name or trademark of the manufacturer shall be clearly marked on the inside of each precast section. Each section of the manhole must be inspected and stamped by an accredited testing laboratory.
3. Sections shall be cured by an approved method for at least 28 days prior to coating and shall not be shipped until at least 2 days after coating.
4. Top sections shall be eccentric except that precast concrete slabs shall be used where indicated or where cover over the top of the pipe is less than 4 feet.
5. Unless otherwise noted, precast concrete vaults, boxes and manholes which are installed in, under, or adjacent to paved or unpaved driving surfaces shall be designed to resist AASHTO H20 traffic loading. In areas not subject to traffic loading, cover design live load shall be 300psf.

### 2.02 PRECAST CONCRETE MATERIALS

#### A. REINFORCING STEEL:

Reinforcing steel shall be as specified in Section 03200.

#### B. CONCRETE:

Concrete shall be Class C as specified in Section 03300.

#### C. GROUT:

Grout shall be as specified in Section 03600.

D. BARREL SECTIONS:

Barrel sections shall have tongue and groove joints. Joints shall have round rubber gaskets set in specially provided indentations. The round rubber "O"-ring gasket shall conform to ASTM C443.

E. COATINGS:

Coatings shall be as specified in Section 09900.

F. EMBEDDED ITEMS AND ANCHORAGE DEVICES:

All embedded items, inserts, and anchorage devices exposed to view, moisture or weather shall be hot-dipped galvanized steel.

G. PENETRATIONS:

All required penetrations and openings larger than 6-inches in diameter or 6-inches square shall be formed in place at the time of casting. Additional reinforcing shall be added where required to meet loading requirements. Openings and penetrations smaller than 6-inches may be core drilled.

H. MOLDS:

Material from which molds are to be fabricated shall be steel, concrete, fiberglass, reinforced plastic or wood. The selection of materials for molds shall be at the manufacturer's option, except that wood shall not be used without the express approval of the Owner's Representative. All elements shall be cast in molds of rigid construction, accurate in detail with precise corners and arises, and designed to provide a close control of dimensions and details as indicated on the drawings.

Prior to casting of precast elements, molds shall have all surface joints, radii, corners, etc., filled, ground, filed, straightened or otherwise removed to provide a finished concrete surface that is smooth and dense, free of honeycombing, large air pockets, offsets, sinkages, or other irregularities.

I. PARTING COMPOUND:

All molds shall be coated with parting compound to facilitate removal of elements from molds. Parting compound shall be non-petroleum, nonstaining and shall be of a nature and composition not deleterious to concrete.

## 2.03 PRODUCT DATA

The following information shall be provided in accordance with Section 01300.

A. MANUFACTURER'S DATA:

Copies of manufacturer's data shall be provided for the following:

1. Gasket material.
2. Items specified in Sections 03200 and 03300.

B. LABORATORY TEST REPORTS:

Before delivery of materials, reports of the tests specified in Section 03200 and 03300 shall be provided. Test reports on previously tested materials shall be accompanied by the manufacturer's statement that the previously tested material is the same type, quality, manufacture, and make as that proposed for use in this project.

## PART 3 -- EXECUTION

### 3.01 INSTALLATION

A. GENERAL:

Manholes and other precast structures shall be constructed to the dimensions and details as shown on the Drawings and as specified in this section.

Precast bases shall be set level with the wall's plumb on compacted grade or crushed rock bedding over compacted subgrade.

Precast concrete structure sections shall be set so as to be vertical and with sections in true alignment with a 1/4-inch maximum tolerance to be allowed. The outside and inside joint shall be filled with a comparatively dry mortar (one part cement to two parts sand) and finished flush with the adjoining surfaces. Allow joints to set for 24 hours before backfilling. Interior and exterior coatings shall be applied prior to backfilling. Backfilling shall be done in a careful manner, bringing the fill up evenly on all sides. The Contractor shall install the precast sections in a manner that will result in a watertight joint.

Where holes may be cut in the precast sections to accommodate pipes, cutting shall be done prior to setting them in place to prevent any subsequent jarring which may loosen the mortar joints.

B. CASTING:

Casting shall be accomplished by methods and equipment that are in conformance with generally acceptable systems for this type of Work. All precast concrete shall be manufactured by a plant thoroughly experienced in this type of Work. The manufacturer shall meet all production

schedules. Surfaces on which units are cast shall be level and free from any imperfections detrimental to the surface appearance of the finished units. Parting compound shall be applied evenly as per manufacturer's recommendations.

C. WELDING:

All weldments shall be made in accordance with the applicable provisions of AWS. All welding, other than tacks, shall be done by certified welders. All units shall be protected from damage by field welding or cutting operations. Noncombustible shields shall be provided as necessary for this purpose.

D. JOINTS AND JOINT SEALANTS:

In all instances, the edges of precast concrete units and of adjacent material shall be sound, smooth, clean and free of all contaminants prior to joint treatment.

Sealant and primer shall be supplied by the same manufacturer and the primer, when required, shall be as recommended for the particular sealant used. All sealant compounds shall be delivered to the job in the manufacturer's original sealed containers with labels intact and shall be applied in strict accordance with the manufacturer's recommendations. Sealant shall be as specified in specification Section 07900 of these specifications.

E. WATERPROOFING:

Unless otherwise noted on the Drawings, exterior surfaces of precast boxes and vaults which are buried shall be waterproofed with epoxy resin specified in Section 07100. Waterproofing may be factory applied, and touched-up in the field prior to backfilling.

### 3.02 CLEANING AND REPAIRING

After installation, precast elements shall be protected from all damage until final acceptance by the Owner's Representative. Precast units with cracks, spalls, and other defects shall be subject to rejection. Units reviewed for repair shall be repaired to the satisfaction of the Owner's Representative.

### 3.03 ALTERNATIVE DESIGN

The General Contractor may offer an alternative design for any precast element. Such design shall be comparable in terms of strength, deflection, finish and all other design criteria indicated. Complete drawings prepared and sealed by a civil or structural engineer registered in the State of Florida where applicable shall be submitted to the Owner's Representative for his review in accordance with specification Section 01300 of this project manual. No alternative design will be permitted unless it has been specifically accepted in writing by the Owner's Representative. If an alternative design is accepted, all expenses resulting therefrom shall be borne by the General Contractor.

### 3.04 MANHOLE TESTING

#### A. GENERAL:

Upon completion of installation, manholes shall be tested. Test shall be either exfiltration or vacuum test, as set out below, at Contractor's option.

#### B. EXFILTRATION TEST:

Plug all inlets and outlets and fill manhole with water to a height determined by the Owner's Representative. Allow filled manhole to stand until it has reached its maximum absorption, but not less than 2 hours. Reestablish head. Measure amount of water required to maintain test head during a 2-hour test period. Leakage as measured by this test shall not exceed 0.1 gallons per hour per foot of manhole diameter per foot of head above manhole invert (or foot of head above groundwater level, if groundwater is above manhole invert).

#### C. VACUUM TEST:

Upon completion of manhole barrel installation, plug all inlets and outlets and insert rubber ring "donut" type plug in cone opening. Attach vacuum pump to hose connected to plug in cone and apply 4 psi of vacuum (install vacuum regulator on pump such that maximum applied vacuum is 10 psi). After vacuum has stabilized at 3.5 psi for 1 minute, test shall begin. During test period, manhole shall lose no more than 0.5 psi of vacuum. Specified test periods are as follows:

Manhole depth, feet	Test period, min.
0-5	4.5
5-10	5.5
10-15	6.0
Greater than 15	6.5

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

## **SECTION 03732 CONCRETE REPAIRS**

### **PART 1 - GENERAL**

#### 1.01 THE REQUIREMENT

- A. The Contractor shall furnish all materials, labor, equipment, tools, etc., required for the repair, renovation, and replacement of concrete and/or reinforcing steel as indicated on the Drawings, specified herein, and determined by field survey.

The Contractor, in conjunction with the Engineer, shall determine the extent of cracked or deteriorated concrete to be rehabilitated and/or resurfaced. A summary of the work to be performed shall be submitted to the Engineer for review, and such summary shall be approved by the Engineer prior to commencement of the Work.

#### 1.02 REFERENCE SPECIFICATIONS, CODES, AND STANDARDS

- A. Shall be as specified in Section 01090, Reference Standards.

#### 1.03 SUBCONTRACTOR/APPLICATOR QUALIFICATIONS

The Contractor shall furnish the name of all subcontractors/applicators which he proposes to use for this work, including necessary evidence and/or experience records to ascertain their qualifications in the application of epoxy, urethane, and polymer-modified mortars. Approved applicator qualifications shall include:

- A. A minimum of 5 years experience in applying epoxy, urethane, and polymer-modified and cement-based compounds similar to those specified in this Section.
- B. A letter from the manufacturer of the specified materials, on the manufacturer's letterhead, signed by an officer of the company, stating that the subcontractor/applicator has been trained in the proper techniques for applying the product, including surface preparation and mixing, placing, curing, and caring for the manufacturer's products. This letter shall further state that the subcontractor/applicator is on the manufacturer's approved list of contractors.

#### 1.04 SUBMITTALS

- A. Material certifications and technical data sheets on all grouts, mortars, epoxy resins, aggregates and repair products specified in this Section.
- B. Subcontractor/Applicator qualifications as specified in Section 1.04.

- C. Shop Drawings detailing any planned deviation from the proposed construction sequence and/or method of repair.
- D. The Contractor, based on their experience in their profession, may submit to the Engineer for approval, alternative materials and/or methods of work to assure the durability and watertight integrity of the repair work performed.

#### 1.05 ADDITIONAL GUARANTEE

- A. The Contractor shall guarantee all repair work performed under this Contract against defects in workmanship resulting in leakage and/or failure of concrete bond for a period of two years from the date of the Certificate of Substantial Completion.

### **PART 2 - MATERIALS**

#### 2.01 WATER

- A. The water used for mixing concrete repair products shall be clean, potable, and free of deleterious substances.

#### 2.02 AGGREGATE

- A. All aggregate shall conform to ASTM C-33. The aggregate supplier shall submit to the Engineer documentation that the proposed aggregates comply with ASTM C-33 and the requirements listed below:
- B. Pea Gravel - Pea gravel shall meet the gradation and material requirements of Standard Size 14 as defined by ASTM C-33. Pea gravel shall be clean and free from deleterious matter and shall contain no limestone.

#### 2.03 EPOXY BONDING AGENT

- A. An epoxy bonding agent shall be used when applying fresh concrete to previously placed concrete. Epoxy bonding agent shall conform to ASTM C-881 Type I, II, IV or V; Grade 2 for epoxy resin adhesives, depending on the application. The class of epoxy bonding agent shall be suitable for all ambient and substrate temperatures. The epoxy resin shall be "Sika Armatec 110" as manufactured by the Sika Corp, Lyndhurst, NJ, "CR 246" as manufactured by Sto Concrete Restoration Division, Atlanta, GA, "Duralbond" as manufactured by Tamms Industries Co., Mentor OH, or equal.

## 2.04 ANTI-CORROSION REBAR COATING

- A. All reinforcing steel cut or exposed during demolition and/or repair operations shall be protected with an anti-corrosive coating. The anti-corrosive coating shall be a two- component, polymer-modified cementitious material such as "Sika Armatec 110" manufactured by Sika Corp., Lyndhurst, NJ, IOCR 246" manufactured by Sto Concrete Restoration Division, Atlanta, GA, or equal.

## 2.05 WATERPROOF INJECTION GROUT

- A. Waterproof crack repair material shall be a one-component, water-activated polyurethane hydrophilic/hydrophobic injection grout capable of 700% expansion. Polyurethane grout shall form a tough flexible/rigid foam seal that is impenetrable to water. Hydrophilic injection grout shall be "Prime Flex 900 LV" manufactured by Prime Resins, Conyers, GA, "Scotch-Seal 5600 Chemical Grout" manufactured by 3M Construction Markets, St. Paul, MN, "Hydro- Active Flex LV" manufactured by De Neef Construction Chemicals, Waller, TX, or approved equal. Hydrophobic injection grout shall be "Prime Flex 920" manufactured by Prime Resins, Conyers, GA, "Sikafix HH" manufactured by Sika Corp., Lyndhurst, NJ, "Hydro-Active Cut" manufactured by De Neef Construction Chemicals, Waller, TX, or equal.

