SECTION 11106
PROGRESSIVE CAVITY SLUDGE PUMPS

PART 1 - GENERAL

1.01 DESCRIPTION

A. SCOPE: The Contractor shall provide three (3) progressive cavity pumps, one (1) for the grease receiving station and two (2) for the transfer of septage/grease from the ground storage tanks to the grease dewatering screw press. This section specifies positive displacement progressing cavity pumps, complete with electric motors, drives, controls, wiring, associated piping, and all specified appurtenances complete and operable, in accordance with the Contract Documents.

B. TYPE: The pumping units shall be of the self-priming, positive displacement, progressing cavity type specifically designed for pumping the specified septage/grease.

C. DESCRIPTION: The grease receiving station pumps shall have the capability to pump to either the septage storage tank or the grease storage tank. The transfer pumps shall pump septage/grease from the septage storage tank or the grease storage tank to the dewatering screw press. Both transfer pumps shall be able operate at the same time.

D. PERFORMANCE AND DESIGN REQUIREMENTS

1. Septage/grease handling pumps shall be specifically designed and selected for continuous duty pumping of liquids with percent solids up to 8% and temperatures ranging from 32 to 113 degrees F.

2. The pumps shall be of the compact, close-coupled design. The gear reducer shall be sized for a minimum service factor of 1.5 and designed with a thrust load capability of 150 percent of the actual thrust load.

3. The pumps, along with associated drive appurtenances, shall be mounted on common fabricated steel baseplates.

4. To assure unity of responsibility, the pumps, motors, and controls shall be furnished and coordinated by the pump manufacturer. The pump manufacturer, in cooperation with the Contractor, shall assume complete responsibility for the satisfactory installation and operation of the entire pumping system.

5. The products furnished under this section shall be by a manufacturer who has been regularly engaged in the design and manufacture of the equipment and who has a minimum of 5 years' experience in design, fabrication and testing of pumping systems of the size, liquids and scopes pecified herein, and shall show evidence of at least five installations of the same size pump units in satisfactory operation in wastewater treatment plant facilities for at least three years.

6. For manufacturers not named in this specification, the Contractor must provide a submittal package that also includes, at a minimum, the following: dimensional drawings, performance curves, O& M manual, electrical/drive details, installation list (for the same liquids as specified) with minimum three contacts and phone numbers. The submittal shall demonstrate to the satisfaction of the ENGINEER that the operating conditions will be met, and the quality is equal to equipment made by those manufacturers specifically named herein.

E. OPERATING CONDITIONS: The progressing cavity pumps shall have the following operating characteristics:

Equipment Service Type	No. of Pumps	Rated Capacity, gpm	Discharge Pressure, psi	Motor speed, rpm	Pump speed, rpm	Max motor hp	Drive
Grease Pump	1						
Low Flow		20	80	523	118	7.5	Variable Speed
High Flow		80	80	1834	414		
Screw Press Feed Pump	2						
Low Flow		375	50	1556	245	40	Variable Speed
High Flow		450	50	1854	292		

1.02 REFERENCES

A. This section contains references to the following documents. They are part of this section as specified and modified. In case of conflict between the requirements of the section and those of the listed documents, the requirements of this section shall prevail.

Reference	Title
AGMA 6010-E-88	Spur, Helical, Herringbone, and Bevel Enclosed Drive
AGMA 6019-E-89	Gear Motors Using Spur, Helical, Herringbone, Straight Bevel, or Spiral Bevel Gears
AGMA 6023-A88	Design Manual for Enclosed Epicyclic Gear Drives

1.03 ENVIRONMENTAL CONDITIONS

A. The pumps to be provided under this section shall be suitable for operation outdoors.

1.04 SUBMITTALS

A. The following information shall be provided.

1. Certified shop and erection drawings showing details of construction, dimensions, materials of construction, equipment weight, anchor bolt locations, and any other pertinent Manufacturer's data.
2. Predicted performance curves.
3. Motor data.
4. Universal joint warranty.
5. Listing of parts and special tools to be provided.
6. A copy of this specification section with addenda updates, and all referenced sections with addenda updates, with each paragraph check marked to show specification compliance or marked to show deviations.

1.05 OPERATING AND MAINTENANCE (O&M) MANUALS

A. The Contractor shall furnish Operating and Maintenance (O&M) manuals as specified in the General Conditions. The manuals shall be prepared specifically for this installation and shall include all required cuts, drawings, equipment lists, descriptions, etc. that are required to instruct operating and maintenance personnel unfamiliar with such equipment. The O&M manuals shall provide detailed descriptions on how to properly operate and maintain the equipment.

1.06 PRODUCT HANDLING

A. All parts shall be properly protected so that no damage or deterioration will occur during a prolonged delay from the time of shipment until installation, and the units and equipment are ready for operation.

B. All equipment and parts must be properly protected against any damage during a prolonged period at the site.

C. Factory assembled parts and components shall not be dismantled for shipment unless permission is received in writing from the Engineer.

D. Finished surfaces of all exposed pump openings shall be protected by wooden planks, strongly built and securely bolted thereto.

E. Finished iron or steel surfaces not painted shall be properly protected to prevent rust and corrosion.

F. After hydrostatic or other tests, all entrapped water shall be drained prior to shipment and proper care shall be taken to protect parts from the entrance of water during shipment, storage and handling.

G. Each box of packing shall be properly marked to show its net weight, in addition to its contents.

1.07 WARRANTY

A. Manufacturer shall provide the Owner with a full warranty for a period of one (1) year from the date of final written acceptance of the complete, properly operating system/project by the Owner and Engineer, regardless of when the equipment was shipped.

PART 2 - PRODUCTS

2.01 ACCEPTABLE PRODUCTS

A. Progressive cavity pumps shall be as manufactured by Seepex, Series BN, or equal.

2.02 MATERIALS

Component	Material - Sludge Pumps
Rotor	D6 – Hardened Tool Steel – chromium nitride coated
Stator	Buna N
Pump Body	Cast iron
Shaft Sealing	Burgmann MG1 Q1Q1VGG

2.03 EQUIPMENT

A. ROTOR AND STATOR: Each pump shall be a one stage design employing a convoluted rotor operating in a similarly convoluted stator. The convolutions shall be configured to form a cavity between the rotor and stator, which shall progress from the pump's inlet to discharge port with the operation of the rotor. The fit between the rotor and stator at the point of contact shall compress the stator material sufficiently to form a seal and to prevent leakage from the discharge back to the inlet end of the pumping chamber. Stators for sludge pumps shall have Buna elastomer. The sludge pump rotors shall be constructed of hardened tool steel. Additionally, the sludge pump rotors shall have a chromium nitride coating (Duktil process) with a minimum thickness of (.0108").

1. Stators shall be replaceable without dismantling the pump suction or discharge flanges or any associated piping. Pumps that require additional space for axial/horizontal removal of the stator shall not be allowed. Stator designs shall additionally incorporate a retensioning feature to compensate for wear in lieu of increasing pump speed.

2. Rotors shall be replaceable without dismantling the pump suction or discharge flanges or associated piping. Pumps that require additional space for axial/horizontal removal of the rotor shall not be allowed. The rotor design shall include provisions so that rotor replacement does not require the disassembly of either universal joint.

B. DRIVE TRAIN: The drive train shall be warranted for one (1) year from acceptance and shall consist of the following:

1. Each pump rotor shall be driven through a positively sealed and lubricated pin joint. The pin joint shall have replaceable bushings, constructed of air-hardened tool steel of 57-60 HRc, in the rotor head and coupling rod. The pin shall be constructed of high speed steel, air hardened to 60-65 HRc. The joint shall be grease lubricated with a high temperature (450° F), PTFE filled synthetic grease, covered with Buna N sleeve and positively sealed with hose clamps constructed of 304 stainless steel.

C. CASINGS: A 150-pound (ANSI B16.5 RF) flanged connection shall be provided at both the inlet and discharge ports. The suction casing shall employ two opposed cleanout openings to facilitate removal of debris without dismantling the pump or pipework.

D. BEARINGS: Each pump shall be provided with oil lubricated thrust and radial bearings, located in the gearmotor, designed for all loads

imposed by the specified service. Minimum bearing L-10 shall be 50,000 hrs.

E. SHAFT SEALING: Shaft shall be sealed using a single internal mechanical seal as specified in Section 2.02. The shaft shall be solid through the sealing area, but of a two part design which allows the rotating unit to be removed from the pump without disassembly of the gearmotor bearings. Seal materials shall be solid silicon carbide faces with 316 stainless steel metal parts and viton elastomers.

F. MOTOR AND DRIVE UNIT:

1. Gear motors or gear reducers shall be designed in accordance with AGMA 6019-E (Class II). Unless otherwise noted, motors shall be energy-efficient, TEFC motors.
2. Pumps that require variable frequency drives (VFDs) are noted in paragraph 1.01 E. VFDs shall be constant torque type. For VFD-driven units, the pump supplier shall be responsible for the provision of the fixed reduction between the motor and pump. The reduction ratio shall be that required to operate the pump at its maximum operating speed when the motor is operating at its nominal rated full speed in accordance with the schedule in paragraph 1.01 E. VFD-driven units may be operated at up to 85 Hz at the maximum speed.

G. Nameplates and other data plates shall be stainless steel, suitably secured to the pump.

2.04 ACCESSORIES:

A. RUN DRY PROTECTION: The stator shall be fitted with a sensor sleeve and thermistor sensor. A controller shall also be provided and shall be installed by the contractor in the motor control center. The controller shall monitor the stator temperature and activate a shutdown and alarm sequence if the stator temperature reaches the adjustable limit on the controller. The controller shall include a manual local and remote reset function. Input to the controller shall be 1x115VAC/60 Hz.