## 2.06 SPALL REPAIR PATCHING MATERIAL

- A. All spall repairs not requiring formwork shall be repaired using a two-component, polymer- modified cementitious mortar and shall have a minimum 28-day compressive strength of 7000 psi. Spall repair mortar for use in horizontal applications shall be manufactured by Sika Corp., Lyndhurst, NJ, "Duraltop Fast Set" manufactured by Tamms Industries, Mentor, OH, IOCR 700" manufactured by Sto Concrete Restoration Division, Atlanta, GA, or approved equal.
  - 1. Spall repair mortar for use in vertical applications shall be "Sikatop III" manufactured by Sika Corp., Lyndhurst, NJ, "Duraltop Gel" manufactured by Tamms Industries, Mentor, OH, "CR730" manufactured by Sto Concrete Restoration Division, Atlanta, GA, or equal.
- B. All spall repairs requiring formwork shall be repaired using a two-component, polymer- modified cementitious mortar/pea gravel mixture and shall have a minimum 28-day compressive strength of 6000 psi. Each unit of mortar shall be mixed with Saturated Surface Dry (SSD) pea gravel to form the repair material following the manufacturer's recommendations. Spall repair mortar shall be "Sikatop 111 Plus" manufactured by Sika Corp., Lyndhurst, NJ, "Duraltop Flowable Grout" manufactured by Tamms Industries, Mentor, OH, "CR 730" manufactured by Sto Concrete Restoration Division, Atlanta, GA, or equal.

- C. All spall repair materials shall conform to EPA/USPHS standards for surface contact with potable water supplies.

## 2.07 STORAGE OF MATERIALS

- A. The Contractor shall provide an area for repair material storage free from exposure to moisture in any form, before, during, and after delivery to the site. Manufactured materials shall be delivered in unbroken containers labeled with the manufacturer's name and product type. All mortar products shall be stored on raised platforms. Materials susceptible to damage by freezing shall be stored in a dry, heated, insulated area. Any material that has hardened, partially set, become caked and/or has been contaminated or deteriorated shall be rejected. All aggregates shall be stored in clean bins, scows or platforms.

## **PART 3 - INSTALLATION**

### 3.01 GENERAL REQUIREMENTS

- A. No repair work shall be undertaken when ambient temperatures are below manufacturer's safe recommendations. No admixtures, except those required by the manufacturer, shall be used in the repairs specified herein. All products shall be applied in strict accordance with manufacturer's recommendations. The Contractor shall furnish and install safe scaffolding and ladders for the Engineer's prework inspection, the repair work activities, and the Engineer's final inspection
- B. Sandblast or waterblast (3000-4000 psi waterjet) deteriorated areas to remove all loose concrete, existing coatings, unsound material, debris, and laitance. All surfaces shall be clean, free of dirt, grease, loose particles, and deleterious substances and shall be prepared according to manufacturer's requirements.

### 3.02 EPOXY BONDING AGENT

- A. Existing concrete surfaces shall be roughened prior to application of bonding agent. Concrete surface shall be clean and sound, free of all foreign particles and laitance. Repair material shall be placed while bonding agent is still tacky. If bonding agent cures prior to placement of repair material, bonding agent shall be reapplied.
- B. Repairing concrete with epoxy mortars shall conform to all the requirements of ACI 503.4 "Standard Specification for Repairing Concrete with Epoxy Mortars" (latest edition), except as modified herein.

### 3.03 ANTI-CORROSION REBAR COATING

- A. Reinforcing steel cut or exposed during demolition and/or repair operations shall be sandblasted and cleaned prior to coating with an anti-corrosive coating. Coating shall thoroughly cover all exposed parts of the steel and shall be applied according to manufacturer's recommendations.

### 3.04 WATERPROOF INJECTION GROUT

- A. All existing, leaking cracks 1/4" or smaller shall be repaired by pressure injecting a waterproof injection grout into the prepared crack. Seal crack surface and install injection ports per manufacturer's recommendations. Holes drilled for injection ports shall not cut rebar. If rebar is encountered during drilling, the hole shall be abandoned and relocated, and the abandoned hole shall be patched immediately with non-shrink grout flush with the surface of the existing concrete. Once the surface sealing material has cured, inject crack with waterproof injection grout using standard pressure injection equipment as directed by the manufacturer.

### 3.05 SPALL REPAIR PATCHING MATERIAL

- A. All voids or spalled areas to be repaired shall be chipped back to sound concrete a minimum 1/8" deep, cleaned and repaired with spall repair patching material according to manufacturer's recommendations. All patching shall provide a final finished surface which is flat, level and even with the existing concrete surface. Repair mortar shall not be feathered to meet existing concrete surface. Final patching on horizontal surfaces shall receive a broom finish consistent with the finish on the existing structure.

### 3.06 CURING

- A. All repair products shall be cured in strict accordance with manufacturer recommendations.

### 3.07 WORK IN CONFINED SPACES

- A. The Contractor shall provide and maintain safe working conditions for all employees and subcontractors. Fresh air shall be supplied continuously to confined spaces through the combined use of existing openings, forced-draft fans and temporary ducts to the outside, or by direct air supply to individual workers. Fumes shall be exhausted to the outside from the lowest level of the confined space. Electrical fan motors shall be explosion-proof if in contact with fumes. No smoking or open fires shall be permitted in or near areas where volatile fumes may accumulate.

END OF SECTION

## **SECTION 05100 ACCESS COVERS AND HATCHES**

### **PART 1 - GENERAL**

#### 1.01 SCOPE

- A. The work includes supply and installation of access covers and hatches as specified herein, required for a complete and functional installation.

#### 1.02 SUBMITTALS

- A. Submit shop drawings in accordance with the General Conditions and Section 01300.
- B. The Contractor shall submit shop drawings and other information to the Engineer, for review. No fabrication shall be started until shop drawings have been reviewed and approved by the Engineer. The shop drawings shall be on 8 ½" x 11" sheets and indicate the following: fabrication, assembly and erection details, sizes of members, profiles, fastenings, supports and anchors, finishes, patterns, clearances, loading calculations and connections to other work.

### **PART 2 - PRODUCTS**

#### 2.01 MATERIALS

- A. All Material shall be of the best quality and entirely suited for the particular service. Metals shall be free from defects and shall have structural properties to safely render required service.
- B. Fastenings shall, insofar as practicable, be noncorrosive, nonstaining and concealed. Exposed welds shall be ground smooth to form a neat uniform fillet without weakening the base metal. Unexposed welds shall have all slag removed. Molded, bent or shaped members shall be formed with clean, sharp rises, without dents. Scratches, cracks, or other defects. All anchors, bolts, shims, and accessory items shall be provided, as required, for building into or fastening to adjacent work.
- C. Unless otherwise specified, the metalwork shall be equal to or exceed the requirements of the following Standards:

Stainless Steel

Fasteners

A167 and A276, Type 316

Aluminum

Structural Shapes

B308, Alloy 6061-T6

Castings

B26, B85 and B108

Extruded Bars, Rods and Tubes

B221 Bars – Alloy 6061-T6

Plates and Sheet

B209 Plates – Alloy 6061-T6

Materials with more than one specification or grade listed shall conform to the specification or grade providing the highest strength and appropriate mechanical properties for the fabrication technique used.

2.02 PROTECTIVE COATINGS

- A. Aluminum to be placed adjacent to masonry or dissimilar metals shall be protected with an isolating coating of bitumastic and/or felt.

2.03 STEEL

- A. All steel shall conform to the following:
  - 1. All stainless steel anchor bolts and fasteners shall be of Type 316 stainless steel.

2.04 STRUCTURAL AND MISCELLANEOUS ALUMINUM

- A. All structural and miscellaneous aluminum shapes, bars, and plates shall be Alloy 6061-T6. All fasteners for aluminum shall be AST A276, Type 316 stainless steel. Aluminum to be placed adjacent to concrete, masonry, or dissimilar metals shall be protected with one coat of bitumastic or layer of felt.

2.05 SAFETY CHAINS

- A. Safety chains shall be 316 stainless steel coil-proof chain. Chains shall be straight link style, 3/16-inch diameter, with at least twelve links per foot, and with snap hooks on each end. Snap hooks shall be boat type and eye bolts for attachment of chains shall be stainless steel 3/8-inch bolt with 3/4-inch eye diameter, anchored as required. Chains shall be 4-inches longer than the anchorage spacing for each guarded area.

## 2.06 FASTENERS

### A. General

1. Bolts, screws, nuts, washers, anchors, and other fasteners shall be first quality and shall conform to the material specifications named herein. All necessary bolts, anchor bolts, nuts, washers, plates, and bolt sleeves shall be furnished by the Contractor in accordance herewith. Anchor bolts shall have suitable washers and, where so required, their nuts shall be hexagonal. Stainless steel bolts shall have a raised letter or symbol on the bolts indicating the manufacturer.
  2. Concrete and masonry inserts shall be drill-in type, as manufactured by Phillips Drill Company – Michigan City, Indiana; Hilti – Tulsa, Oklahoma or equal. Powder or gun-driven, fiber, and plastic inserts shall not be used.
- B. Material: All bolts, anchor bolts, nuts, washers, plates, and bolt sleeves shall be Type 316 stainless steel unless otherwise indicated or specified.
- C. Concrete Inserts: Concrete inserts shall be designed to support safely, in the concrete that is used, the maximum load that can be imposed by the bolts used in the inserts.
- D. Dissimilar Metal: All dissimilar metal shall be connected with appropriate fasteners and shall be insulated with a dielectric or approved equal. Unless otherwise specified, aluminum shall be fastened with Type 316 stainless steel bolts and insulated with felt, micarta, nylon, rubber, or equal.
- E. Guarantee: The manufacturer shall guarantee in writing that the access hatch is watertight, and the proper operation against defects in material or workmanship for a period of five years.

## 2.07 ACCESS HATCHES

- A. Access hatches for the valve vaults and wet-wells shall be aluminum and shall be finished and installed as shown on the drawings. Contractor shall coordinate with supplier for dimensions and proper installation of hatches.
- B. Access hatches shall have ¼" thick aluminum "checkered" floor plate reinforced to a **H-20 wheel load**. The frame shall be one piece extruded aluminum section with an integral seat and anchor flange. The frame shall drain through a 1 ½" pipe coupling. The handle shall be drop-type flush mounted. All hinges and associated hardware shall be stainless steel with tamper proof stainless steel bolts and nuts, and be removable for maintenance after the access door is cast in place. The access door shall have a watertight stainless steel slam lock operated by a

flush drop handle from the outside and fixed handle inside. Hatch shall include recessed staple for padlock. Hatch shall have covers bolted to the frame to prevent rattling and vibration. Hatches shall include vertical compression springs for easy open and close. Hatches shall be Type AHS as manufactured by U.S. Foundry or equal.

- C. Wet Well hatches shall include Hatch Net 121 Fall Through Protection System as manufactured by U.S. Netting or approved equal.
- D. Guarantee: The manufacturer shall guarantee in writing that the access hatch is water resistant and the proper operation against defects in material or workmanship for a period of five years.

### **PART 3 - EXECUTION**

#### **3.01 FABRICATION**

- A. General: All workmanship shall be first class and conform to recognized and accepted best practice. All structural materials shall be thoroughly straightened in the shop by methods that will not injure them before templates are placed on same for laying out and before any work is done upon them. Finished members shall be absolutely straight and free from open joints and distortions of any kind. All shearings shall be neatly finished. Flame cutting may be used in the preparation of the various members provided this operation is performed by a machine. All necessary fillets, connections, brackets, posts, and other details not shown on the drawings, but necessary for the work, shall be furnished by the Contractor. Fabrication shall be by welding except where riveted construction is specifically allowed by the Specifications or Engineer.
- B. Aluminum: Aluminum fabrication shall meet the applicable requirements of the Aluminum Construction Manual, Specifications for Aluminum Structures.
- C. Welding: All welding shall be in accordance with the latest revised standards and recommendations of the American Welding Society. The welding of all joints shall produce complete fusion with the parent metal and shall be free from deleterious metals and cracks. Machine welding shall be used insofar as practicable. Tack welding will not be permitted on exposed surfaces. Finished welded joints shall be reasonably smooth and free from grooves, depressions, or other irregularities. Any other irregularities shall be corrected by welding and/or grinding. All scale or flux shall be removed after each pass. All flush welds of butt joints shall be ground smooth where exposed to view.
- D. Castings: Castings shall be tough, sound, and free from blow holes, shrinkage cracks, or other defects. Castings shall be smooth and clean. Units that have been plugged or filled will be rejected.

### 3.02 INSTALLATION

- A. All access covers, hatches and grates shall be installed in conformance with Specifications and details as shown on the Drawings, or shop drawings. Installation and erection shall conform to the best practice with each item set plumb, level, true to line, and securely anchored in its proper place.

END OF SECTION

## **SECTION 09972**

### **COATINGS - MORTAR/EPOXY LINER FOR CONCRETE MANHOLES**

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

##### 1.01 SCOPE

- A. Furnish all labor, surface preparation and coating material, tools, rigging, harness, lighting, ventilation, gas monitor and other related items of equipment and materials necessary to clean, prepare, cure, coat and cleanup a complete coating system on all structures and/or equipment as specified or shown on the drawings.
- B. The work includes coating (application of corrosion barrier system) the interior surface of existing and/or new wetwells and valve pits. These areas are located within confined space areas. All workers must be confined space certified prior to starting all work. All workers shall abide by OSHA 1910.146.
- C. Clean, prepare, and coat all surfaces in strict accordance with the manufacturer's published recommendations and specifications.
- D. Perform all work by the use of skilled work persons in a safe and productive manner using equipment and procedures consistent with good coating practices.

##### 1.02 RELATED SECTIONS

- A. Section 01300: Submittals

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

##### 2.01 GENERAL REQUIREMENTS

- A. Prior to preconstruction meeting submit a certification stating the applicator is:
  - 1. Currently approved by the Manufacturer of the specified products.
  - 2. Licensed and qualified in the application of the specified products.

##### 2.02 QUALITY ASSURANCE

- A. Preconstruction meeting: A preconstruction meeting shall be held prior to start of any application of restoration and corrosion barrier system. The Engineer is responsible for scheduling the meeting. The attendance of the Engineer, Applicator, Underground Contractor and FKAA Construction Coordinator is

required. During the meeting, the process of preparation, application, curing, field inspection and coordination with other work shall be reviewed.

- B. The approved specified products shall be applied in accordance with the Manufacturer's recommendations unless noted otherwise in this specification.
- C. Material delivered to the site shall be in Manufacturer's original, unopened containers and packaging, with label clearly identifying product name and Manufacturer, batch and lot number, and expiration date as applicable. The material shall be protected during storage, handling and application to prevent damage.
- D. The liner manufacturer shall warrant the corrosion barrier system for five (5) years from the time of:
  - 1. First permanent service activation discharging wastewater into the new structure.
- E. The liner manufacturer shall warrant the corrosion barrier system for all labor and materials cost necessary to repair or replace the failed application, including related work (permits, bypass piping, pumps, flow monitoring, restoration, and record information).

### 2.03 ENVIRONMENTAL CONDITIONS

- A. Do not apply materials under the following conditions:
  - 1. Temperature exceeding the Manufacturer's recommended maximum or minimum allowable.
  - 2. Overflowing water condition

### 2.04 PRODUCTS

- A. Manufacturer must be listed on FKAA's approved materials list
- B. Restoration and Corrosion Barrier System
  - 1. General:
    - a. Materials from single Manufacturer
- C. Penetrating Epoxy Primer/Sealer
  - 1. Compatible with Corrosion Barrier Topcoat
  - 2. Composition: 100% solids epoxy
  - 3. Number of components: 2

- D. Corrosion Barrier Topcoat
  - 1. Composition: 100 percent solids, modified epoxy sprayable coating
  - 2. Thickness: min. of 100 mils in 1 or 2 coats (dry film thickness)
  - 3. Number of components: 2
  - 4. Finish: Gloss
  - 5. Color: White or Gray
- E. Water: Water shall be potable and clean.

## 2.05 APPROVED PRODUCTS

- A. Approved products for corrosion barrier systems are “IET SYSTEM 3” (Polymorphic Resin Coating) or equal. “IET SYSTEM 3” is manufactured by IET Systems.

**IET Systems**  
17660 East Street  
North Fort Myers, FL 33917  
(239) 997-6645

## **PART 3 - EXECUTION**

### 3.01 EXAMINATION

- A. Inspect surfaces to receive restoration and corrosion barrier system for leaks, deteriorated concrete, cracks and voids. Notify the Engineer and the FKAA Construction Coordinator in writing if surfaces do not meet the minimum conditions as set by the coating Manufacturer. Do not begin surface preparation or application until unacceptable conditions have been corrected. New structures to be inspected and visibly marked by the FKAA Construction Coordinator prior to system application.
- B. Give the FKAA Construction Coordinator a minimum of two days advance notice of completion of surface preparation and start of application.
- C. Before application of each material, surfaces to be sprayed or coated will be inspected by the FKAA Construction Coordinator. Correct defects or deficiencies before application of subsequent material.

- D. Inspection or the waiver of inspection by the FKAA Construction Coordinator and /or the Engineer of any portion of the work shall not relieve the Contractor of responsibility to perform the work as specified.

### 3.02 SURFACE PREPARATION

- A. Place covers over inverts to isolate the structure receiving the surface restoration.
- B. Place masking tape to protect equipment not intended for spraying/coating.
- C. Prepare surfaces in accordance with manufacturer's instructions.
- D. Cleaning: Clean surfaces by water (minimum 3500 psi) or abrasive blasting, or hand or power tools as required to remove all previously applied coatings, unsound concrete, contaminants, dirt, debris, and deteriorated reinforcing steel, laitance, efflorescence, form oils and spoiled concrete.

### 3.03 HYDROSTATIC LEAKS

- A. Stop visible hydrostatic leaks by application of hydraulic cement mortar, after completion of surface preparation.
  - 1. Mix only 1 to 2 pounds of mortar at a time.
  - 2. Add water to form a viscous mass with consistency of modeling clay.
  - 3. Apply by hand or trowel.
  - 4. Press mixed material firmly into place, starting at top of leak and working downward.
  - 5. Inject flowing leaks using a suitable polymer gel or foam. Be sure to remove any excess or spilled material and clean/saturate the concrete surface with water prior to application of the restoration mortar
  - 6. Prepare surfaces to have a minimum profile of 1/16 inch, with aggregate exposed, then remove the water and any loose material.
  - 7. Inspect surfaces for soundness.
  - 8. Saturate all surfaces thoroughly with clean water.
  - 9. Apply mortar as soon as water sheen is no longer visible (saturated surface dry).

### 3.04 APPLICATION OF CORROSION BARRIER TOPCOAT

- A. Provide mixing and application equipment designed for mixing and spraying epoxy coating.
- B. Apply penetrating Epoxy primer/sealer and corrosion barrier topcoat epoxy to all prepared surfaces in accordance with manufacturer's instructions.
- C. Apply topcoat as soon as possible after application of penetrating Epoxy primer/sealer.
- D. Do not allow surface contamination to the finished primer/sealer before application of topcoat.
- E. Topcoat Thickness: Spray apply a minimum thickness of 100 mils DFT.
- F. Curing of Corrosion Barrier Topcoat
  - 1. Allow a minimum cure time of 24 hours at 70 degrees F.
  - 2. Curing Conditions:
    - a. Shelter system from direct impingement of water until 1 to 3 hours after application of topcoat, depending on substrate temperatures, after which cure sufficiently to be undamaged by water impingement or immersion at ordinary velocities.
    - b. Sanitary Sewer Systems: It may be necessary to plug services or main lines temporarily in order to achieve these environmental conditions.
  - 3. Immersion Service: Reach a tack-free condition before being immersed.
  - 4. Remove any loose debris, plugs, covers and masking prior to inspection.

### 3.05 FIELD QUALITY CONTROL:

- A. The Contractor shall hire an independent testing laboratory to perform and certify Check the application for minimum thickness of coatings (minimum ½" of restoration mortar, minimum 100 mils MDFT of epoxy topcoat). The test for the topcoat shall consist of five separate spot measurements (average of three readings each), spaced evenly over each 100 square feet of the area to be tested. The average of five spot measurements for each such 100 square foot area shall not be less than 100 mils MDFT. No single spot measurement in any 100 square foot area shall be less than 80 mils MDFT. Any one of three readings which are averaged to produce each spot measurement may underrun be a greater amount. The five spot measurement shall be made for each 100 square feet of area as follows:

1. Perform minimum 1 set of tests for every manhole, and minimum of three (3) 100 square foot areas shall be randomly selected and measured for every wet well.
  2. If the dry film thickness for any 100 square foot area is not in compliance with the average of 100 mils MDFT, then each 100 square foot area shall be tested. Check the application for holidays using recognized testing procedures and equipment, such as “high voltage holiday detector test.”
- B. Coated Surfaces will be rejected by FKAA if they fail:
1. To meet the MDFT requirements, or
  2. To stop inflow, infiltration, exfiltration, or
- C. Rejected Coated Surfaces: Coated and rejected areas must be identified and marked. To repair and recoat: sand or grind down to substrate, clean, spray with approved primer/sealer, and recoat with specified corrosion barrier topcoat. Re-inspection will be required.
1. The certified laboratory performing the testing shall issue a written statement to the Department confirming the compliance of each structure.
  2. The Department may require that additional testing of the liner be performed at the manufacturer’s expense any time during the five year warranty period. Any deficiencies in performance shall be corrected without delay by the manufacturer’s contractor at no cost to the Department.

## **PART 4 - SAFETY**

### 4.01 GENERAL

- A. Make all necessary provisions regarding materials, confined space entry, equipment, personnel, procedures, and practices, to assure that the work is done safely and that the working area is maintained free of all health and safety hazards.
- B. Observe manufacturer’s health and safety precautions when storing,
- C. Direct personnel’s attention to all product warnings and information given on the labels of all products.
- D. Post warning signs outside of the work to appraise personnel of the hazards in the work area.

- E. Remove waste coating materials and contaminated disposable items from the job site and dispose of them at the completion of work each a day.

END OF SECTION

**SECTION 15000**  
**PIPING SCHEDULE AND GENERAL PIPING REQUIREMENTS**

**PART 1 - GENERAL**

1.01 DESCRIPTION

- A. This section describes the application of the Piping Schedule shown in the specifications and the general requirements for selecting piping materials; selecting the associated bolts, nuts, and gaskets for flanges for the various piping services in the project; and miscellaneous piping items.

1.02 SUBMITTALS

- A. Submit shop drawings in accordance with the General Terms and Conditions and Section 01300.
- B. Submit affidavit of compliance with referenced standards (e.g., AWWA, ANSI, ASTM, etc.).
- C. Submit certified copies of mill test reports for bolts and nuts, including coatings if specified. Provide recertification by an independent domestic testing laboratory for materials originating outside of the United States.
- D. Submit manufacturer's data sheet for gaskets supplied showing dimensions and bolting recommendations.

1.03 DEFINITIONS OF BURIED AND EXPOSED PIPELINE:

- A. Buried piping is piping buried in the soil, commencing at the wall or beneath the slab of a structure. Where a coating is specified, provide the coating up to the structure wall. Piping encased in concrete is considered to be buried. Do not coat encased pipe.
- B. Exposed piping is piping in any of the following conditions or locations:
  - 1. Above ground.
  - 2. Inside buildings, vaults, or other structures.
  - 3. In underground concrete trenches or galleries.

## **PART 2 - MATERIALS**

### **2.01 MATERIALS SELECTION AND ALTERNATIVE MATERIALS**

- A. The Piping Schedule in the specifications lists the material and specification for each piping service in the project. In locations where the piping material referenced on the Piping Schedule is not appropriate, the piping material is indicated in the drawings. Materials called out in the drawings shall govern over materials stated in the Piping Schedule.
- B. The Piping Schedule in the specifications may show alternative piping materials for certain services. In such cases, the same pipe material shall be used for all pipe sizes in all locations for the given piping service. Do not intermix piping materials.
- C. All hardware (bolts, nuts, washers, etc.) for the project needs to be 316 stainless steel. This includes the Restraint Device T-bolts and nuts to also be 316 stainless steel. The T-bolts and nuts will also require a Fluoropolymer coating to be applied at the factory.

### **2.02 BOLTS AND NUTS FOR FLANGES FOR DUCTILE IRON PIPING**

- A. Bolts and nuts for Class 150 flanges (including AWWA C207, Class D) located indoors, outdoors above ground, and in vaults and structures shall be Type 316 stainless steel conforming to ASTM A 193, Grade B8M, for bolts and ASTM A 194, Grade 8M, for nuts.
- B. Bolts and nuts for buried or submerged Class 150 flanges and Class 150 flanges located outdoors above ground or in vaults and structures shall be Type 316 stainless steel conforming to ASTM A 193, Grade B8M, for bolts and ASTM A 194, Grade 8M, for nuts.
- C. Hex head machine bolts for use with lugged valves shall comply with ASTM A 193, Grade B7.
- D. Fit shall be Classes 2A and 2B per ANSI B 1.1 when connecting to cast-iron valves having body bolt holes.
- E. Provide washers for each nut. Washers shall be of the same material as the nuts.

### **2.03 BOLTS AND NUTS FOR FLANGES FOR PVC PIPE**

- A. Bolts and nuts for flanges located indoors, outdoors above ground, and in vaults and structures shall be Type 316 stainless steel conforming to ASTM A 193, Grade B8M, for bolts and ASTM A 194, Grade 8M, for nuts.

- B. Bolts and nuts for buried and submerged flanges and flanges located outdoors above ground or in vaults and structures shall be Type 316 stainless steel conforming to ASTM A 193, Grade B8M, for bolts and ASTM A 194, Grade 8M, for nuts.
- C. Provide a washer under each nut and under each bolthead. Washers shall be of the same material as the nuts.

#### 2.04 LUBRICANT FOR STAINLESS STEEL BOLTS AND NUTS

- A. Lubricant shall be chloride free and shall be RAMCO TG-50, Anti-Seize by RAMCO, Specialty Lubricants Corporation Husky™ Lube O'Seal, or equal.