2.05 CONTROLS:

A. Pumps shall be controlled in accordance with Electrical Drawings and Section 16945 – Motor Control Centers.

2.06 STANDBY COMPONENTS

A. One set of special tools shall be provided to service the pumps.

PART 3 - EXECUTION

3.01 INSTALLATION

A. The pumps shall be installed as specified and in accordance with manufacturer's written recommendations. The installation and initial operation of all components shall be certified by an authorized representative of the pump manufacturer.

B. Install base-mounted pumps and steel foundation plates on concrete base. Anchor bolts used to secure the pumps and plates to the concrete base shall be poured in place as indicated on Drawings. Set and level pump, grout under pump base with non-shrink grout.

C. Provide piping; accessories; hangers, supports, and anchors; valves; meters and gauges; vibration isolation; and equipment supports; as indicated for complete installation.

D. Check alignment, and where necessary, realign shafts of motors and pumps within recommended tolerances by manufacturer, and in presence of manufacturer's service representative.

E. Lubricate pumps before start-up. Start-up in accordance with manufacturer's instructions.

F. Ensure that pump units are wired properly, with rotation in correct direction, and that pump and motor grounding have been provided.

3.02 FIELD PAINTING

A. Pump, motor, and base shall be painted with the highest/best grade paint suitable for the particular application.

B. Field painting shall be provided by the contractor. The field paint shall be products of the same manufacturer as the primer paint used in the shop to assure compatibility. Paint shall be Koppers Company or approved equal.

C. Colors to be selected by Owner. Submit color chart in advance.

D. All nameplates shall be properly protected during painting.

3.03 TESTING

A. After completion of installation, the pumps shall be completely tested to demonstrate compliance with operating requirements as specified.

3.04 SERVICES OF MANUFACTURER

A. Inspection, Startup, and Field Adjustment: The service representative of the Manufacturer shall be present at the site for one work day, to provide startup services including field testing for proper operation and any necessary field adjustments to ensure that the equipment installation and operation comply with requirements.

B. Instruction of Personnel: The training representative of the Manufacturer shall be present at the site for one work day to instruct personnel in the operation and maintenance of the equipment, including step-by-step troubleshooting with necessary test equipment.

C. For the purposes of this paragraph, a workday is defined as an eight hour period at the Site, excluding travel time.

D. The inspection, startup, and field adjustment services and training shall be provided on two separate days at no additional cost to the Owner.

END OF SECTION

SECTION 11280
LIQUID POLYMER BLENDING SYSTEM

PART 1 - GENERAL

1.01 SECTION INCLUDES

A. Polymer activation and feed System

1. The polymer activation and feed system shall be capable of effectively activating and fully blending with water a homogenous polymer solution ranging from 0.1% to 1% concentration.

1.02 WARRANTY

A. The system shall be covered by a one (1) year limited warranty against defects in materials and workmanship.

1.03 SUBMITTALS

A. Product Data:

1. One (1) electronic copy of submittal data will be supplied for the system.

2. One (1) Hard copy and one (1) electronic copy of the operations and maintenance manual will be shipped with the system.

B. Shop Drawings:

1. Component data and shop drawings of the system will be supplied, including dimensions, weight, and parts list.

2. Control panel elevation, control schematics and component data will be supplied.

1.04 QUALITY ASSURANCE

A. Manufacturers Qualifications:

1. Manufacturer must have at least five years experience in the design and manufacture of the equipment, and supply a list of not less than five operating installations as evidence of meeting the experience requirement.

2. Demonstrate to the satisfaction of the ENGINEER that the quality is equal to equipment made by the manufacturers named herein.

B. System to be pre-assembled and shop-tested to assure compliance with the operational requirements.

PART 2 - PRODUCTS

2.01 MANUFACTURERS

A. Provide a quantity of 1 polymer activation, blending and feed system(s) as manufactured by IPM Systems, LLC. of Lee's Summit, MO or equal. Should equipment of a different type or size which otherwise differs from that specified herein be offered, such equipment shall be acceptable only on the basis that any revisions in the design and/or construction of the structure, piping, appurtenant equipment, electrical work, etc, required to accommodate such a substitution shall be made at no additional cost to the Owner, shall be the responsibility of the Contractor and shall be as approved by the Engineer.

2.02 IDENTIFICATION

A. A corrosion resistant nameplate shall be supplied on the system. Nameplate information to include equipment model number, serial number and contact phone number for support.

2.03 EQUIPMENT

A. Poymer blending system shall be Model P-S-5P-600-S, as manufactured by IPM Systems, LLC, or equal.

B. Multi-Stage Mixing Chamber:

1. The polymer mixing chamber shall have a confined inversion zone wherein the oil phase continuous emulsion is injected, stripping the oil from the polymer molecules, partially hydrating the solution. The solution then passes from the confined space without recirculation through that confined space to the activation zone consisting of a minimum of three baffled zones creating a plug flow for the solution exposing it to mild turbulence with low shear to complete the hydration process. There shall be no recirculation of the initially inverted neat polymer.

2. The system shall have a minimum of two mixing zones designed to strip the oil from the emulsion and allow hydration of the polymer molecule without damaging the polymer's molecular structure, regardless of flow rate.

3. The systems mixing energy shall be variable in intensity. Mixing energy must be variable by VFD control to handle the wide range of

polymers available. Mixer motor shall be washdown duty, 0.5 hp, TEFC, 3450 rpm, 56C frame for polymer solution flow rates up to 40 gpm.

4. The mixing chamber shall include a flushing provision for the mechanical seal utilizing incoming water flow to continuously flush the seal area when in operation. A secondary lip seal shall be installed between the mixing chamber mechanical seal and the mixer motor. A weep hole shall be located between the mechanical seal and lip seal to provide additional protection for the mixer motor in the event of a mechanical seal failure. The system shall also be equipped with a seal failure detection system to indicate an alarm on the control panel when the seal fails. Systems that do not have a seal failure detection system shall not be considered.

5. Systems that rely solely on water pressure to create mixing energy will be considered only if provided with an integrally mounted dilution water booster pump and if the system meets the above criteria. A VFD motor controller shall be provided to control the pressure and therefore mixing energy generated by the booster pump. The VFD motor controller shall meet the control requirements of these project specifications and be integrally mounted in the systems control panel. Adequate space shall be provided in the control panel for cooling. Booster pumps shall be multi-staged and of stainless steel construction. The booster pump shall be capable of generating 75 psid independent of water supply pressure which shall be verified at system start-up. In the event the booster pump cannot produce 75 psid of water pressure a properly sized booster pump shall be installed at supplier's expense. A pressure regulating / reducing valve shall be factory installed downstream of the booster pump to protect the equipment from over-pressure. Stainless steel, liquid filled pressure gauges shall be factory installed immediately up stream and immediately downstream of the pressure regulating valve.

6. The mixing chamber shall have a maximum rated pressure of 125 psi.

7. Under no circumstances shall systems that rely solely on plant water pressure to create mixing energy be acceptable. At no time shall polymer be exposed to excessive shear.

8. Provide a neat polymer check valve specifically designed to isolate neat polymer from dilution water. The valve shall be designed with an open, unobstructed path to the valve seat. The valve body shall be constructed of Stainless Steel with viton seals. The plug and spring shall be stainless steel. Under no circumstances will the spring be in the neat polymer flow line. The spring shall be located outside the mixing chamber for simple adjustment. The valve shall be readily accessible for cleaning, shall be easily disassembled and reassembled

and shall not require tools for removal, cleaning or replacement. Conventional check valves, ball checks, and or check valves that are installed inside the mixing chamber, or which require mixing chamber disassembly for servicing will not be accepted.

C. Dilution Water Assembly:

1. A 1" FNPT 304 stainless steel dilution water inlet connection shall be provided to allow a maximum total flow of 10 gpm.

2. The dilution water flow rate shall be monitored by a Rotameter type flow meter having a range of 1 to 10 GPM,. A union shall be provided on the Rotameter to allow easy removal for cleaning.

3. Unit shall have an electric solenoid valve with NEMA 4 rated coil for on/off control of total dilution water flow.

4. A thermal flow switch shall be provided and mounted in the dilution water line. The switch shall be rated NEMA 4X and manufactured by IFM or equal.

5. Provide a 2-1/2" stainless steel liquid filled pressure gauge to monitor dilution water inlet pressure.

D. Polymer Metering Pump:

1. The unit shall have one (1) neat polymer metering pump(s) integrally mounted on the systems skid. The metering pump(s) shall have a range of 0.5 to 5.0 GPH of neat polymer. The pump shall be a 4-stage positive displacement, progressive cavity type metering pump. The rotor shall be 316 stainless steel. The stator shall be fluoroelastomer. The pump shall have a mechanical seal.

2. The pump shall be driven by a ½ HP AC (minimum), TEFC motor. The variable speed capability shall be provided by a VFD controller. The VFD shall be a NEMA 4X self enclosed a mounted on the polymer system frame. The VFD shall be power flex 40 and manufactured by Allen Bradley.

3. Provide a calibration column with two full port PVC ball valves having Viton o-rings. The column shall be calibrated for a one minute draw-down and read in GPH and milliliters.

4. Provide a metering pump priming assembly including vacuum device and valve.

D. Solution Discharge Assembly:

1. A 304 stainless steel solution discharge connection shall be provided

2. Provide a 2-1/2" stainless steel liquid filled pressure gauge to monitor system discharge pressure.

3. A check valve of PVC construction with union shall be installed integral to the system to prevent backflow of polymer solution or process water, sludge, etc. into the mixing chamber or dilution water piping.