#### 2.05 GASKETS FOR FLANGES FOR DUCTILE-IRON PIPING AND FITTINGS IN RAW SEWAGE

- A. Gaskets shall be full face EPDM, 1/8-inch thick, Buna-N having a hardness of 55 to 65 durometer. Gaskets shall be suitable for a water pressure of 200 psi at a temperature of 250°F. Gaskets shall have "nominal" pipe size inside diameters not the inside diameters per ANSI B 16.21. Provide Garlock Style 9122 or equal.

#### 2.06 GASKETS FOR FLANGES FOR PVC AND CPVC PIPING

- A. Gaskets for flanged joints shall be full faced, 1/8-inch thick, having a hardness of 50 to 70 durometer A. Gasket material shall be EPDM.

### **PART 3 - EXECUTION**

#### 3.01 INSTALLING PIPE SPOOLS IN CONCRETE

- A. Install pipes in walls and slabs before placing concrete.

#### 3.02 RAISED FACE AND FLAT FACE FLANGES

- A. Where a raised face flange connects to a flat-faced flange, remove the raised face of the flange.

#### 3.03 INSTALLING BELOWGROUND PIPING

- A. The minimum cover for the water mains and force mains is 30-inch cover. The Contractor is not allowed to install these pipes deeper than 36" max cover unless the pipes are required to go deeper to avoid conflicts. The Civil Drawings show the areas where the pipes will need to be installed below the 36" max cover requirement by FKAA. All other areas will need to be authorized by FKAA in the field.

### 3.04 INSTALLING ABOVEGROUND OR EXPOSED PIPING

- A. Provide pipe hangers and supports as detailed in the drawings.
- B. Install pipe without springing, forcing, or stressing the pipe or any adjacent connecting valves or equipment.

### 3.05 INSTALLING FLANGED PIPING

- A. Set pipe with the flange boltholes straddling the pipe horizontal and vertical centerline. Install pipe without springing, forcing, or stressing the pipe or any adjacent connecting valves or equipment. Before bolting up, align flange faces to the design plane within 1/16 inch per foot measured across any diameter. Align flange boltholes within 1/8-inch maximum offset.
- B. Clean flanges by wire brushing before installing flanged fittings. Clean flange bolts and nuts by wire brushing, lubricate carbon steel bolts with oil and graphite, and tighten nuts uniformly and progressively.
- C. Bolt lengths shall extend completely through their nuts. Any which fail to do so shall be considered acceptably engaged if the lack of complete engagement is not more than one thread.
- D. Do not use more than one gasket between contact faces in assembling a flanged joint.
- E. If flanges leak under pressure testing, loosen or remove the nuts and bolts, reset or replace the gasket, reinstall or retighten the bolts and nuts, and retest the joints. Joints shall be watertight.

### 3.06 INSTALLING BLIND FLANGES

- A. At outlets not indicated to be connected to valves or to other pipes and to complete the installed pipeline hydrostatic test, provide blind flanges with bolts, nuts, and gaskets.
- B. Coat the inside face of blind flanges with fusion-bonded epoxy per Section 09900.

### 3.07 INSTALLING GROOVED-END PIPING

- A. Install grooved-end pipe and fittings in accordance with the coupling manufacturer's recommendations and the following.
- B. Clean loose scale, rust, oil, grease, and dirt from the pipe or fitting groove before installing coupling.

- C. Apply the coupling manufacturer's gasket lubricant to the gasket exterior including lips, pipe ends, and housing interiors.
- D. Fasten coupling alternately and evenly until coupling halves are seated. Use torques as recommended by the coupling manufacturer.
- E. Provide separate hangers and supports at both sides of flexible joints.

3.08 INSTALLATION OF STAINLESS STEEL BOLTS AND NUTS

- A. Prior to assembly, coat threaded portions of stainless steel bolts and nuts with lubricant.

3.09 PIPING SCHEDULE

<b>PIPING SCHEDULE</b>			
<b>SERVICE</b>	<b>PIPE MATERIAL</b>	<b>TEST PRESSURE (PSIG)</b>	<b>COLOR</b>
GRAVITY SANITARY SEWER	PVC SDR 26	AIR OR WATER LEAKAGE	Green
FORCE MAIN HDPE	HDPE DR-11	100 psi	Black w/ Green Stripe
FORCE MAIN PVC	PVC C900 DR 18	100 psi	Green
FORCE MAIN DIP	DIP CL350	100 psi	-
FORCE MAIN SST	SCH 10S 316L SST	150 psi	-
WATER MAIN PVC	PVC C900 DR 18	150 psi	Blue
<del>WATER MAIN DIP</del>	<del>DIP CL 350</del>	<del>150 psi</del>	-
<del>WATER MAIN SST</del>	<del>SCH 10S 316L SST</del>	<del>150 psi</del>	-
<del>RECLAIMED WATER MAIN PVC</del>	<del>PVC C900 DR18</del>	<del>150 psi</del>	<del>Purple</del>
<del>RECLAIMED WATER MAIN DIP</del>	<del>DIP CL 350</del>	<del>150 psi</del>	-

END OF SECTION

**SECTION 15013**  
**PVC FORCE MAIN PIPE (AWWA C900)**

**PART 1 - GENERAL**

1.01 DESCRIPTION

- A. This specification covers PVC Schedule 80 pipe and fittings for pressure applications. The system is intended for pressure applications where the operating temperature will not exceed 140° F.

1.02 SUBMITTALS

- A. Submit shop drawings in accordance with the General Terms and Conditions and Section 013300.
- B. Provide affidavit of compliance with ASTM D 1785.
- C. Submit fully dimensioned cross-section of the bell and barrel of the pipe. Show the bell maximum outside diameter in the pressurized area and its minimum wall thickness at the same location.
- D. Submit copies of the following manufacturer-required tests conducted on project pipe:
  - 1. Quick-burst strength of pipe and couplings.
  - 2. Flattening resistance of pipe.
  - 3. Record of additional tests after test sample failure.
- E. Submit manufacturer's literature of gray iron and ductile-iron fittings including dimensions, thickness, weight, coating, lining, and a statement of inspection and compliance with the acceptance tests of AWWA C110 or C153. Submit copy of report of pressure tests for qualifying the designs of all sizes and types of AWWA C153 fittings that are being used in the project. The pressure test shall demonstrate that the minimum safety factor described in AWWA C153, Section 53-15 is met.

**PART 2 - MATERIALS**

2.01 PIPE

- A. The material used in the manufacture of the pipe shall be rigid polyvinyl chloride (PVC) compound, Type 1 Grade 1, with a Cell Classification of 12454 as defined in ASTM D 1784, trade name designation H707 PVC.

- B. The pipe and fittings shall be homogenous throughout and free from visible cracks, holes, foreign inclusions, or other defects. The pipe shall be uniform as commercially practicable in color, opaqueness, density, and other specified physical properties. The dimensions of the pipe shall be measured as prescribed in ASTM D 2122.

## 2.02 FITTINGS

- A. Socket type molded fittings will be manufactured to the dimensions and tolerances of ASTM D-2467. Threaded type (NPT) molded fittings will be manufactured to the dimensions and tolerances of ASTM D-2464 and meet the requirements of ANSI/ASME B 1.20.1.
- B. Fittings and joints shall be of a schedule, SDR, pressure class, or pipe stiffness that equals or exceeds that of the plastic pipe. Joints and fittings shall be compatible with the pipe which they attach.

## 2.03 SOLVENTS

- A. Solvents for solvent welded pipe joints shall conform to ASTM D-2564. Primers and solvent cements shall conform to ASTM A-656 and ASTM A-493, respectively.

## 2.04 FLANGES

- A. Flanges on outlets of fittings shall be Class 125 per ANSI B 16.1.

## 2.05 GASKETS FOR FLANGES

- A. **All gaskets shall be EPDM.**

## 2.06 BOLTS AND NUTS FOR FLANGES

- A. **All nuts and bolts shall be 316 SS.**

# PART 3 - EXECUTION

## 3.01 PRODUCT MARKING

- A. Legibly mark pipe at 5-foot intervals and each coupling to identify the nominal diameter, the outside diameter base, that is, cast-iron or steel pipe (IPS), the material code for pipe and couplings, and the dimension ratio number.

### 3.02 DELIVERY AND TEMPORARY STORAGE OF PIPE

- A. Ship, store, and place pipe at the installation site, supporting the pipe uniformly. Avoid scratching the pipe surface. Do not stack higher than 4 feet or with weight on bells. Cover to protect from sunlight.
- B. Do not install pipe that is gouged or scratched forming a clear depression.

### 3.03 HANDLING PIPE

- A. Hoist pipe with mechanical equipment using a cloth belt sling or a continuous fiber rope that avoids scratching the pipe. Do not use a chain. Pipes up to 12 inches in diameter may be lowered by rolling on two ropes controlled by snubbing. Pipes up to 6 inches in diameter may be lifted by hand.

### 3.04 INSTALLING BURIED PIPING

- A. Install in accordance with AWWA C605, and as follows.
- B. When installing pipe in trenches, do not deviate more than 1 inch from line or 1/4 inch from grade. Measure for grade at the pipe invert.
- C. Backfill materials in the pipe zone shall be imported sand. Do not add successive layers unless the previous layer is compacted to 95% relative compaction per ASTM 01557.
- D. Compact material placed within 12 inches of the outer surface of the pipe by hand tamping only.
- E. Compact trench backfill to the specified relative compaction. Do not float pipe. Do not use high impact hammer-type equipment except where the pipe manufacturer warrants in writing that such use will not damage the pipe.

### 3.05 WRAPPING FITTINGS AND RESTRAINED JOINT DEVICES

- A. Wrap buried cast-iron fittings and restrained joint devices with polyethylene per Section 02620.

### 3.06 FIELD HYDROSTATIC TESTING

- A. Test pressures are shown in the Piping Schedule in the Specifications. Test in accordance with Section 02682.

END OF SECTION

**SECTION 15013**  
**PVC FORCE MAIN PIPE (AWWA C900)**

**PART 1 - GENERAL**

1.01 DESCRIPTION

- A. This section includes materials, installation, and testing of PVC Force Main pipe conforming to AWWA C900. Size range is 4 through 12 inches.

1.02 SUBMITTALS

- A. Submit shop drawings in accordance with the General Terms and Conditions and Section 013300.
- B. Provide affidavit of compliance with AWWA C900.
- C. Submit fully dimensioned cross-section of the bell and barrel of the pipe. Show the bell maximum outside diameter in the pressurized area and its minimum wall thickness at the same location.
- D. Submit copies of the following manufacturer-required tests conducted on project pipe:
1. Quick-burst strength of pipe and couplings.
  2. Flattening resistance of pipe.
  3. Record of additional tests after test sample failure.
- E. Submit manufacturer's literature of gray iron and ductile-iron fittings including dimensions, thickness, weight, coating, lining, and a statement of inspection and compliance with the acceptance tests of AWWA C110 or C153. Submit copy of report of pressure tests for qualifying the designs of all sizes and types of AWWA C153 fittings that are being used in the project. The pressure test shall demonstrate that the minimum safety factor described in AWWA C153, Section 53-15 is met.
- F. Submit outline drawings and materials description of service connection saddles, corporation stops, and pipe plugs.
- G. Submit test results for the restrained joint system to be used certified by an independent test laboratory demonstrating compliance with these specifications for each size and pressure rating.
- H. Submit restrained joint system installation instructions. Include bolt torque limitations and assembly tolerances.

## **PART 2 - MATERIALS**

### 2.01 PIPE

- A. AWWA C900, rubber-ring gasket bell end or plain end with elastomeric gasket coupling, Class 150, cast iron equivalent outside diameter, material cell classification 12454-B per ASTM D 1784.

### 2.02 FITTINGS

- A. Fittings shall conform to AWWA C110 with a minimum pressure rating of 250 psi. Size bells specifically for outside diameter of cast-iron equivalent PVC pipe including rubber-ring retaining groove.
- B. Mechanical joint fittings conforming to AWWA C153 may be used in lieu of AWWA C110 fittings.

### 2.03 LINING AND COATING FOR FITTINGS

- A. Line and coat fittings with fusion-bonded epoxy.
- B. Coat buried fittings with bituminous coating.

### 2.04 FLANGES

- A. Flanges on outlets of fittings shall be Class 125 per ANSI B 16.1.

### 2.05 GASKETS FOR FLANGES

- A. **All gaskets shall be EPDM.**

### 2.06 BOLTS AND NUTS FOR FLANGES

- A. **All nuts and bolts shall be 316 SS.**

### 2.07 RESTRAINED JOINTS

- A. Provide restrained joints where indicated in the drawings. Restrained joints shall be provided by restraining systems that incorporate a series of machined serrations on the inside diameter of a restraint ring to provide positive restraint. Restraining systems shall meet or exceed the requirements of UNI-B-13-94 and ASTM F 1674 and the following:
  - 1. Restraint devices for bell-and-spigot joints shall consist of a split restraint ring installed on the spigot, connected to a solid backup ring seated behind the bell.

2. Restraint devices for connection to ductile-iron mechanical joints shall consist of a split restraint ring installed behind the ductile-iron fitting follower gland and gasket and shall retain the full deflection capability of the joint. **All bell restraints and fitting restraints must include 316 SS nuts and bolts.**
3. The split restraint ring shall be machined to match the outside diameter of the pipe, provide full 360 degree support around the barrel of the pipe, and shall incorporate a series of machined serrations for gripping the outside surface of the pipe. The serrations shall be uniform and extend the full circumference of the clamp. The ring shall also incorporate a positive means of avoiding applying excessive clamping force to the pipe.
4. Materials used in the restraint device shall be ductile iron conforming to ASTM A 536, Grade 60-4212 or 65-45-12.
5. T-bolts, studs, and connecting hardware shall be 316 Stainless Steel.
6. Design restraining devices to have a 2:1 safety factor based on the design strength of the pipe.
7. Restraining devices shall be EBAA Iron Series 1600. **All bell restraints and fitting restraints must include 316 SS nuts and bolts.**

## 2.08 FLANGED COUPLING ADAPTERS

- A. See Section 05500.

## **PART 3 - EXECUTION**

### 3.01 PRODUCT MARKING

- A. Legibly mark pipe at 5-foot intervals and each coupling to identify the nominal diameter, the outside diameter base, that is, cast-iron or steel pipe (IPS), the material code for pipe and couplings, the dimension ratio number, AWWA C900, and the seal of the testing agency that verified the suitability of the material for potable water service (NSF in the United States).

### 3.02 DELIVERY AND TEMPORARY STORAGE OF PIPE

- A. Ship, store, and place pipe at the installation site, supporting the pipe uniformly. Avoid scratching the pipe surface. Do not stack higher than 4 feet or with weight on bells. Cover to protect from sunlight.
- B. Do not install pipe that is gouged or scratched forming a clear depression.

### 3.03 PIPE LAYOUT FOR CURVED ALIGNMENT

- A. Pipe lengths may be bent for curved alignment but to no smaller radius curve than the following:

<b>Pipe Diameter (inches)</b>	<b>Minimum Curve Radius (feet)</b>
4	400
6	600
8	800
10	1,000
12	1,200

### 3.04 HANDLING PIPE

- A. Hoist pipe with mechanical equipment using a cloth belt sling or a continuous fiber rope that avoids scratching the pipe. Do not use a chain. Pipes up to 12 inches in diameter may be lowered by rolling on two ropes controlled by snubbing. Pipes up to 6 inches in diameter may be lifted by hand.

### 3.05 INSTALLING BURIED PIPING

- A. Install in accordance with AWWA C605, and as follows.
- B. When installing pipe in trenches, do not deviate more than 1 inch from line or 1/4 inch from grade. Measure for grade at the pipe invert.
- C. Backfill materials in the pipe zone shall be imported sand. Do not add successive layers unless the previous layer is compacted to 95% relative compaction per ASTM 01557.
- D. Compact material placed within 12 inches of the outer surface of the pipe by hand tamping only.
- E. Compact trench backfill to the specified relative compaction. Do not float pipe. Do not use high impact hammer-type equipment except where the pipe manufacturer warrants in writing that such use will not damage the pipe.

### 3.06 ASSEMBLY OF PIPE JOINT

- A. The spigot and bell or bell coupling shall be dirt free and slide together without displacing the rubber ring. Lay the pipe section with the bell coupling facing the direction of laying.

- B. Insert the rubber ring into the groove in the bell in the trench just before joining the pipes. First clean the groove. Observe the correct direction of the shaped ring. Feel that the ring is completely seated.
- C. Lubricate the spigot over the taper and up to the full insertion mark with the lubricant supplied by the pipe manufacturer. If the lubricated pipe end touches dirt, clean the pipe end and reapply lubricant.
- D. Insert the spigot into the bell and force it slowly into position.
- E. Check that the rubber ring has not left the groove during assembly by passing a feeler gauge around the completed joint.

3.07 WRAPPING FITTINGS AND RESTRAINED JOINT DEVICES

- A. Wrap buried cast-iron fittings and restrained joint devices with polyethylene per Section 02620.

3.08 FIELD HYDROSTATIC TESTING

- A. Test pressures are shown in the Piping Schedule in the Specifications. Test in accordance with Section 02682.

END OF SECTION

## **SECTION 15014 DUCTILE-IRON PIPE**

### **PART 1 - GENERAL**

#### **1.01 DESCRIPTION**

- A. This section describes materials, testing, and installation of ductile-iron pipe and fittings 24 inches and smaller.
  
- B. Submittals
  - 1. Submit shop drawings in accordance with the General Terms and Conditions and Section 01300.
  - 2. Provide an affidavit of compliance with standards referenced in this specification, e.g., AWWA C151. Submit copy of report of pressure tests for qualifying the designs of all sizes and types of AWWA C153 fittings that are being used in the project. The pressure test shall demonstrate that the minimum safety factor described in AWWA C153, Section 5.5 is met.
  - 3. Submit piping layout profile drawings showing location and dimensions of pipe and fittings; submit after equipment and valve submittals have been reviewed and marked "Resubmittal not required." Include laying lengths of valves, meters, in-line pumps, and other equipment determining piping dimensions. Label or number each fitting or piece of pipe. Piping having identical design pressure class, laying lengths, and bell-and-spigot dimensions that is to be placed in long straight reaches of alignment may have the same identifying label or number.
  - 4. Provide the following information:
    - a. Mortar lining thickness.
    - b. Wall thickness.
    - c. Material test data for this project.
    - d. Show deflections at push-on and mechanical joints.
    - e. Submit joint and fitting details and manufacturer's data sheets.
  - 5. Submit calculations and test data proving that the proposed restrained joint arrangement can transmit the required forces with a minimum safety factor of 1.5.
  - 6. Submit copy of manufacturer's quality control check of pipe material and production. Include hydrostatic test records and acceptance test records. For each acceptance test, submit a stress-strain diagram showing yield strength, yield point, tensile strength, elongation, and reduction in area. Provide specimen test section dimensions and speed and method used to determine speed of testing, method used for rounding of test results, and

reasons for replacement specimens, if any. Submit ringbending test of pipe of the same diameter and pressure class as the pipe required for this project to prove ring-bending stress at 48 ksi results in a factor of safety of 2.0.

7. Submit certificate that cement for mortar lining complies with ASTM C 150, designating type.
8. Submit test report on physical properties of rubber compound used in the gaskets.
9. Submit drawing or manufacturer's data sheet showing flange facing, including design of facing serrations.
10. Submit weld procedure specification, procedure qualification record, and welder's qualifications prior to any welding to ductile-iron pipe.

## **PART 2 - MATERIALS**

### **2.01 PIPE**

- A. Pipe shall be cast ductile (nodular) iron, conforming to AWWA C 151.

### **2.02 PIPE MARKING**

- A. Plainly mark each length of straight pipe and each flange at the bell end to identify the design pressure class, the ductile-iron wall thickness, and the date of manufacture. Mark the spigot end of restrained joint pipe to show clearly the required depth of insertion into the bell.

### **2.03 DESIGN CRITERIA**

- A. Obtain the following information from the drawings:
  1. Elevation of the pipe invert and of the completed ground.
  2. Alignment of the pipeline.
  3. Field test hydraulic gradient elevation (HGL).
  4. Nominal internal diameter, ID.
  5. Design internal pressure class and thickness class.
  6. Joint types(s).

### **2.04 PIPE WALL THICKNESS**

- A. Minimum wall thicknesses for pipe having grooved-end joints shall be as shown in the following table:

<b>Pipe and Fitting Sizes (inches)</b>	<b>Wall Thickness*</b>
16 and smaller	Special Class 52
18	Special Class 54
20	Special Class 55
24 to 36	Special Class 56

\*Special Class and Pressure Class per AWWA C151.

- B. Minimum wall thickness for pipe having push-on or mechanical joints, restrained joints, plain ends, or cast flange ends shall be Class 250 for pipe diameter greater than 14 inches, Pressure Class 350 for pipe diameter less than 12 inches, unless otherwise shown in the drawings.
- C. Minimum wall thickness for pipe having threaded flanges shall be Special Class 53.
- D. Minimum pipe wall thickness required for corporation stops and tapped outlets shall be in accordance with Table A.1 of AWWA C151 for three full threads for design pressures up to 250 psi and four full threads for design pressures over 250 to 350 psi.

## 2.05 FITTINGS

- A. Fittings 48 inches and smaller shall conform to AWWA C110 with a minimum pressure rating of 250 psi. Material shall be ductile iron. Flanges shall be flat faced.
- B. Mechanical joint fittings conforming to AWWA C153 may be used in lieu of AWWA C110 fittings.

Mechanical joint ductile-iron fittings 18 through 48 inches conforming to AWWA C110 (except for laying length) with a minimum pressure rating of 250 psi may also be used.

- C. Grooved-end fittings shall conform to AWWA C110 with grooved ends conforming to AWWA C606, radius cut rigid joints. Fitting material shall conform to ASTM A 48, Class 30; ASTM A 126, Class B; or ASTM A 536, Grade 65-42-10. Wall thickness of ductile-iron (ASTM A 536) fittings shall conform to AWWA C110 or C153; wall thickness of cast-iron fittings shall conform to AWWA C110. Fittings and couplings shall be furnished by the same manufacturer.

- D. Material for fittings with welded-on bosses shall have a Charpy notch impact value of minimum 10 ft-lbs under the conditions defined in AWWA C151. Test completed welds by the liquid penetrant method per ASTM E 165.

## 2.06 FLANGES

- A. Flanges shall be solid back, Class 125 per AWWA C115. Flanges on pipe shall be either cast or threaded. Material shall be ductile iron.
- B. Flanged pipe and fittings shall be shop fabricated, not field fabricated. Threaded flanges shall comply with AWWA C115. Flanges shall be individually fitted and machine tightened in the shop, then machined flat and perpendicular to the pipe barrel. Flanges shall be backfaced parallel to the face of flange. Prior to assembly of the flange onto the pipe, apply a thread compound to the threads to provide a leak-free connection. There shall be zero leakage through the threads at a hydrostatic test pressure of 250 psi without the use of the gasket.

## 2.07 PIPE LINING-CERAMIC EPOXY

- A. Ductile iron pipe and fittings shall be shop-lined with an amine cured novalac epoxy containing at least 20 percent by volume of ceramic quartz pigment, Protecto 401 ceramic epoxy. This lining may be used where polyethylene lining has been called for on the drawings.
- B. Before application of the lining, prepare the pipe surfaces in accordance with the applicator's recommendations. Apply the lining to a thickness of 40 mils nominal dry film thickness. Do not line the face of flanges.
- C. For bell sockets and spigot ends, coat the gasket area and spigot end up to 6 inches back from the end of the spigot with 6 mils nominal, 10 mils maximum of Presto Joint Compound. Apply the joint compound with a brush without causing excess buildup in the gasket seat or on spigot ends.
- D. Test lining thickness using a magnetic film thickness gauge. Conduct testing in accordance with SSPC-P A-2, Film Thickness Rating. Test for pinholes with a non-destructive 2,500 volt test. Repair all defects prior to shipment.

## 2.08 GASKETS FOR FLANGES

- A. **All gaskets shall be EPDM.**

## 2.09 GASKETS FOR MECHANICAL PUSH-ON AND RESTRAINED JOINTS

- A. Synthetic rubber in accordance with AWWA C111.

## 2.10 BOLTS AND NUTS FOR FLANGES

- A. **All bolts and nuts shall be 316 SS.**

## 2.11 OUTLETS AND NOZZLES

- A. Provide outlets 2 inches and smaller by tapping the pipe and attaching a service clamp.
- B. For outlets larger than 2 inches use a tee with a flanged outlet.

## 2.12 JOINTS

- A. Joints in aboveground or submerged piping or piping located in vaults and structures shall be flanged.
- B. Joints in buried piping shall be of the restrained push-on or mechanical-joint type per AWWA C111 except where flanged joints are required to connect to valves, meters, and other equipment.
- C. Restrained joints for piping 6 inches and larger shall be American Cast Iron Pipe "Lok-Ring" or "Flex-Ring," U.S. Pipe "TR-Flex," or equal.
- D. Restrained joints in 4-inch-diameter buried piping shall be American Cast Iron Pipe Company "FastGrip," U.S. Pipe Field-10k gasket within Tyton joint pipe and finings, or equal. Joint restraint shall be certified to four times rated pressure of 200 psi by Factory Mutual.
- E. Provide restraining devices per the Thrust Restraint Table shown in the Detail Drawings.