E. Controls:

1. A control panel integral to the systems frame shall be provided. The enclosure shall be rated NEMA 4X and constructed of FRP. The control panels hall consist of all digital displays, potentiometers, switches, lights, relays, and other control devices required for a complete operable system. The control panel and all components shall be industrial duty. All skid mounted electrical components interconnected to the control panel shall terminate at numbered and labeled terminal blocks. The terminal blocks shall be sized for 14 ga. wire. Wires shall be neatly run through wire race-way and numbered with adhesive type labels. The control panel shall be built and labeled according to UL 508A standards. Systems without a UL labeled panel will not be acceptable. Control features shall include the following:

2. Control Devices:
   a. System ON-OFF-REMOTE switch. In remote mode the system shall start by remote dry contacts.
   b. Door mounted potentiometer for Local speed adjustment
   c. An adjustable flush timer shall be supplied to allow dilution water to flush the mixing chamber and discharge piping after automatic shutdown.
   d. Mixing Chamber OFF-AUTO switch.

3. Indicators
   a. System Running Indication
   b. LCD Display of metering pump output (0-max gph)
   c. Loss of water flow alarm
   d. Seal Failure Alarm

4. Alarms:
   a. Thermal Flow switch. Switch rated NEMA 4X. Metering pump goes to stand-by mode when loss of water flow occurs. The pump restarts when the alarm is acknowledged and flow returns to an operating state.

5. Inputs:
   a. Remote Start / Stop dry contact
   b. Pacing Signal based on process flow (4-20mA)

6. Outputs:
   a. System Running (dry contact)
   b. System in “Remote Mode” (dry contact)
   c. Loss of water flow (dry contact)
   d. Actual Pump Speed (0-10vdc)

7. Voltages available – 208/240/480 VAC/ 3 phase/ 60 Hz,

F. Equipment Skid

1. The system's frame shall be of rugged 304 stainless steel construction. No mild steel shall be used. All piping shall be rigidly supported.

2. The overall system dimensions shall not exceed 56”H x 34”D X 24”W.

3. Approximate weight of standard unit to be 250 pounds.

2.06 ACCESSORIES

A. Drum Truck wesco or equal
B. Drum Scale with 4-20mA transmitter force flow or equal.
C. Drum Mixer to be IPM Systems, LLC.or equal.
D. Tote Mixer to be IPM Systems, LLC.or equal.
E. Tote Scale with 4-20mA transmitter force flow or equal.
F. Water Pressure regulating valve (provided loose for field installation).
G. Drum suction wand for 55 gallon drum evacuation.
H. Pump suction hose assembly for tote including ½” PVC true-union isolation ball valve, quick disconnect and 8 feet of braided clear PVC hose (provided loose for field installation).
I. Desiccant drum dryer to be IPM Systems, LLC.or equal.

PART 3 - EXECUTION

3.02 INSTALLATION

A. Polymer feed system(s) shall be installed in strict conformance with the manufacturers installation instructions. Checkout of final installation, start-up, calibration and instruction of operating personnel shall be performed by an authorized representative of the manufacturer. Startup service to be performed in one (1) trip of one (1) day.

END SECTION

SECTION 11305
SUBMERSIBLE PUMPS, CONTROLS, AND PANELS

PART 1 - GENERAL

1.01 WORK INCLUDED

A. The contractor shall furnish and install, as described hereinafter and shown on the plans, two (2) recirculating submersible chopper pumps to operate in the wet well of the septage/grease lift station. The pumps shall be explosion proof and specifically designed to pump and mix waste solids at heavy consistencies without plugging or dewatering of the solids. Materials shall be chopped/macerated and conditioned by the pump as an integral part of the pumping action. The pumps must have demonstrated the ability to chop through and pump high concentrations of solids such as plastics, heavy rags, grease and hair balls, wood, paper products and stringy materials without plugging, both in tests and field applications.

B. Additionally, the Contractor shall furnish and install the pump station wet well, pump discharge piping, valves and valve vault, as station control panel and all miscellaneous and associated equipment required for a complete operating sewage pumping system.

1.02 RELATIVE WORK

A. Division 16 - Electrical

1.03 QUALITY ASSURANCE

A. The chopper pump manufacturer shall have a minimum of ten (10) years of documented experience in the design and production of chopper pumps of all types, and not less than five (5) years of experience in the production of the exact equipment as specified herein.

B. The Contractor shall submit manufacturer's standard warranty and a performance affidavit for equipment to be furnished in accordance with this section. The warranty for workmanship and materials shall be manufacturer's standard for 1 year from startup, not to exceed 18 months from factory shipment. In the performance affidavit, the manufacturer must certify to the Contractor and the Owner, that the Contract Documents have been examined, and that the equipment will meet in every way the performance requirements set forth in the Contract Documents for the application specified.

C. The performance affidavit must be signed by an officer of the company manufacturing the equipment, and witnessed by a notary public. The

performance affidavit must include a statement that the equipment will not clog or bind on solids typically found in the application set forth.

D. All equipment shall be installed by skilled workmen in accordance with the instructions of the equipment supplier.

E. All equipment supplied shall have ample means of lubrication for all bearings and other metal surfaces in sliding contact. The Contractor shall provide all lubricants, fuel and power necessary to start-up, test, and place the pumping facility in operation.

1.04 SUBMITTALS

A. Shop Drawings: The contractor shall submit six sets of detailed and dimensioned working shop drawings showing the construction of the proposed facility and installation of all equipment complete in every respect. Each drawing shall be indexed and/or referenced to the Contract Drawings and Specifications. No work upon the manufacture or fabrication of any equipment shall be performed until the Engineer's review has been obtained. Certified pump curves shall be submitted with the shop drawings and shall indicate actual test performance of units furnished. The Contractor shall also submit layout drawings showing exact installation, piping and foundation details for the pumping units being installed. Shop drawings will not be reviewed prior to the receipt by the Engineer of an acceptable performance affidavit.

PART 2 - PRODUCTS

2.01 PUMP MATERIALS

A. Casing: Shall be of volute design, spiraling outward to the 125 lb. flanged centerline discharge. Casing shall be ductile cast iron with all water passages to be smooth, and free of blowholes and imperfections for good flow characteristics.

B. Impeller: Shall be semi-open type with pump out vanes to reduce seal area pressure. Chopping/maceration of materials shall be accomplished by the action of the cupped and sharpened leading edges of the impeller blades moving across the cutter bar at the intake openings, with a maximum set clearance between the impeller and cutter bar of 0.015-0.025" cold. Impeller shall be cast alloy steel heat treated to minimum Rockwell C 60 and dynamically balanced. The impeller shall be keyed to the shaft and shall have no axial adjustments and no set screws.

C. Cutter Bar Plate: Shall be recessed into the pump bowl and shall contain at least 2 shear bars extending diametrically across the intake opening to

within 0. 010-0.020” o f t he r otating c utter n ut t ooth, for t he purpose of preventing i ntake op ening bl ockage and w rapping o f d ebris at t he s haft area. C hopper pu mps ut ilizing i ndividually mounted s hear bar s s hall no t be ac ceptable. C utter bar s hall be alloy s teel he at-treated to m inimum Rockwell C 60.

D. Cutter Nut: The impeller shall be s ecured to the shaft using a c utter nut, designed t o c ut s tringy m aterials a nd pr event bi nding us ing a r aised, rotating c utter t ooth. The c utter nut s hall be c ast s teel heat t reated t o minimum Rockwell C 60.

E. Upper Cutter: Shall be threaded into the casing or back pull-out adapter plate behind the impeller, designed to cut against the pump-out vanes and the i mpeller hub, r educing and r emoving s tringy m aterials f rom t he mechanical s eal ar ea. U pper c utter s hall b e c ast s teel heat t reated t o minimum Rockwell C 60. The upper cutter teeth are positioned as closely as possible to the center of shaft rotation to minimize cutting torque and nuisance motor tripping. The ratio of upper cutter cutting diameter to shaft diameter in the upper cutter area of the pump shall be 3.0 or less.

F. Recirculation N ozzle A ssembly: The pump s hall be fitted w ith a recirculation noz zle as sembly t o per mit r ecirculation o f t he pi t c ontents prior to discharge. The recirculation nozzle shall be adjustable minimum 180 degrees horizontally and 45 deg rees vertically. A v alve as sembly shall be connected to the pump discharge to adjust pump flow either to the nozzle or the pump discharge flange. Valve shall be ductile cast iron, with 316 S S v alve di sk. The op erating l evers shall be l ocated ab ove at a mounting plate for easy access

G. Automatic V alve A ctuator: An electrically oper ated v alve ac tuator s hall position t he v alve f or pumpout or mixed o peration. A ball s crew l inear actuator shall be used to provide valve positioning. Unit shall operate on 220V. AC, single-phase power with 25% duty cycle, and shall be capable of pr oducing 500l b. o f actuation force, w ith a freewheeling feature t o prevent overtravel at the end of stroke. External PLC controls, housed in a s eparate c ontrol u nit ar e r equired t o d etermine v alve pos ition. A capacitor for single ph ase-motor starting shall be i ncluded in the design. All c omponents s hall be ho used i n an e nclosure s uitable for outdoor operation.

H. Pump S hafting: The p ump s haft a nd i mpeller s hall be s upported b y ball bearings. Shafting shall be heat treated steel, with a minimum diameter of 1.5 inches in order to minimize deflection during solids chopping.

I. Bearing H ousing: S hall be d uctile c ast i ron, and m achined w ith piloted bearing fits for concentricity of all components. Piloted motor mount shall firmly align motor on top of bearing housing.

J. Thrust Bearings: Shaft thrust in both directions shall be taken up by two back-to-back mounted single-row angular contact ball bearings. Overhang from the centerline of the lower thrust bearing to the seal faces shall be a maximum of 1.7". A third mechanical seal shall be provided to isolate the bearings from the pumped media at operating temperatures to 250 F. The third seal, as well as the thrust bearings shall be oil bath lubricated in the bearing housing by I.S.O. Grade 46 turbine oil, with a minimum B-10 life rated 100,000 hours. Shaft overhang exceeding 1.7 inches from the center of the lowest thrust bearing to the seal faces shall be considered unacceptable.