## 2.13 DUCTILE-IRON PIPE WELDMENTS

- A. All welding to ductile-iron pipe, such as for bosses, joint restraint, and joint bond cables, shall be done at the place of manufacture of the pipe. Perform welding by skilled welders experienced in the method and materials to be used. Welders shall be qualified under the standard qualification procedures of the ASME Boiler and Pressure Vessel Code, Section IX, Welding Qualifications.
- B. Welds shall be of uniform composition, neat, smooth, full strength, and ductile. Completely grind out porosity and cracks, trapped welding flux, and other defects in the welds in such a manner that will permit proper and complete repair by welding.
- C. Completed welds shall be inspected at the place of manufacture by the liquid penetrant method. Conform to the requirements specified in ASTM E 165,

Method A, Type I or Type II. The materials used shall be water washable and nonflammable.

### **PART 3 - EXECUTION**

#### **3.01 DELIVERY, UNLOADING, AND TEMPORARY STORAGE OF PIPE AT SITE**

- A. Limit onsite pipe storage to a maximum of 4 weeks.
- B. Use unloading and installation procedures that avoid cracking of the lining. If necessary, use plastic sheet bulkheads to close pipe ends and keep cement-mortar lining moist.
- C. Deliver the pipe alongside the pipe laying access road over which the pipe trailer-tractors can travel under their own power. Place the pipe in the order in which it is to be installed and secure it from rolling.
- D. Do not move pipe by inserting any devices or pieces of equipment into the pipe barrel. Field repair linings damaged by unloading or installation procedures.

#### **3.02 SANITATION OF PIPE INTERIOR**

- A. During laying operations, do not place tools, clothing, or other materials in the pipe.
- B. When pipelaying is not in progress, close the ends of the installed pipe by a child- and vermin-proof plug.

#### **3.03 INSTALLING FLANGED PIPE AND FITTINGS**

- A. Cut the bore of the gaskets such that the gaskets do not protrude into the pipe when the flange bolts are tightened.

#### **3.04 INSTALLING BURIED PIPING**

- A. Install in accordance with Section 02220 and as follows.
- B. When installing piping in trenches, do not deviate more than 1 inch from line or 1/4 inch from grade. Measure for grade at the pipe invert.
- C. Provide restraining devices at fittings per Detail Drawings.
- D. Assemble restrained joints per manufacturer's instructions.

### 3.05 PAINING AND COATING

- A. Coat pipe located above ground and in vaults and structures as shown in the Piping Schedule in the specifications per Section 09900. Apply prime coat in the shop before transporting pipe to the jobsite. Apply intermediate and finish coats in the field before installing the pipe, then touch up after installation.
- B. Provide bituminous coating on buried pipe.
- C. Coat buried flanges and buried mechanical and restrained joint bolts, nuts, and glands per Section 09900.
- D. Coat submerged pipe with fusion-bonded epoxy.

### 3.06 POLYETHYLENE ENCASEMENT OF BURIED PIPE AND FITTINGS

- A. Wrap buried pipe, fittings, and joints with polyethylene per Section 02620.

### 3.07 CLEANING PIPE

- A. After interior joints have been pointed and mortar has hardened, sweep pipe clean of all dirt and debris. If hardened mud exists in the pipe, remove with the use of pressurized water hoses.

### 3.08 HYDROSTATIC TESTING

- A. Test pressures are shown in the Piping Schedule in the specifications. Test in accordance with Section 02682.

END OF SECTION

## **SECTION 15018 HDPE FORCE MAIN PIPING**

### **PART 1 - GENERAL**

#### 1.01 DESCRIPTION

- A. This specification governs the material, pipe, fittings, joining methods and general construction practice for High Density Polyethylene (HDPE) piping systems.

#### 1.02 QUALITY ASSURANCE

- A. References, American National Standards Institute (ANSI), American Society for Testing and Materials (ASTM), Federal Specifications (FS), International Standards Organization (ISO), and manufacturer's printed recommendations.

### **PART 2 - PRODUCT**

#### 2.01 PIPE

- A. Pipe shall be manufactured from a PE 3408 resin listed with the Plastic Pipe Institute (PPI) as TR-4. The resin material shall meet the specifications of ASTM D3350-02 with a minimum cell classification of PE345464C. Pipe shall have a manufacturing standard of ASTM D3035. The pipe shall contain no recycled compounds except that generated in the manufacturer's own plant from resin of the same specification from the same raw material. The pipe shall be homogeneous throughout and free of visible cracks, holes, foreign inclusions, voids, or other injurious defects. The pipe shall be identified for the application by a green colored stripe AND, for long term identification, "**Low Pressure Sewer FM**" shall be debossed (indent imprinted) in the identification line of the pipe.
1. Pipe & Fittings for 1- $\frac{1}{4}$ " Service Laterals shall be SDR 9 IPS HDPE
  2. Pipe & Fittings for 2" & 3" Force Main shall be SDR 13.5 IPS HDPE
  3. Pipe & Fittings for 4" and Larger Force Main shall be SDR 13.5 DIPS HDPE

#### 2.02 FITTINGS

- A. **BUTT FUSION FITTINGS:** Butt fusion fittings shall be in accordance with ASTM D3261 and shall be manufactured by injection molding, a combination of extrusion and machining, or fabricated from HDPE pipe conforming to this specification. All fittings shall be pressure rated to provide a working pressure rating no less than that of the pipe. The use of fabricated fittings shall be limited

as much as possible. The fitting shall be homogeneous throughout and free of visible cracks, holes, foreign inclusions, voids, or other injurious defects.

- B. ELECTROFUSION FITTINGS: Electrofusion Fittings shall be PE3408 HDPE, Cell Classification of 345464C as determined by ASTM D3350-02 and be the same base resin as the pipe. Electrofusion Fittings shall have a manufacturing standard of ASTM F1055.

### **PART 3 - EXECUTION**

#### **3.01 GENERAL**

- A. PIPE & FITTINGS: Size as indicated on the plans. Install as shown in accordance with manufacturer's recommendations.

#### **3.02 JOINING:**

- A. All joints shall be made by Butt Fusion or with the use of Electrofusion Fittings (unless otherwise shown on drawings). Use of mechanical connectors, fittings or inserts is prohibited.
- B. BUTT FUSION: Sections of polyethylene pipe should be joined into continuous lengths on the jobsite above ground. The joining method shall be the butt fusion method and shall be performed in strict accordance with the pipe manufacturer's recommendations. The butt fusion equipment used in the joining procedures should be capable of meeting all conditions recommended by the pipe manufacturer, including, but not limited to, temperature requirements of 400 degrees Fahrenheit, alignment, and an interfacial fusion pressure of 75 PSI. The butt fusion joining will produce a joint-weld strength equal to or greater than the tensile strength of the pipe itself.
- C. SIDEWALL FUSION: Sidewall fusions for connections to outlet piping shall be performed in accordance with HDPE pipe and fitting manufacturer's specifications. Service saddles for 1-1/4" service laterals shall be Electrofusion type. In the event that the main has been put into service and must remain under pressure, Electrofusion tapping service saddles will be used.
- D. OTHER: Socket fusion, hot gas fusion, threading, solvents, and epoxies may not be used to join HDPE pipe.

#### **3.03 QUALITY AND WORKMANSHIP**

- A. The pipe and/or fitting manufacturer's production facility shall be open for inspection by the owner or his designated agents with a reasonable advance notice. During inspection, the manufacturer shall demonstrate that it has facilities

capable of manufacturing and testing the pipe and/or fittings to the standards required by this specification.

### 3.04 PIPE PACKAGING, HANDLING & STORAGE

- A. The manufacturer shall package the pipe in a manner designed to deliver the pipe to the project neatly, intact and without physical damage. The transportation carriers shall use appropriate methods and intermittent checks to insure the pipe is properly supported, stacked and restrained during transportation such that the pipe is not nicked, gouged, or physically damaged.
- B. Pipe shall be stored on clean, level ground to prevent undue scratching or gouging. If the pipe must be stacked for storage, such stacking shall be done in accordance with the pipe manufacturer's recommendations. The pipe shall be handled in such a manner that it is not pulled over sharp objects or cut by chokers or lifting equipment.
- C. Sections of pipe having been discovered with cuts or gouges in excess of 10% of the pipe wall thickness shall be cut out and removed. The undamaged portions of the pipe shall be rejoined using the heat fusion joining method.
- D. Fused segments of the pipe shall be handled so as to avoid damage to the pipe. Chains or cable type chokers must be avoided when lifting fused sections of pipe. Nylon slings are preferred. Spreader bars are recommended when lifting long fused sections.

## **PART 4 - TESTING**

### 4.01 PRESSURE PIPELINES

- A. Refer to Specification Section 02682 Pressure Testing of Piping.
- B. Pressure pipelines shall be tested in accordance with the specifications and requirements of the engineer, pipe manufacturer's recommendations and ASTM F2164. Hydrostatic pressure testing with potable water will be the only method allowed. After allowing for temperature equalization and the initial expansion phase, a test pressure of 100 psi shall be held for a period of 1 hour. If no visual leakage is observed and pressure during the test phase remains steady (within 5% of the test phase pressure) for the 1 hour test phase period, a passing test is indicated.

**END OF SECTION**

## SECTION 15100 VALVES

### PART 1 - GENERAL

#### 1.01 THE REQUIREMENT

- A. The Contractor shall provide all tools, supplies, materials, equipment, and labor necessary for furnishing, epoxy coating, installing, adjusting, and testing of all valves and appurtenant work, complete and operable, in accordance with the requirements of the Contract Documents. Where buried valves are shown, the Contractor shall furnish and install valve boxes to grade, with covers, extensions, and position indicators.
- B. The provisions of this Section shall apply to all valves and valve operators specified in the various Sections of these Specifications except where otherwise specified in the Contract Documents. Valves and operators in particular locations may require a combination of units, sensors, limit switches, and controls specified in other sections of these Specifications.
- C. All below grade valves installed in water, wastewater or drainage systems owned and maintained by the Florida Keys Aqueduct Authority (FKAA) shall be equipped with identification markers/tag. All valve information shall be approved by FKAA prior to installation. Valve tags shall be 2-inch square or circular aluminum or 1/16-inch tick fiberglass manufactured by W.H. Brady B-60, Seton Name Plat Corp. Series SVT, or equal.

#### 1.02 REFERENCE SPECIFICATIONS, CODES, AND STANDARDS

- A. Commercial Standards:
  - ANSI B16.1 Cast Iron Pipe Flanges and Flanged Fittings, Class 25, 125, 250, and 800.
  - ANSI B16.5 Pipe Flanges and Flanged Fittings, Steel Nickel Alloy and Other Special Alloys.
  - ANSI B16.21 Nonmetallic Flat Gaskets for Pipe Flanges
  - ANSI B18.21 Square and Hex Bolts and Screws - Inch Series
  - ANSI/ASME B1.20.1 General Purpose Pipe Threads (Inch).
  - ASTM A 48 Specification for Gray Iron Castings.

ASTM A 126	Specification for Gray Iron Castings for Valves, Flanges, and Pipe Fittings.
ASTM A 536	Specification for Ductile Iron Castings.
ASTM B 62	Specification for Composition Bronze or Ounce Metal Castings.
ASTM B 584	Specification for Copper Alloy Sand Castings for General Applications.
AWWA C550	Protective Interior Coatings for Valves and Hydrants.

### 1.03 SUBMITTALS

- A. Shop Drawings: Shop drawings of all valves and operators including associated wiring diagrams and electrical data, shall be furnished as specified in Section 01300, "Submittals".
- B. Data to be submitted shall include but not be limited to:
  - 1. Catalog data consisting of specifications, assembly and installation drawings, and a parts schedule that identifies the materials to be used various parts and accessories. The illustrations shall be in sufficient detail to serve as a guide for assembly and disassembly.
  - 2. Weight of all component parts and assembled weight.
  - 3. Listing of all lubricants required for the equipment.
  - 4. Spare parts and special tools.
  - 5. Operation and maintenance manuals as required by Section "Submittals".

### 1.04 QUALITY ASSURANCE

- A. Unless otherwise specified, each valve body shall be tested under a test pressure equal to twice its design water-working pressure.
- B. Unless otherwise specified, all interior bronze parts of valves shall conform to the requirements of ASTM B 62, or, where not subject to dezincification, to ASTM B 584.

## 1.05 TOOLS

- A. Special tools, if required for normal operation and maintenance shall be supplied with the equipment.

## **PART 2 - PRODUCTS**

### 2.01 VALVES – GENERAL REQUIREMENTS

- A. The Contractor shall furnish all valves, stem extensions, and other accessories as shown or specified. All valves shall be new and of current manufacture.
- B. All valves shall have a minimum design pressure rating of 150 psi and capable of a test pressure of 300 psi. For service applications with pressures in excess of 150 psi, valves shall have a minimum pressure rating in excess of the service application working pressure.
- C. All valves and appurtenances shall have the name of the maker and the working pressure for which they are designed cast in raised letters upon some appropriate part of the body.
- D. Cast iron parts of valves shall meet the requirements of ASTM A 126, "Standard Specifications for Grey Iron Castings for Valves, Flanges and Pipe Fittings, Class 'B'". Flanged ends shall be flat-faced and have bolt circle and bolt patterns conforming to ANSI B16.1 Class 125 unless otherwise specified hereinafter.
- E. All castings shall be clean and sound, without defects of any kind and no plugging, welding or repairing of defects will be permitted. All bolt heads and nuts shall be hexagonal conforming to ANSI B18.2.1. Gaskets shall be full face and made of natural or synthetic elastomers in conformance with ANSI B16.21 suitable for the service characteristics, especially chemical compatibility and temperature. Nonferrous alloys of various types shall be used for parts of valves as specified. Where no definite specification is given, the material shall be the recognized acceptable standard for that particular application.
- F. All buried valves shall have mechanical joint pipe ends and shall be provided with cast-iron valve boxes unless otherwise indicated. Valve boxes shall be as specified elsewhere in this Section.
- G. All buried valves shall have an operator shaft extension from the valve or valve operator to finish grade, a 2-inch square AWWA operating nut, and cover or box and cover as may be required.
- H. Where subject to dezincification, gate valve stems shall be of bronze to ASTM B 62, containing not more than 5 percent of zinc nor more than 2 percent of

aluminum. Where dezincification is not a problem, bronze to ASTM B 584 may be used. For valve stems with a minimum tensile strength of 60,000 psi, a minimum yield strength of 40,000 psi, and an elongation of at least 10 percent in 2 inches, as determined by a test coupon poured from the same ladle from which the valve stems to be furnished are poured.

- I. Except where otherwise specified, ferrous surfaces, exclusive of stainless steel surfaces, in the water passages of all valves 4 inch and larger, as well as the exterior surfaces of all submerged valves, shall receive a fusion-bonded epoxy coating in accordance with AWWA C550. Flange faces of valves shall not be epoxy coated. The Contractor, through the valve manufacturer, shall certify in writing that such coating has been applied and tested in the manufacturing plant prior to shipment, in accordance with these Specifications.

## 2.02 OPERATORS, GENERAL

- A. Valves and gates shall be furnished with operators, provided by the valve or gate manufacturer. All operators of a given type shall be furnished by the same manufacturer. All valve operators, regardless of type, shall be installed, adjusted, and tested by the valve manufacturer at the manufacturing plant. Operator orientation shall be verified with the Engineer prior to installation. If this requirement is not met, changes to orientation shall be made at no additional cost.
- B. All operators, unless otherwise specified, shall turn counter-clockwise to open. Operators shall have the open direction clearly and permanently marked. All valve operators, manual, electric and pneumatic, shall be provided with the valve by the valve manufacturer. The Contractor, through the valve manufacturer, shall be solely responsible for the selection of the proper operator to meet the operating conditions specified herein. Field calibration and testing of the operators and valves to ensure a proper installation and an operating system shall be the responsibility of the Contractor.
- C. All manual operators shall have levers or handwheels, unless otherwise shown. Where buried, the valves shall have extensions with square nuts or floor stands. Valves mounted higher than 6 feet above floor or operating level shall have chain operators. Chains shall extend to within three (3) feet from operating floor. Unless otherwise shown or specified, valves of sizes 4-inch and larger shall have gear-assisted operators. Valves over five (5) feet to center line shall be rolled toward the operating side to make the handwheel or wrench more accessible.
- D. Operation of valves and gates shall be designed so that the effort required to operate the handwheel, lever or chain shall not exceed 40 pounds applied at the extremity of the wheel or lever. The handwheels on valves 14 inches and smaller shall not be less than 8 inches in diameter, and on valves larger than 14 inches the handwheel shall not be less than 12 inches in diameter.

- E. Chainwheel operator shall be fabricated of malleable iron and pocketed type chainwheels with chain guards and guides. Chainwheel operators shall be marked with an arrow and the word "open" indicating direction to open. The operators shall have galvanized smooth welded link type chain. Chain that is crimped or has links with exposed ends shall not be acceptable.
- F. Floor stands shall be cast iron, non-rising stem type with lockable hand wheel operator, valve position indicator and steel extension stem. Hand wheel shall be lockable in the full closed position. The floor stand shall be furnished with an armored padlock and six keys. Lock shall be as manufactured by Master, Schlage or equal. Floor stand shall be standard pattern type as manufactured by Clow Corporation, or equal.

### 2.03 VALVE BOXES

- A. Valve boxes shall be of the adjustable telescope type, cast iron, suitable to withstand heavy traffic. They shall be Model No. F-2452, as manufactured by James B. Clow & Sons, Mueller, U.S. Foundry No. 7615, No. 7630, or approved equal. The covers shall be marked as indicated on the Detail Drawings or other depending on service.
- B. Valve boxes shall be provided with suitable heavy bonnets and shall extend to such elevation at or slightly above the finished grade surface as directed by the Engineer. The boxes shall be installed perpendicularly, centered around and covering the upper portions of the valve or valve operator, or the pipe.
- C. Valve boxes shall be provided with concrete base and valve nameplate with suitable anchors for casting in concrete. Nameplate shall be 3-inch diameter bronze disk with raised lettering 1/8-inch high as manufactured by Wagco Markers; or equal.
- D. The interior and exterior surfaces of valve boxes shall be coated with asphalt.

### 2.04 BRONZE BALL VALVES

- A. Bronze
  - 1. Ball valves for service unless otherwise indicated shall be end entry type with bronze body and trim, TFE seats, TFE or Viton Stem seals and flanged or threaded end connections as indicated.
    - a. Valve body shall be either two or three piece design; no design with an internal retaining ring for the ball shall be acceptable.
    - b. Valves shall be Class 150.
    - c. Valves shall be as manufactured by Hills McCanna, or equivalent

by Jamesbury, WKM, Whitey, NIBCO, or Watts Regulator Company.

- d. Valves shall be supplied with manual lever or "T" handle.
- e. Valves shall be non-lubricated, and capable of sealing in either flow direction.

B. Stainless Steel

- 1. Ball valves for use with stainless steel piping systems, including air lines release lines and moisture drains, shall be end entry type with type 316 stainless steel body and trim, TFE seats and seals and flanged or threaded connections as indicated.
  - a. Valve body shall be either two or three piece design. No internal ring for the ball shall be acceptable.
  - b. Valves shall be class 150.
  - c. Valves shall be McCannaflo series 602 by Hills McCanna or equivalent models by Jamesbury, WKM or Whitey.
  - d. Valves shall be supplied with manual lever or "T" handle.
    - 1) Valves used as moisture drain valves shall be installed at low points of the line and plugged or capped.

2.05 PLUG VALVES

- A. Eccentric plug valves, 1/2 inch through 3 inches, shall be non lubricated type. Minimum pressure rating shall be 175 psi. Bodies shall be made of cast iron per ASTM A 126, Class B. Ends shall be threaded or flanged (ASNI B16.1, Class 125). Plug shall be cast iron (ASTM A 1-26, Class B) with neoprene coating. Body capscrews and bolts and nuts shall be Type 316 stainless steel. Packing shall be nitrile butadiene-filled Teflon. Valves shall be DeZurik Figure 118, Clow, Pratt "Ballcentric," or equal.
- B. Eccentric plug valves, 4 inches through 12 inches, shall be nonlubricated type. Minimum pressure rating shall be 175 psi. Bodies shall be cast iron per ASTM A 126, Class B. Ends shall be flanged, Class 125 per ANSI B 16.1. Plugs shall be cast iron (ASTM A 126, Class B), or ductile iron (ASTM A 536, Grade 65-45-12) with neoprene facing. Valve body seats shall be Type 304 or 316 stainless steel or have a raised welded-in overlay at least 1/8-inch thick of not less than 90% nickel. Body capscrews and bolts and nuts shall be Type 316 stainless steel. Packing shall be butadiene-filled Teflon. Provide 100% port area. Valves shall be DeZurik Figure 118, Clow F-5412, Milliken "Millcentric," or equal.
- C. Valve ends shall be flanged (or grooved end couplings) or mechanical joint for above ground and underground installation, respectively. Valve body seats shall

have a welded-in overlay of not less than 90-percent nickel for all parts, which comes in contact with the plug face. Packing shall be safely adjustable and replaceable without removing the valve from service, with the body pressurized to its full rated pressure. Bearings shall be permanently lubricated 316 stainless steel in both upper and lower journals in accordance with AWWA Standard C-507. The valve supplied shall have drip tight shut off with flow in either direction at the full pressure rating of the valves. All exposed nuts, bolts, springs and washers on buried and on above ground outdoor service valves shall be 316 stainless steel.

- D. Plug coating shall be Teflon or nylon, permanently bonded to the plug. Body, gland, and cover cap screws and bolts and nuts shall be Type 316 stainless steel Provide operating for buried valves.
- E. Valves shall be bolted design and be provided with lever operators for interior and exposed service with nominal pipe sizes six (6) inches and less.
- F. Interior and exposed service with nominal pipe sizes eight (8) inches and larger shall be provided with totally enclosed worm gear actuators with permanently lubricated bronze bearings. The actuators shall be properly sized to suit the maximum differential across the valve in either direction.
- G. For buried or submerged service, valves shall be provided with an AWWA operating nut. Valves with nominal pipe sizes eight (8) inches and larger shall have permanently lubricated totally enclosed worm gear actuators.
- H. Flanged valves shall be faced and drilled conforming to ANSI B16.1 Class 125. Mechanical joint bells shall conform to AWWA C111. Threaded ends shall conform to the NPT Standard.
- I. All exposed nuts, bolts, springs, washers, etc. shall by type 316 stainless steel.
- J. Valves shall have the standard face to face dimensions of AWWA gate valves for nominal pipe sizes three (3) to twelve (12) inches with flanged end connection.
- K. Valve bodies and plugs shall be semi-steel conforming to the requirements of ASTM A126 Grade B cast iron. Plugs shall be covered with neoprene for general service.
- L. Valve seats shall be corrosion resistant consisting of a welded-in overlay of 90 percent pure nickel.
- M. Valve bearings shall be replaceable type 316 stainless steel for both the upper and lower journals.
- N. Shaft seals shall be multiple ring V-Type Buna-N packing. The stuffing box shall be designed to allow the packing to be adjusted and replaced when the valve is in service.

- O. Where required, valve operators shall be provided with extension bonnets.

#### 2.06 SWING CHECK VALVES (3-INCH AND LARGER) FOR LIQUID SERVICE

- A. Unless otherwise indicated or specified, check valves 3-inches and larger shall be cushion swing check with outside lever and weights. Valves shall have Class 125 flanged ends faced and drilled in accordance with ANSI Standard. Check Valves shall have cast iron bodies, with the following components of stainless steel: body ring, disc ring, clapper hinge shaft, high shaft key, clapper spacers, disc stud, disc stud nut and bushing, disc retaining washer and cotter pin. The hinge pin shall extend outside the cast iron body through lubricated stainless steel bushings and outside packed glands on each side of the valve. Each bushing shall be provided with a button head grease fitting. Stainless steel shall be at least 18-8 nickel-chromium content. Check valves shall be tested at the factory and shall be drip tight under a hydrostatic pressure of 200 psi applied to the downstream side of the disc. A certified test report shall be furnished with each valve.
- B. Suppliers, or Equal
  1. APCO; Series 6000
  2. G.A. Industries

#### 2.07 SWING CHECK VALVES (2-1/2-INCH AND SMALLER) FOR LIQUID SERVICE

- A. Swing check valves for steam, water, oil, or gas in sizes 2-1/2-inch and smaller shall be suitable for a steam pressure of 150 psi and a cold water pressure of 300 psi. They shall have screwed ends, unless otherwise shown, and screwed caps.
- B. The valve body and cap shall be of bronze to ASTM B 61 with threaded ends to ANSI/ASME BI.20.1.
- C. Valves for steam service shall have bronze discs, and for cold water, oil, and gas service replaceable composition discs.
- D. The hinge pins shall be of bronze or stainless steel.
- E. Suppliers or Equal
  1. Crane Company.
  2. Milwaukee Valve Company.
  3. Stockham Valves and Fittings
  4. Val-Matic.

5. APCO; Series 800T.
6. NIBCO

2.08 SLANTING DISC CHECK VALVE

A. Where indicated on the Drawings, check valve shall be slanting disc type. The body shall be heavy two piece cast iron, not fabricated steel. The two (2) body halves and body seat shall be a-ring sealed and bolted together in a manner to sandwich the body seat on 55 degree angle. Each body half must have an access covered hole for internal inspection, and each body half and disc shall be fully machined to accept attachment of a Top Mounted Oil Dash Pot. The seat ring and disc ring must be of the design that permits replaceability in the field without need for special tools of machining. The pivot pins in the body and the bushings, in the disc lugs, must be stainless steel, but of different hardnesses to prevent galling. The bushings shall be press fit to prevent wear. An indicator shall be provided to show the position of the disc. The area throughout the valve body must be equal to full pipe area. The area thru the seat section shall be 40% larger than the inlet and outlet of the valve to achieve lowest head loss.