K. Pump Mechanical Seal: The mechanical seal shall be located immediately behind the impeller hub to maximize the flushing available from the impeller pumpout vanes. The seal shall be a cartridge-type mechanical seal with Viton O-rings and silicon carbide (or tungsten carbide) faces. This cartridge seal shall be pre-assembled and pre-tested so that no seal settings or adjustments are required from the installer. Any springs used to push the seal faces together must be shielded from the fluid to be pumped. The cartridge shall also include a 17-4PH, heat-treated seal sleeve and a ductile cast iron seal gland. Seal faces shall be tested for flatness within 2 Helium light bands under a Helium light source and optical flat.

L. Automatic Oil Level Monitor: An oil level switch shall be mounted at the top of the wet well, with a hose feeding down to the side of the bearing housing to detect oil level and shut off the motor in event of low oil level. A sensitive relay shall be included for mounting in the motor control panel.

M. Shaft Coupling: The submersible motor shall be close coupled directly to the pump shaft using a solid sleeve coupling, which is keyed to both the pump and motor shafts. Slip clutches and shear pins between the shaft and the motor are considered unacceptable.

N. Stainless Steel Nameplates: Shall be attached to the pump and drive motor giving the manufacturer's model and serial number, date of manufacture, horsepower, rated capacity, head, voltage, full load amps, full load rpm, phases, frequency, impeller size, and any other pertinent data.

O. Surface preparation: Sandblast and apply single coat of Tnemec 27WB primer (5-8 MDFT) and apply finish coat of Tnemec 27WB epoxy (5-8 MDFT).

P. Pumps shall meet the following listed minimum operating conditions:

LOCATION	NO.OF PUMPS INSTALLED	EACH PUMP GPM	TDH	RPM
Septage/Grease Lift Station	2	800	30	1170

Q. Pump manufacturer and model shall be as follows, or equal:

MANUFACTURER	PUMP MODEL	IMPELLER	NOMINAL HP
Vaughan Co., Inc.	S4SR-115	11.5”	15

R. Discharge Pressure Gauge: Furnish and install a pressure gauge assembly on the pump discharge piping. The pressure gauge assembly shall be AISI Type 316 stainless steel, supplied with AISI Type 316 stainless steel gauge sensor tubing and NPT threaded ball valves for isolation and venting. Sensor piping tubing fittings shall also be Type 316 stainless steel. Pressure gauge shall be constructed of Type 316 stainless steel wetted parts and Type 304 stainless steel case and bayonet ring, adjustable pointer, laminated safety glass window, glycerin liquid filled case, 1.5 percent span accuracy, and shall have a 2.5-inch diameter dial size, minimum. Pressure gauges shall be as manufactured by WIKA Instrument Corporation, or equal.

2.02 MOTORS

A. Pumps and motors shall be constructed as integral units and shall be the products of one manufacturer/supplier. The submersible motor shall be U/L listed and suitable for Class I, Group C and D, Division I hazardous locations, rated at 460 Volts, 60 Hertz and 3-phase, with Class B insulation system with Class F materials. Motor shall have tandem mechanical seals in oil bath and dual moisture sensing probes. The lower motor seal shall be exposed only to the lubricant in the bearing housing, with no exposure to the pumpage. Motor shall include two normally closed automatic resetting thermostats connected in series and imbedded in adjoining phases. Motor frame shall be cast iron, and all hardware and shaft shall be stainless steel.

2.03 GUIDE RAILS

A. Provide a non-sparking guide rail system for each pump consisting of two stainless steel guide rails, cast bronze pump guide bracket, cast ductile iron discharge elbow with mounting feet and 125 lb. flanges, upper guide

rail mounting bracket, and intermediate guide brackets every 10 feet. System design shall prevent spark ignition of explosive gases during pump installation and removal. The lower guide holders shall be integral with the discharge base elbow.

2.04 PUMP CABLES

A. Each pump shall be furnished with separate power and control cables. All cables shall be water resistant 600 V, 60 degrees C, UL Listed and CSA approved. Each pump shall be provided with a sufficient cord length to extend from the pump motor terminals when pump is in position on the pump discharge base and extend to the cable terminal lugs, with an additional 10 feet of looped cable to be suspended within the wet well. Electrical cable splicing or connection to a terminal junction box within the wet well shall not be accepted. Electrical cables shall be supported from an AISI Type 316 stainless steel cable support with individual stainless steel Kellan strain relief supports.

B. Cable entry system shall be designed to provide a positive, leak-free seal to prevent liquid from entering the motor housing. The design shall incorporate provisions to prevent moisture from wicking through the cable assemblies, even if the cable jacket has been punctured. The cable entry system into the lead connection chamber shall be encapsulated for positive moisture sealing. A Buna-Nitrile cable grommet shall be furnished in addition to the epoxy sealed leads.

C. Lifting Cable: Furnish and install an AISI Type 304 stainless steel lifting cable, thimbles, clamps, and fasteners. Each lifting cable shall be of sufficient length to extend from the pump to the top of the wet well. Provide an AISI Type 304 stainless steel hook at the top of the wet well to attach the cable when not in use. The steel hook shall be located so as not to interfere with the lowering/raising of each pump.

2.05 STATION CONTROL PANEL

A. The Pump Control Panel, rack mounted, shall be a dead front style enclosure as shown on the plans and/or defined in the Technical Specifications. The panel shall be verified by the pump supplier to insure compatibility between pumps and <u>all</u> controls. The cabinet shall have fully-gasketed hinged door with ground strap. The door shall be operated by a single lockable lever type handle that actuates a three-point interior latching mechanism with a one-quarter turn.

B. An inner aluminum door mounted on a continuous piano-type hinge shall be furnished for protection against exposed wiring and shall have cut-outs for access to the circuit breakers.

C. All wiring within the panel shall be as specified in the Technical Specifications, or as noted on the plans. All panel components shall be UL listed and conform to all applicable codes and regulations as specified in the Technical Specifications, or as noted on the plans.

D. Outer and inner doors shall have provisions to be held in the "open" position. A permanent metal pocket shall be provided on the left exterior side of the enclosure door for 8½-inch by 11-inch papers. The panel shall have a wiring schematic permanently affixed to the interior of the enclosure door and it will show the numbering and color coding of the wires in the control panel.

E. A sign shall be installed on the outside of the control panel indicating the station number and a contact phone number.

2.06 CONTROL SYSTEM

A. The control system shall provide for the automatic and manual control of the pumps to maintain a pumped down condition of the wet well.

B. The control system shall control two submersible chopper pumps at the station based upon a float operated control system. A minimum of four float switches shall be installed in the wetwell to monitor and control liquid level height.

C. The controller shall provide adjustable on/off level settings for each pump. The pumps shall operate in a lead and lag mode, based on corresponding rising and falling wetwell water levels, as selected by the operator. The controller shall recognize and alarm a failed pump, and automatically select the other pump as the operating pump.

1. As the level in the wet well rises, the lead pump, as determined by the alternator, shall start and pump the station to the "off" position. In the event the incoming flow exceeds the capacity of the lead pump, the number one lag pump shall start and both pumps shall run to the off level. The alternator shall switch when the off level is reached. Alternation control is provided through the RTU control functions. The controller shall also contain suitable high-level and low-level alarms. If the level continues to rise, alarm functions shall be activated.

2. An independent high and low level alarm and redundant pump control capability shall be provided in addition to the specified primary control system.

2.07 ANCILLARY EQUIPMENT

A. The control system shall include, but not be limited to, the equipment listed below.

1. A three position Hand/Off/Auto switch shall be provided for each pump. The switch shall be NEMA 4x rated with ten amp contacts. A position indicating legend plate shall be provided. The Hand/Off/Auto switches shall be mounted on the inner dead front door.
2. A green "Run" pilot indicator for each pump shall be mounted on the dead front door.
3. An elapsed time meter for each pump shall be mounted on the dead front door. The meter shall operate on 120 VAC, shall be indicated in hours (six digits) and tenths and shall be non-resetable.
4. Pilot lights and running time meters.
5. Main disconnect switches and main circuit breakers.
6. High level alarms including externally mounted alarm light and horn.
7. Auxiliary power receptacle.
8. Lightning arrestor and surge protection.

2.08 ACCESS HATCHES

B. Wet Well and Valve Vault Access Hatches: Shall be 300 lb/SF load rated and as manufactured by The hatch assemblies shall be as manufactured by Bilco, Halliday, or equal. Frames and covers complete with hinges, locking devices and hand lifts shall be aluminum and/or stainless steel construction. The frame shall have safety locking rails for locking in the open position and enclosed, and stainless steel vertical springs for lift assistance. The covers shall be checker plate design. All access vaults shall be equipped with an enclosed hinged hatch safety grate.

2.09 MISCELLANEOUS

A. A final Record Drawing, laminated in mylar, shall be attached to the inside of the front door. A list of all legends shall be included.

B. All component parts in the control panel shall be permanently marked and identified as they are indicated on the drawing. Marking shall be on the back plate adjacent to the component. All control conductors shall be identified with wire markers at each end as close as practical to the end of conductor.

C. All panels shall be tested to the power requirements as shown on the plans to assure proper operation of all the components. Each control function shall be activated to check for proper indication.

D. All control equipment shall be guaranteed for a period of three years from date of shipment. The guarantee is effective against all defects in workmanship and/or defective component. The warranty is limited to replacement or repair of the defective equipment.

E. The manufacturer shall be a UL listed shop for industrial control systems and shall provide evidence of such on request from the engineer or using authority.

2.10 SPARE PARTS

The Contractor shall furnish the following spare parts for each pump in clearly identified containers, labeled for easy identification without opening the packaging and suitably protected for long-term storage in a humid environment.

1. One impeller (trimmed)
2. One cutter bar with internal cutter
3. One lower mechanical seal

PART 3 - EXECUTION

3.01 INSTALLATION

A. All material and equipment shall be installed as shown on the Drawings and as recommended by the manufacturer.

B. Additional items of construction, such as valve boxes, flanged adapters, and other items necessary for the complete installation of the system shall be included and shall be constructed of first-class materials.

3.02 FIELD QUALITY CONTROL

A. Testing: Upon completion of installation, the Contractor shall test the facilities to demonstrate that the station performs as specified. He shall perform the initial testing to assure himself that acceptance testing can be satisfactorily completed.

B. The Contractor shall then arrange for the equipment manufacturer to furnish a qualified representative to check the installation and conduct testing for final acceptance, and shall give the Engineer written notice as to the date and time of the test. An acceptance test shall demonstrate that all items are in compliance with the function as specified. Testing shall illustrate the following:

1. That all units have been properly installed and are in correct alignment.
2. That all units operate without overheating or overloading any parts and without objectional vibration.
3. That there are no mechanical defects in any of the parts.
4. That all pumps can deliver the specified pressure and quantity and have correct rotation, volts and amps.
5. That the pumps shall be capable of pumping raw, uns creened sewage.
6. That all pumps, sensors and controls perform satisfactorily as to sequence control, correct start and stop elevations, and proper high and low level alarm functions.

C. Field Tests: A qualified representative of the pumping system supplier shall inspect the installation and supervise start-up performed by the Contractor's personnel. All components of the systems shall be tested for proper operation during the start-up operation.

D. Maintenance Procedures: After the equipment has been placed into operation, the qualified representative of the pump system supplier shall instruct the Owner's personnel in proper operating and maintenance procedures without additional cost to the Owner. The time required for start-up inspection and instructing personnel on the proper operation and maintenance of the station is not to exceed one day. Additional time, beyond that specified which is necessitated by installation shall be paid for by the Contractor. These services shall be made during the initial operation of the pumping station and shall be over and above any services necessary during construction or to correct defective materials or workmanship during the guarantee period. The pump representative shall be specially trained and qualified for installation, adjustment, start-up and testing work and shall not be a sales representative only. The cost for such representation, including subsistence and travel, shall be included under this Contract.

END OF SECTION

SECTION 11321
GREASE SCREENING EQUIPMENT

PART 1 GENERAL

1.1 SCOPE OF WORK

A. Contractor shall supply all labor, materials, equipment and incidentals required to install and place into operation the Grease Screening Equipment as shown on the Drawings and as specified herein.

1.2 RELATED DOCUMENTS

A. Concrete work included in Division 3
B. Metal work included in Division 5
C. Field painting included in Division 9
D. Electrical work included in Division 16

1.3 REFERENCE STANDARDS – The properties of all materials, design, fabrication and performance of the equipment to be furnished under this section shall be in accordance with the latest issue of applicable standard specifications. The governing authorities of these standards are listed below.

A. AICS, American Institute of Steel Construction
B. AISI American Iron and Steel Institute
C. ANSI, American National Standards Institute
D. ASCE, American Society of Civil Engineers
E. ASME, American Society of Mechanical Engineers
F. ASTM, American Society of Testing and Materials
G. AWS, American Welding Society
H. IBC, International Building Code
I. IEC, International Electric Code
J. IEEE, Institute of Electrical and Electronics Engineers
K. NEC, National Electrical Code
L. NEMA, National Electrical Manufacturers Association
M. Underwriters Laboratory (UL and cUL)

1.4 SUBMITTALS - Submittals shall be provided to the engineer that includes at the following information:

A. Certified shop drawings showing all important details of construction, dimensions and anchor bolt locations.
B. Descriptive product literature.
C. Schematic electrical wiring diagram and electrical controls information.
D. Complete motor and drive data.
E. The total weight of the equipment
F. A complete bill of materials of all equipment.

1.5 QUALIFICATIONS

A. All the equipment specified under this Section shall be supplied by a single manufacturer involved in the manufacture of septage/grease screening equipment.

B. If equipment is not manufactured by supplier, including welding and machining, the name and contact information of manufacturing facility must be supplied. If more than one manufacturer is used all companies and facilities must be provided.

C. If patents protecting equipment are not owned by supplier then affidavit must be supplied stating owner of design and expiration of licensing agreement.

1.6 DESIGN REQUIREMENTS

A. System Description

1. The fine screen will have a continuous stainless steel belt that automatically rotates within the internal guide system of the static frame or be a front cleaning, front return multi-rake design.

2. The screen will be installed into a stainless steel tank as shown on the contract drawings to accommodate the flow pattern through the screen belt. The tank will include an external rock and gravel trap.

3. The inlet piping shall include the quick release coupling, the magnetic flow meter, an external rock trap and the control pinch valve.

4. The solids will collect as a mat on the front face of the screen. The screen will intermittently rotate and elevate the solids to the discharge point. Larger objects will be picked up by a series of hooks or be carried up on the cleaning rakes.

5. The solids will be automatically removed at the top of the screen by a spray bar or mechanical wiper into an internal hopper and be sluiced to the screening handling system.

6. The continuous belt or rake mechanism will be directly driven by drive sprockets that shall support and rotate the grid assembly.

7. The screen tank will be totally enclosed and have access covers that will be lightweight and easily removable for maintenance.

8. The washing compactor will sit under the discharge point of the screen.

9. The washing compactor will be adequately sized to handle all the screenings and wash water that will be generated by the screen at peak flow. The system will be required to wash the screenings to reduce the organic content and compact the remaining solids into a dry plug.

10. The washing compactor will generally comprise of a screw auger rotating within the washing and drainage trough, a wash water system, a compaction zone and an outlet chute arrangement.

11. All stainless steel (including frame, grid, drive components and hardware) mentioned below as stainless steel shall be T304 stainless steel.

12. The control system will include a hauler keypad access station to monitor each hauler and automatically upload the haulers transaction data.

B. System Performance – The fine screening system will be designed to meet the following design parameters:

1.	Number of grease screens	1
2.	Peak flow to grease screen	400 GPM
3.	Screen grid opening	6 mm
4.	Head loss at peak flow	6 inches @ 50% blinding
5.	Tank width	24 inches
6.	Tank length	90 inches
7.	Tank height	36 inches
8.	Inlet pipe diameter	4 inches
9.	Outlet pipe diameter	4 inches
10.	Screen discharge height above tank	33 inches
11.	Number of washing compactors	1
12.	Diameter of screw	6 inches
13.	Diameter of shaft	2.375 inches
14.	Compactor discharge height above grade	72 inches
15.	System wash water requirements	16 GPM @ 60 PSI

PART 2 PRODUCTS

2.1 MANUFACTURER

A. The grease receiving station shall consist of the Triden Screen and washing compactor as provided by Hydro-Dyne Engineering, Inc., Oldsmar, FL. or the Flo-MultiRake washer/compactor by Enviro-Care Co., Rockford, IL.

B. If submitted equipment requires arrangement differing from that specified, prepare and submit for review complete structural, mechanical, and electrical

drawings and equipment lists showing all necessary changes and embodying all special features of equipment proposed. Any changes are at no additional compensation and the Manufacturer will be responsible for all engineering costs of redesign by the Engineer, if necessary.

2.2 THE CENTER FLOW FINE SCREEN

A. Design A: Laced Link Grid - The Continuous Screening Belt (Triden)

1. The screenings belt will consist of heavy duty stainless steel laced links connected in parallel and separated by Delrin spacers to maintain specified opening. Each laced link element shall be fabricated from 14 gauge stainless steel and be a minimum of 1 inch wide forming a slotted opening of the specified width and minimum 1 inch deep in the direction of flow. Hooks on elements shall form horizontal lifting trays or shelves for removing large solids and rags every 8 inches.

2. The stainless steel laced links will be connected by heavy duty stainless steel axles every 8 inches to form a continuous belt that will rotate within the frame's guide system. The axle design will allow the row of laced links to pivot. The links shall support the screening grid and bear tension loads across the entire width and length of the screen belt.

3. The axles will be extended to fix a UHMWPE guide link to the side of each row of laced link elements. These guides will interlock to create a continuous guide link system that will slide within the frame.

4. The heavy duty guide links will be minimum 2 inches thick to protect against undue wear from grit and will be specially machined to form a closure seal between the rotating belt and the static frame.

5. The seal shall be continuous from grade level through the water flow forming an uninterrupted closure between the traveling screen grid and the stationary frame. The seal shall be fixed to the screen frame and be adjustable so will remain in contact with the rotating screen belt at all times.

6. Guide systems that use rollers, stainless or hardened steel chains will not be acceptable.

7. Grid sealing systems that use neoprene seals or stainless steel hinges will not be acceptable.
8. Grid to frame sealing systems that use adjustable UHMWPE strips attached to the frame will not be acceptable.

9. Intermittent stainless steel laced link elements that form sharp hooks will be regularly placed along the face of each row of the grid to effectively remove larger particles up to 4 inches in diameter.

B. Design B – Bar Rack (Flo-MultiRake)

1. The screening surface shall consist of a vertical bar rack. The bar rack shall be supported from the framework and bolted to the screen frame.

2. A clear opening size of 1/4" between each bar in the bar rack shall be provided. There shall be no space wider than the opening between the bars which would permit passage of larger solids through the bars.

3. The bars shall be fastened to a dead plate that extends to the point of discharge. The dead plate shall be flat such that a close tolerance between the raking tines and the plate can be maintained during the cleaning cycle. The backside of the dead plate shall be constructed to guarantee a uniform space between the rake bar and the dead plate leading to the discharge chute without interruption.

4. The bar rack shall consist of continuous bars with rectangular cross section (.196") x (1.18").

C. The Frame

1. The screen shall be housed in a heavy duty Stainless steel static support frame that shall stand at a 75 degree angle in the channel between guide angles mounted to the tank walls. All routine maintenance will be achieved without removing the screen from the channel.

2. The guide link system will travel around a stainless steel guide wear track that is integral to the support frame.

3. There shall be a removable inspection panel located directly beneath the drive allowing easy access to the grid drive sprockets, drive shaft and screenings collection hopper.