B. Valve materials shall be certified conforming to the following A.S.T.M. specifications.

Bodies	Cast Iron	ASTM A126 GR.B
Disc (2" thru 10")	Bronze	ASTM B584 C83700
Disc (12" & larger)	Ductile Iron	ASTM A536
Seat Ring & Disc Ring	Bronze	ASTM A271 C92200
Pivot Pins (2" thru 10")	Aluminum Bronze	ASTM B 150 Alloy 2
Pivot Pins (12" & larger)	Stainless Steel	ASTM A582 T303
Pivot Pin Bushings	Stainless Steel	ASTM A269 T304
Exterior Paint	Phenolic Primer Red Oxide	FDA Approved for Potable Water Contact

C. Each valve shall have a top mounted oil dashpot to control opening and closing cycle of the valve in order to prevent surge and water hammer. Dashpot must have two (2) control flow rates: (1) 90% rapid rate; (1) 10% slow rate during shut-down and start-up. Each rate shall be infinitely and independently adjustable. The dashpot must be a self contained oil system, separate and independent from the water line media. The oil reservoir for closing cycle shall be open to atmosphere with an air breather cap to prevent dust and other media from contaminating the oil. The oil reservoir for opening cycle must be hermetically sealed to contain

pressure if necessary (air over oil) and be equipped with a pressure gauge and pneumatic air valve.

- D. Valves shall be provided with electrical signal switches mounted on the indicator cover to give remote signal indicating if the valve disc is closed.
- E. Suppliers, or Equal
  - 1. APCO; Series 800T

## 2.09 STAINLESS STEEL BALL VALVES

- A. Ball valves for use with stainless steel piping systems, including instrument isolation, air lines, and moisture drains shall be end entry type with type 316 stainless steel body and trim, Teflon seats and seals and flanged or threaded connections as indicated. Valve body shall be either two or three piece design, no internal ring for the ball shall be acceptable. Valves shall be class 150, ASTM A479 GR 316 or ASTM A351 GR CF8M, rated 1,000-pound WOG.
- B. Valves shall be supplied with stainless steel manual lever or "T" handle. Valves used as moisture drain valves shall be installed at low points of the line and piped to drain.
- C. Suppliers, or Equal
  - 1. Janesbury Corporation;
  - 2. Jenkins Bros.;
  - 3. Lunkenheimer Flow Control;
  - 4. Wm. Powell Company;
  - 5. Worcester Controls;
  - 6. Swagelock Series 40 (instrument isolation) or Series 60 (SS Ball Valve).

## 2.10 RESILIENT-SEATED GATE VALVES

- A. Gate Valves three inches and larger shall be resilient seated or resilient wedge gate valves for 150 psi working pressure, conforming to AWWA Standard C-509. The gate valves shall have a high strength bronze non-rising stem. Valves shall have neoprene, Buna-N or equal, but not natural rubber, O-ring stem seals (compatible with chloramines) and be of a design that permits the replacement of the O-ring seals while the valve is in service, without undue leakage. All exposed bolts used with valves shall be AISI Type 304 stainless steel. The valves shall operate in a vertical position with a vertical operating nut shaft and shall be suitable for buried service. The valves shall open by turning the operating nut

counterclockwise. Operating nuts shall be AWWA two inch square nuts with skirts. Valve body, bonnet, and gate shall be ductile iron conforming to ASTM-A536. The gate valves for distribution systems shall be designed for 150 psi working water pressure rating. Gate valves for connection to the high pressure transmission mains and installed between the transmission mains and pressure reducing valves, shall be designed for 250 psi working pressure and 400 psi test pressure and shall be furnished with two Class 250 flanges.

B. Suppliers, or Equal

1. American Flow Control (Series 2500);
2. Clow Corporation;
3. Kennedy Valve Mfg. Co., (ITT Grinnell);
4. Mueller Company;

2.11 GATE VALVES (SMALLER THAN 3-INCH)

A. Gate valves, smaller than 3-inch, for general purpose use shall be heavy duty type for industrial service. with threaded or soldered ends to suit piping. The bodies shall have threaded tops or union bonnets, of bronze to ASTM B 62, with bronze stems, solid wedges, metal handwheels, and Teflon-impregnated or other acceptable packing. Buried valves shall have non-rising stems. Exposed valves (above ground) shall have rising stems. All valves shall have a minimum pressure rating of 125 psi steam, or 200 psi cold water, unless otherwise specified or shown.

B. Suppliers. or Equal

1. Crane Company;
2. Milwaukee Valve Company;
3. Wm. Powell Company;
4. Stockham Valves and Fittings.

2.12 TAPPING SLEEVE AND VALVE

A. Tapping sleeves shall be ASTM 285 Grade C Steel or ASTM A-36 Carbon Steel with Fusion applied epoxy coating (AWWA C213-70). Tapping Sleeves shall utilize AISI Type 304 (ASTM A320 Grade B8) stainless steel bolts and nuts. Tapping Sleeves shall be as manufactured by JCM Industries Model 412, Romac Industries Model FTS420, or approved equal.

B. Tapping valves shall be as specified for gate valves, hereinabove, and as further

specified herein. Tapping valves for use in tapping distribution mains shall be resilient seat gate valves. Inlet shall be Class 125, ANSI B16.1, ductile iron flange with centering ring to match tapping sleeve. Outlet shall be a mechanical joint. Tapping valve shall be compatible for use with drilling machine. Operating nut shall be 2" square and open to the left. Tapping valves shall be attached to tapping sleeves with heavy hex-head AISI Type 316 (ASTM A320 Grade B8) stainless steel bolts. Approved tapping valves include: American Flow Control Series 2500 or approved equal.

#### 2.13 AIR RELEASE VALVES

- A. Refer to Section 15130.

#### 2.14 AIR/VACUUM VALVE

- A. Refer to Section 15130.

#### 2.15 HDPE BALL VALVES

- A. Ball valves for use with HDPE piping system shall be PE3408/PE100 Black SDR 11 rated @ 160 PSI. Valve shall be an integrally fused full port poly ball valve to allow unrestrictive flow with an operating temperature range of -20F to 140F.
- B. Valves shall meet ASTM D 2513 requirements, ISO 9001, and be manufactured with materials that are approved for water contact as defined by NSF.

### **PART 3 - EXECUTION**

#### 3.01 VALVE INSTALLATION

- A. All valves and appurtenances shall be installed in accordance with the manufacturer's written instructions and in the locations shown, true to alignment and rigidly supported. Any damage to the valves and appurtenances shall be repaired to the satisfaction of the Engineer before they are installed.
- B. All valves shall be installed to provide easy access for operation, removal, and maintenance and to avoid conflicts between valve operators and structural members or handrails.
- C. Install all floor boxes, brackets, extension rods, guides, the various types of operators and appurtenances as shown on the Drawings that are in masonry floors or walls, and install concrete inserts for hangers and supports as soon as forms are erected and before concrete is poured. Before setting these items, the Contractor

shall check all plans and figures which have a direct bearing on their location, and he shall be responsible for the proper location of these valves and appurtenances during the construction of the structures.

- D. Valve boxes with concrete bases shall be installed as shown on the Drawings. Mechanical joints shall be made in the standard manner. Valve stems shall be vertical in all cases. Place cast iron box over each stem with base bearing on compacted fill and top flush with final grade. Boxes shall have sufficient bracing to maintain alignment during backfilling. Knobs on cover shall be parallel to pipe. Remove any sand or undesirable fill from valve box.

### 3.02 TESTING

- A. All valves shall be hydrostatically field tested at the specified pipeline test pressures specified in the piping sections. Any leakage or “sweating” of joints shall be stopped and all joints shall be tight.

END OF SECTION

**SECTION 15120  
MISCELLANEOUS APPURTENANCES**

**PART 1 - GENERAL**

1.01 WORK INCLUDED

- A. Ball Valve Curb Stops
- B. Ball Valve Meter Stops
- C. Saddles
- D. Pack Joint Tees
- E. Corporation Stops
- F. Pump Suction Control Valves
- G. Fire Hydrants
- H. Polyethylene Tubing
- I. Valve Identification Systems
- J. Detectable Warning Tape

1.02 RELATED WORK

- A. Section 15013: PVC Force Main Pipe
- B. Section 15015: Water Mains

1.03 REFERENCES

- A. AWWA - American Waterworks Association.
- B. ASTM - American Society for Testing Materials
- C. FS - Federal Specification.

1.04 SHOP DRAWINGS

- A. Submit detailed Shop Drawings in accordance with Section 01300. Clearly indicate make, model, location, type, size, and pressure rating.

## **PART 2 - PRODUCTS**

### **2.01 BALL VALVE CURB STOPS**

- A. Curb stops shall be Ford Series B-11, Mueller H10283 or approved equal. Ball valves shall have locking lugs and 2" square operating nut which opens to the left on 1 ½" and 2" valves.

### **2.02 BALL VALVE METER STOPS**

- A. Meter stops shall be Ford Series B43 or BF13, or an approved equal. Valves shall have lockable padlock wings, and open to the left.

### **2.03 SADDLES**

- A. Saddles shall be Rockwell International, Type 323, style double strap bronze saddles, for PVC and ductile iron pipe, or approved equal. Tapping saddles shall be used for all taps on 4" PVC pipe.

### **2.04 PACK JOINT TEES**

- A. Pack joint tees shall be used to connect services to 2" water mains. They shall be Ford T441-774 or approved equal.

### **2.05 CORPORATION STOPS**

- A. Corporation stops shall be Ford F-1000, FB-1000, or approved equal. The largest corporation stop which can be tapped directly into the pipe is 1-inch.

### **2.06 FIRE HYDRANTS**

- A. Fire hydrants shall be 6-inch, mechanical joint pipe connection with a minimum 5.25 inch valve opening. Hydrants shall be of AWWA approved type, designed for a 150 psi working pressure.
- B. Provisions shall be made for two 2.5 inch hose nozzles and one 4.5 inch pumper nozzle, open left (counter clockwise). All base threads shall conform to the national standard hose coupling thread specifications. Fire hydrants shall have a safety stem coupling to prevent bending of the operating stem, and a safety flange to prevent breaking of the hydrant barrel if hit by a vehicle. The hydrant base (shoe) shall be coated with a two-part thermo-setting epoxy, not less than 4 mils thick. Weather cap shall be metal. The maximum pressure loss allowable for the 5-1/4" valve opening shall be 2.2 psi at 1000 gpm flow based on 5 foot bury with 6" diameter inlet. The

hydrant shall be a Mueller Figure No. A-423 American Darling B-84-B. The drain hole in the foot of the fire hydrant shall be plugged and all buried bolts shall be AISI Type 316 stainless steel.

- C. Fire hydrants shall be painted with one coat of rust proof primer and two finish coats of an approved paint of the color directed by FKAA.

## 2.07 POLYETHYLENE TUBING

- A. Service lines shall be polyethylene tubing conforming to ASTM D2737; SDR 9 with a minimum working pressure of 200 psi.

## 2.08 VALVE IDENTIFICATION SYSTEMS

### A. Buried Valves:

1. In paved areas, tops of valve box covers shall be set flush with pavement. Following paving operations, a 30-inch square shall be neatly cut in the pavement around the box and the paving removed. The top of the box shall then be adjusted to the proper elevation and a 30-inch square by 6-inch thick concrete pad poured around the box cover. Concrete pads in traffic areas shall be reinforced with No. 4 reinforcement bars as shown on the drawings. Concrete for the pad shall be 3,000 psi compressive strength.
2. In unpaved areas, tops of valve box covers shall be set 0.20 foot above finished grade. After the top of the box is set to the proper elevation, a 30-inch square by 6-inch thick concrete pad shall be poured around the box cover. Concrete for the pad shall be 3,000 psi compressive strength.
3. Shall have valve boxes protected by a concrete pad. The concrete pad for the valve box cover shall have a 2 2 -inch diameter, bronze disc embedded in the surface as shown on the drawings. The bronze disc shall have the following information neatly stamped on it:
  - a. Size of valve, inches
  - b. Type of valve:
    - 1) GV - Gate Valve
    - 2) BFV - Butterfly Valve
    - 3) Ball Valve
  - c. Number of turns to fully open
  - d. Direction to open
  - e. Year of installation

## 2.09 DETECTABLE WARNING TAPE

A. Detectable warning tapes shall be provided for all water, wastewater and reclaimed water mains. Such tape shall be magnetic type, 5 mils thick, 2 mil thick aluminum center core, encased in mylar. Tape shall be imprinted with the following words:

- "Caution: Water Line Below" (color shall be blue)
- "Caution: Wastewater Line Below" (color shall be green)
- "Caution: Reclaimed Line Below" (color shall be purple)

Printing shall appear on both sides of the tape. The tape shall be placed between 6 and 12 inches below finish grade.

END OF SECTION