4. The design will ensure that the support frame meshes with the closure seal on each guide link to prevent passage of screening material and grit particles.

5. The frame shall accommodate stainless steel protective covers designed to prevent leakage and contain spray wash. All access covers for maintenance will be lightweight and easily removable. Screens with covers requiring neoprene, rubber or plastic seals are not acceptable.

D. The Offloading of Screenings

1. A stainless steel spray wash header will be located in the head space of the screen to offload the screenings from the continuous belt.

2. The spray bars will incorporate brass flat jet nozzles at 2 inch spacing that can easily be replaced or removed for cleaning.

3. The spray bar will be positioned behind the rotating belt and will backwash the solids into a discharge hopper manufactured from stainless steel. The wash water will be used to continuously flush the screenings from this hopper into the extended sluice or directly into the washer screw compactor.

4. The addition of a rotating or static brush system to aid offloading will not be acceptable.

5. Designs using a mechanical wiper to offload solids will be acceptable.

E. The Drive Mechanism

1. Each screen will have a single 0.5 hp, continuous duty electric geared motor suitable for a 4 60/3/60 supply. The motor will be T EFC NEMA rated. The motor will be located outside of the screen covers.

2. The gear reducer shall be directly coupled to a heavy duty shaft machined from solid stainless steel round bar.

3. The drive shaft shall be supported on both ends by grease filled roller bearings. Separate grease-filled self-contained cartridge seals shall be mounted on drive shaft between bearings and frame to eliminate spray wash from entering bearings or gear reducer.

4. The continuous belt will be supported and rotated around heavy duty stainless steel sprockets located on the drive shaft in the head space of the screen.

5. These sprockets will have lugs that transmit torque directly from the gear reducer to notches on the underside of the U HMWPE guide links. Driving forces shall be transmitted to areas located behind the screen's grid to prevent solids from contacting drive surfaces.

6. Chain driven systems or screens with wheels submerged in the wastewater will also be acceptable.

2.3 THE WASHING COMPACTOR

A. The Washing Compactor

1. The main body will be the washing trough that will receive screenings and wash water directly from the discharge point of the screen.

2. The washing trough will house the screw auger and provide a dedicated section to reduce organic content. It will comprise of angled side walls manufactured from 10 gauge stainless steel that will direct the screenings on to the screw auger, and a drainage section in which the screw auger will ride.

3. The drainage section will be manufactured from stainless steel that has been machined with 5mm slots. The slots will be perpendicular to the direction of the screw so that the shearing action will prevent material collecting in the slots. The screw will not require stiff nylon brushes to keep the section clean.

4. The underside of the washing trough will be a catch pan that will collect the contaminated water that passes through the drainage section. The catch pan will feed a 6 inch diameter outlet connection.

5. The screw auger will sit in the washing trough. Washing compactors with shaft less screws are not acceptable as shaft is required to support flight and provide necessary torque and compaction.

6. The auger will be a full pitch screw supported at the compaction end by two (2) 2.5” wide UHMWPE sleeve bearings that are arranged in parallel to create a collar around at least one full pitch of the screw flight. Each bearing ring will be designed to rotate through 180 degrees to provide a second wear surface below the screw. Each wear surface is fitted with a set screw that can be removed to inspect for wear. The operator will be able to inspect and rotate of the bearing by removing the outside cover but without disassembling the equipment.

7. The end of the screw shall be re-enforced with a triangular shaped stainless steel gusset welded behind the final screw flight to provide protection in this high wear area and to assist in compression of the screenings.

8. The screw will rotate creating sufficient agitation to break down the organic material and separate it from the non-organic screenings.

9. The wash water system will flush the separated organic material through the drainage basket/section in solution or as small particles.

10. A portion of the washing water will enter the washing trough with the screenings. This will be supplemented by spray nozzles that will direct water on to the screenings prior to compaction. The nozzles will be recessed into the side wall of the washing trough to protect from ragging and blockage.

11. The screw will transfer the washed screenings into the compaction zone. This will be a section of stainless steel pipe followed by the UHMWPE sleeve bearing arrangement. The total length of this section will at a minimum equal two full pitches of the screw flight.

12. The compacted screenings will be pushed through the compaction zone and pass through a 45 degree elbow into the outlet chute. The outlet chute will be tapered at 1 degree along the full length and will elevate the dewatered screenings to discharge into a bagging system.

13. The tapered outlet chute will terminate in a flange that will connect directly to a stainless steel discharge box that will direct the compacted screenings downward into the cassette bagger. The box will be designed to prevent bridging of solids and will have a bolted down maintenance access hatch.

14. The outlet of the discharge box will be a stainless steel mounting assembly that will allow a 24" diameter circular cassette of bags to slide horizontally into position.

15. The plastic cassette will house one 230 feet long continuous bag that will be released under the weight of compacted screenings dropping from the outlet chute.

16. The outlet chute will come complete with a freeze protection package including a thermostat in the control panel, tape heat strips, insulation and stainless steel covers. The manufacturer will provide wiring connections that include fittings to mount to field wiring at the job site.

B. The Drive Mechanism

1. Each washing compactor will have a single 1.5 hp, continuous duty electric geared motor suitable for a 460/3/60 supply. The motor will be TEFC NEMA rated.

2. There shall be the facility to change the height of the screw within the washing trough by using adjustment bolts on the gearbox plate. This will prevent excess wear of the screw flights.

2.4 THE STAINLESS STEEL TANK

A. The Screen Tank

1. The screen manufacturer shall design and supply a stainless steel tank that will house the screen and washer compactor.

2. The tank will be manufactured from 14 gauge stainless steel with 10 gauge exterior bracing to prevent distortion. The tank will include bolt holes to allow fixing to a flat concrete floor.

3. The tank will incorporate an emergency by-pass that will divert flow from upstream of the screen into the downstream chamber. An overflow weir will be set above top water level that will direct the flow into an enclosed channel/pipe that runs parallel to the tank as shown on the drawings. No valves, gates or level instruments will be required to initiate the by-pass.

4. The system will incorporate a rock and gravel trap in front of the screen. This will be a 4" deep by 8" wide trench that spans the width of the tank. At the base of stone trap there will be a 1" drain connection that will be manually opened to allow the standing water to flow through a stainless steel pipe to the downstream side of the screen. The stone trap will incorporate a tray with ¼" (6mm) perforations designed to slide out of either side of the tank. The debris on the tray will be tipped into the dumpster by the operator before being inserted back into position. Stainless steel covers with gaskets will be used that will prevent leakage.

5. A baffle will be installed between the rock trap and the front of the screen that is designed to prevent the build up of stones and gravel on the tank floor. The baffle will be sloped to direct heavy material back into the collection trench.

6. The tank inlet connection will have an aluminum quick coupling suitable for a 4" diameter pipe. The inlet pipe will be positioned to allow for complete gravity unloading of the septage/grease tanker.

7. The manufacturer will include all 4" pipe from the aluminum coupling into the tank. This will include all ANSI Class 150 flanges to install the flow meter and the pinch valve.

8. The tank will include a heavy duty pinch valve suitable for a 4" diameter pipe. The pinch valve shall be The Red Valve Series 5200E electrically operated valve designed for tough slurry and abrasive applications. The pinch valve shall have a ductile iron body with ANSI Class 150 flanges. The sleeve will be made from Buna-N and designed to isolate all mechanical parts of the valve from the flow.

9. The tank will have a 4” diameter flanged outlet pipe.

10. The tank will be completely enclosed to minimize odors with a stainless steel cover that will have four (4) bolted down access hatches. The ultrasonic level sensor shall be mounted on to the top of the tank. The sensor shall be factory wired to a NEMA 4/7 junction box mounted to the side of the tank.

2.5 THE EXTERNAL ROCK TRAP

A. The External Rock Trap

1. The screen manufacturer shall design and supply an external rock trap that collects rocks, stones and gravel larger than ½” before entering the screen tank. This will be installed between the pinch valve and the screen tank.

2. The main body and cover of the rock trap shall be manufactured from a minimum of 10 gauge stainless steel with appropriate gaskets included to prevent leakage.

3. The cover will include a 1” vent and vacuum relief valve.

4. The outlet shall be a vertically mounted 4” diameter pipe fitted with a manually operated slide gate. This will be periodically opened to allow the trapped material to fall into a dumpster.

2.6 THE CONTROL PANEL

A. General Information - The manufacturer will supply one UL listed 508A stainless steel main control panel that shall automatically control the equipment offered in this section.

B. The Main Control Panel – NEMA 4X – Each control panel shall consist of the following components for each screening system

1. Stainless steel NEMA 4X, control panel enclosure
2. Sunshield
3. Hand/Off/Auto switch
4. Fused disconnect
5. Recycle timer
6. Hour run meter
7. Control transformer
8. Fuses and breakers
9. Motor starter
10. Motor overload sensor
11. Screen run light
12. Washing Compactor run light

13. Emergency stop
14. Ultrasonic level transducer and controller
15. Control relay to signal a ready permissive to the keypad access system

2.7 KEYPAD ACCESS SYSTEM

A. A Card Reader/Keypad station is required for the Hauler to access and discharge to the system. The Hauler Access Station will include the following minimum features:

1. Digital Keypad Operator Interface with minimum 4-line display
2. Swipe/Scan Card Reader with 100 Programmable Cards
3. Printer to print out a record of the delivery, time and quantity
4. After card swiping, the User will be prompted for additional information as follows:

    a. A 4-digit PIN that allows access to the system.
    b. Type of material being discharged (configurable option)
        1 – Septage
        2 – Secondary Sludge
        3 – Grease Trap
        4 – Other
    c. Volume of material (configurable if flow meter not used)

B. After information is loaded, a green light will indicate that the system is ready and the inlet valve will open.

C. The Access Station shall store data in non-volatile local memory. When a local or networked PC is connected via. Ethernet to the Access Station, PortALogic shall synchronize the user PINs and discharged receipt data.

D. Enclosure: NEMA 4X, 304 Stainless Steel to UL/cUL (CSA optional) "Industrial Control Panel" Standard.

E. A 4" diameter magnetic flow meter shall be provided for installation by the Contractor into the inlet piping as shown on the contract drawings. The flow tube shall be the Rosemount Series 8705 with an integrally mounted Series 8712 transmitter Class 1, Div 2/8732 transmitter Class 1, Div 1. The flow tube shall be suitable for mounting between ANSI Class 150 flanges. Two standard electrodes AISI Type 316 stainless steel shall be provided. The transmitter shall include an operator interface and a 4-20 mA analog output signal. The magnetic flow meter shall be suitable for a Class1, Div1 OR Class 1, Div 2 explosion proof area.

2.8 SURFACE PREPARATION AND PAINTING

A. All stainless steel materials, including hardware, shall be acid passivated for quality control, removal of heat affected discoloration, surface treatment for corrosive environments and to provide a uniform finish to stainless surfaces.

B. Prime coat for all ferrous surfaces (except stainless steel) shall be epoxy primer as specified in Section 09901.

C. Finish coat shall be as specified in Section 09902.

D. Motor and gearbox shall be chemical rated (corrosion resistant).

2.9 SPARE PARTS AND ACCESSORIES – The manufacturer will supply the following components, per screen supplied, with the equipment:

A. Design A:

1. Two (2) screen panels
2. Two (2) grid axles
3. Two (2) guide links
4. Ten (10) hook links and elements spacers
5. One (1) solenoid valve
6. One (1) wash water strainer
7. One (1) screening bagger assembly
8. One (1) tank mounted pH probe

B. Design B:

1. Two (2) UCT Bearings
2. One (1) Rake Plate
3. One (1) 2m Chain Section
4. One (1) solenoid valve
5. One (1) wash water strainer
6. One (1) screening bagger assembly
7. One (1) tank mounted pH probe

Part 3 EXECUTION

3.1 WARRANTY – The Manufacturer of the equipment supplied under this specification shall provide a warranty for a period of twelve months commencing on acceptance and/or beneficial occupancy by the Owner but no later than 90 days from the date of shipment by the Manufacturer. The Manufacturer shall guarantee that the equipment furnished is suitable for the purpose intended and free from defects in design, materials and workmanship. In the event that the equipment fails to perform as specified the Manufacturer shall, at his option, promptly repair, modify or replace the defective equipment.

3.2 FACTORY TESTING

A. The screening system and all components shall be factory assembled and tested for a minimum of 24 hours prior to shipment. The screens and washing compactor shall be shipped fully assembled and shall be capable of being set in place and field erected by the Contractor with minimal field assembly.

B. During the factory test period the screening system shall be adjusted as required assuring proper operation on completion of the field installation. The Manufacturer shall supply a certification of the completion of the factory testing of the assembled screening system and appurtenances and shall certify as to the equipment being in satisfactory operating condition at time of shipment. The Engineer and/or Owner may, at their own option and expense, witness the factory test.

3.3 DELIVERY AND STORAGE

A. The screening system shall be appropriately crated and delivered to protect against damage during shipment.

B. An authorized representative of the Contractor shall inspect the screens on delivery to the jobsite and shall report any damage or missing components to the Manufacturer and the Engineer within 72 hours of receipt of the shipment.

3.4 INSTALLATION - The Installation of the screens shall be as indicated on the drawings and in strict accordance with the Manufacturer's instructions and recommendations.

3.5 FIELD TESTS, ADJUSTMENTS AND START-UP

A. The After completion of the installation, the equipment shall be inspected and certified by an authorized representative of the Manufacturer as being in compliance with the Manufacturer's recommendations and requirements. At such time as the Manufacturer has deemed the installation to be acceptable, the Manufacturer's authorized service representative shall make any required adjustments and shall start the equipment to assure proper operation.

B. The Manufacturer's authorized representative shall provide instruction to the plant personnel as to the operation and maintenance of the equipment including startup, shut down, on-line operations, lubrication and preventative maintenance.

C. The Contractor shall include in his bid, the cost of the above referenced authorized service representative for a minimum of one (1) eight hour day onsite to complete the certifications and training described in this specification section.

END OF SECTION

SECTION 11326
DEWATERING SCREW PRESS

PART 1 - GENERAL

1.1 SCOPE OF WORK

A. This section shall include furnishing One (1) Volute Dewatering Press as specified and indicated on the drawings and as required to meet the specified performance requirements.

1.2 WORKMANSHIP AND DESIGN

A. All components of the sludge dewatering equipment shall be engineered for long, continuous, and uninterrupted service with minimal operator intervention. Provisions shall be made for easy maintenance, adjustment, or replacement of all parts.

1.3 SYSTEM PERFORMANCE

A. The sludge dewatering system will be capable of dewatering the feed sludge and producing a solids cake with no free water present. The system will be able to start up, operate as required and shut down in the absence of any operators.

1.4 SYSTEM DESCRIPTION

A. The sludge dewatering system shall consist of One (1) Volute Dewatering Press and all appurtenances.

B. The Volute Dewatering Press shall be a complete prefabricated system consisting of:

1. sludge conditioning system consisting of two-stage flocculation tanks wih a mixing tanks with gear motor and mixing impeller to allow efficient mixing of polymer in the sludge and a flocculation tank including gear motor and large cross-sectional area agitator
2. Two (2) x 300 series “Dewatering drums” including spray wash down system and gear drives
3. support structure for the Dewatering Drum including filtrate collection pan and outlet plumbing.
4. a self-contained electrical and control panel including control for ancillary equipment such as feed pumps and solids conveying and control for the additional dewatering drum
5. polymer dilution and dosing equipment

6. sludge feed pump

7. magnetic flow meter

8. shaftless screw conveyor

1.5 BASIS OF DESIGN

A. The basis of design and specification is based on Volute Dewatering Press product model ES-302 as supplied by Process Wastewater Technologies LLC.

B. Provide a quantity of 1 Volute Dewatering Press manufactured by Process Wastewater Technologies or equal. Should equipment of a different type or manufacturer which otherwise differs from that specified herein be offered, such equipment shall be acceptable only on the basis that any revisions in the design and/or construction of the structure, piping, appurtenant equipment, electrical work, etc, required to accommodate such a substitution shall be made at no additional cost to the Owner, shall be the responsibility of the Contractor and shall be as approved by the Engineer.

1.6 PATENTS

A. The manufacturer warrants that the use of this system and its equipment, in the process for which the system has been expressly designed, will not infringe on any U.S. or foreign patents or patents pending. In the event of any claim of infringement the manufacturer shall defend and indemnify the owner free from any liabilities associated with the use of the patented equipment or process.

B. The contractor hereby grants to the owner, in perpetuity, a paid-up license to use any inventions covered by patent or patents pending, owned, or controlled by the supplier in the operation of the facility being constructed in conjunction with the equipment supplied under this contract, but without the right to grant sublicenses.

1.7 WARRANTY

A. The manufacturer shall warrant, in writing, that all equipment supplied by them shall be free from defects in material and workmanship, for a period of twelve (12) months from the date of startup, not to exceed eighteen (18) months from the date of delivery, unless noted otherwise within the specifications.

1.8 CONDITIONS OF SERVICE

A. The dewatering equipment shall be designed to adequately condition and dewater the septage/grease such that a dewatered sludge cake is

produced that easily discharges from the dewatering unit, without blinding or plugging, and that may be handled by solids conveying equipment.

B. Each unit shall be designed to operate in the environment for which it is intended, continuously or intermittently on demand, and shall perform the required dewatering operations without spillage of water or sludge beyond the nominal machine envelope. In addition, the unit will operate with no requirement for operator attention other than periodic inspection and chemical replenishment.

1.9 QUALITY ASSURANCE

A. System Responsibility

1. Vested responsibility for operation and control of the Volute Dewatering Press system, which is comprised of all equipment controlled by the Volute Dewatering Press control panel, resides with the manufacturer of the Volute Dewatering Press.

B. Factory Quality Control Test

1. Prior to shipment, the Volute Dewatering Press and control panel shall be factory tested at the place of assembly. Factory test each pre-assembled, pre-wired, Volute Dewatering Press and its associated control panel to be supplied to the job site. Prior to shipment, verify through a one-hour continuous operating test that the Volute Dewatering Press and associated equipment operate smoothly, noiselessly, vibration free, and without overheating of any bearing or motor.

C. Owners Right to be Present

1. The owner/engineer shall, at their option, be permitted to witness the factory quality control test at the manufacturer's facility. The manufacturer shall give the owner/engineer a minimum of one (1) weeks' notice prior to testing.

PART 2 - MECHANICAL REQUIREMENTS

2.1 MATERIALS AND COATINGS SCHEDULE

A. All materials utilized in the construction of the sludge dewatering equipment shall be entirely suitable in every respect for the service required. All metals in contact with polyelectrolyte or sludge, and all other metal components other than those specified below in Table 1 shall be stainless steel, type 304 or 316.

B. The following table indicates the materials and coatings that shall be provided for the volute Dewatering Press and related components unless specified otherwise herein:

Table 1. Material and Coatings Schedule

Item of Equipment	Material
Mixing and Flocculation tanks	Type 304 Stainless steel
Plumbing	Type 304 Stainless steel or Schedule 80 PVC
Dewatering Drums	Type 304 Stainless steel
Dewatering Drum screw	Type 304 Stainless steel with Flame coating 10Co-4Cr
Gear Motors	Die cast Aluminum and Type 304 Stainless Steel
Gear Motor coating	Acrylic paint
Spray bars and water plumbing	Type 304 Stainless steel
Spray nozzles	Polypropylene
Electrical control panel enclosure	NEMA 4X Type 304 Stainless Steel
Electrical wiring housing	Non-metallic flexible liquid-tight conduit and liquid tight fittings
Electrical switch enclosures	Stainless steel or non-metallic NEMA 4X
Frame / Skid mounting	Type 304 Stainless Steel
Valves – Wetted Sections	Stainless Steel, EPDM Seating

2.2 STRUCTURAL SKID FRAME

A. The structural support frame shall be fabricated of type 304 stainless steel members conforming to the latest ASTM Standard Specifications for Structural Steel, Designation A36 It will be a rigid structure, adequately braced to withstand intended loads without excessive vibration or deflection.

B. The framework shall be of welded an/or bolted construction. All welding shall conform with the American Welding Society Structural Welding Code.

C. The structure shall be designed for installation on a prepared concrete foundation or suitable flat concrete slab and secured with anchor bolts.

D. The construction shall allow easy access and visual inspection of all internal components.

2.3 DEWATERING DRUMS

A. Description

1. The dewatering drums will be constructed of ATSM type 304 SS except for the rings in the thickening section of the drum which will be manufactured in a polycarbonate resin. All circular components will be laser cut to ensure maximum evenness of wear and therefore operating life.

B. Performance

1. Assembly will be undertaken in such a way that all fixed rings are concentric and parallel. All fixed rings will be equally spaced apart for each section of the dewatering drum. When mounted on the retaining rods and installed, all moving rings will move freely between the fixed rings.

2.4 DEWATERING DRUM SPRAY SYSTEM

A. Description

1. Each Dewatering Drum shall be equipped with individual spray bars. Each spray bar shall consist of a spray pipe fitted with spray nozzles, located above the dewatering drum. The spray pipe and spray nozzle assembly shall be readily removable.

2. Nozzle spacing and spray pattern shall be such that the sprays from adjacent nozzles overlap one another on the dewatering drum surface.

B. Performance

1. The sprays will operate periodically and will remove solids built up externally on the drum such that over time no significant build up of solids occurs on the drum.

2.5 DEWATERING DRUM DRIVE

A. Description

1. The Dewatering Drum drive motor will be a one piece gearmotor. Gearmotors will be hollow shaft design designed to drive the dewatering drum screws with no additional couplings or joints.

Motors will be filled with grease on assembly and sealed for life. Screw rotational speeds shall be obtained through a hypoid reduction gear. Input power to the dewatering drum drive shall be supplied through an A.C. variable frequency drive unit.

B. Drive Motor Data

1.	Maximum Horsepower:	0.55
2.	Power Requirements:	480 VAC, 3 phase, 60 hertz
3.	No load motor speed:	1760 RPM
4.	Gear Reduction:	504:1
5.	Output shaft speed:	3.5 RPM @ 60Hz
6.	Insulation Class:	IP56
7.	Enclosure:	TEFC
8.	Enclosure material:	Die Cast Aluminum
9.	Service Factor:	1.15

2.6 MIXING AND FLOCCULATION TANKS

A. Description

1. Mixing and flocculation tanks will be manufactured in type 304 stainless steel and will be a minimum of 20 gauge (1mm). Tanks and spill containment trays will be fully welded internally and externally.

B. Performance

1. Design and manufacture of tanks and spill trays must ensure no leakage or spillage of fluids under normal working conditions. Tank design will minimize the possibility of any short circuiting of flow. Tank size will allow for sufficient residence time for flocculation to occur.

2.7 MIXER AND FLOCCULATION DRIVES

A. The mixer and flocculation tank drive motors will be a one piece gearmotor. Gearmotors will be hollow shaft design designed to drive the mixing impeller shafts with no additional couplings or joints. Motors will be filled with grease on assembly and sealed for life. Mixer rotational speed shall be obtained through a hypoid reduction gear. Input power to the dewatering drum drive shall be supplied through an A.C. variable frequency drive unit allowing variable mixing energy to be input to the system.

B. Mixing tank drive motor data:

1.	Maximum Horsepower:	0.25
2.	Power Requirements:	480 VAC, 3 phase, 60 hertz
3.	No load motor speed:	1760 RPM
4.	Gear Reduction:	10:1
5.	Output shaft speed:	180 RPM @ 60Hz
6.	Insulation Class:	IP65
7.	Enclosure:	TEFC or TENV
8.	Enclosure material:	Die Cast Aluminum
9.	Service Factor:	1.15

C. Flocculation tank drive motor data:

1.	Maximum Horsepower:	.55
2.	Power Requirements:	480 VAC, 3 phase, 60 hertz
3.	No load motor speed:	1760 RPM
4.	Gear Reduction:	60:1
5.	Output shaft speed:	30 RPM @ 60Hz
6.	Insulation Class:	IP65
7.	Enclosure:	TEFC or TENV
8.	Enclosure material:	Die Cast Aluminum
9.	Service Factor:	1.15

2.8 CONTROL PANEL

A. General

1. Each Volute Dewatering Press shall have an integrated electrical and control system that will allow for safe, simple and automated operation of the unit. All electrical work, motors and drives will comply with any relevant NEMA standards. The electrical control system will be able to accept remote start and stop signals, and will have outputs for unit in operation, and unit alarms to an external PC.:

    a. Control Panel will be UL listed.

    b. Enclosures: Control panel enclosures shall be free-standing, fabricated of type 304 stainless steel and shall be suitable for NEMA 4X service.

c. The control panel shall accept a 208/240/480 volt (as specified by the client), 60 hertz, 3 phase ac power input. A main disconnect circuit breaker and operator mechanism shall be included. When the disconnect is in the open position, all power shall be removed from the control system.

d. IEC rated motor starters shall be provided for all non-VFD and DC motors.

e. Variable frequency drives (VFD) shall be provided for the dewatering drum drive and mixing and flocculation tank agitators as well as any feed pumps.

f. Short circuit protection for system components shall be accomplished utilizing fuses. Individual thermal overload protection shall be provided.

g. A transformer shall be included that will provide 120 volts, ac for the polymer dilution and dosing system and control system

h. A Programmable Logic Controller (PLC) will control all timing and switching functions

i. The control panel will have externally mounted controls for key operational items as per Section 3.2.2.

B. External Enclosure Features

1. The external door of the panel will have the following switches and indicators:

a. Main Isolating Switch (Circuit Breaker)

b. An emergency stop button which shall be a mushroom head style pushbutton that when depressed shall immediately de-energize all moving equipment in the system.

2. Within a widowed enclosure mounted on the panel door:

a. HMI Touch Screen

b. An H-O-A system switch to switch the system from Auto to off to manual modes

c. Power on Light (white)

d. An Operating Light -for when the unit is actually in operation - (green)

3. In addition to items located on the main enclosure door:

a. An Alarm Light - a flashing light located on the top of the panel (red)

2.9 PROGRAMMABLE LOGIC CONTROLLER (PLC)

A. Each Volute Dewatering Press will be provided with an Allen Bradley CompactLogix PLC, installed, wired and programmed to perform the following functions:

1. Operational Control

a. Control of all components of the Volute Thickener- system including the ability to set times and operating speeds for any feed pump installed, solids conveyor, dewatering drums, mixers, polymer dosing system and wash-down sprays.

2. System Tuning

a. PLC will allow suitably qualified operators to adjust operating parameters such as delay timers for fault alarms and system calibration constants.

3. Monitoring Operation

a. PLC will allow the operator to inspect the operation of all the components including indicators such as output frequency, current draw, thermal condition, elapsed operating times, and any faults present. Operator will be able to view approximated readouts of all operational speeds and flowrates relevant to the operation of the system.

4. Manual operation of components

a. Operator will be able to manually operate each item of equipment from the PLC interface for inspection and maintenance reasons.

5. Time Clocks

a. Operator will be able to set the unit to operate at specific time or on specific days with no operators present.

2.10 ELECTRICAL HARDWARE

A. Power Wiring: All power and wiring shall be 600 volt, type SIS insulation stranded copper and shall be sized for the required load, 14 AWG minimum.

B. Control Wiring: Control wiring shall be 250 volt, type SIS insulation stranded copper and shall be sized for the required load, 18 AWG minimum.

C. Circuit Breakers: Circuit breakers for the main disconnect shall be thermal magnetic molded case units. Circuit breakers shall be Square D, Class 650, Type FAL or equivalent.

D. Motor Starters: Motor starters shall be full voltage, non-reversing, IEC style across-the-line units. Coils shall be 120 volts ac. Siemens type Sirius 3RT10 or equivalent.

E. Selector Switches: All selector switches shall be heavy duty, corrosion resistant units rated for NEMA 4X service. Contact blocks shall be rated for 10 ampere continuous service. Selector switches shall be Idec Series TWTD.

F. Pilot Lights: Pilot lights shall be heavy duty, corrosion resistant units rated for NEMA 4X service. Units shall be 120 VAC full voltage incandescent type. Pilot lights shall be Idec Series TWTD or equal

G. Terminal Blocks: Terminal blocks shall be high density, solderless box lug style, with 600-volt rating. Terminal blocks shall be Allen Bradley type 1492 or equal

H. Control Relays: Control relays shall be general purpose type with a 10 amp contact rating, miniature square base and internal on status pilot light. Relays shall be Allen Bradley Type 700-HF Series or equal.

I. Programmable Logic Controller: The programmable relay shall be an Allen Bradley CompactLogix PLC.

J. Variable Frequency Drives (VFD): The VFDs shall be UL listed and shall be manufactured by Altimar.

2.11 FUNCTIONAL SPECIFICATION

A. The control panel will undertake the following operations:

B. Auto-Manual operation

1. The Volute Thickener-Dewatering Press system may be set to either Auto/Manual/Off on the control panel via a 3 position switch. This will be the “main switch” for the plant.

2. When set to manual, all items may be switched on and off at the control panel by the switches on the HMI unit.

3. When set to off, no items will work whether switched on or off either at the control panel or anywhere else.

4. When set to Auto, all items of equipment will work as per the following descriptions.

C. Clock Operation

1. The clock function will be controlled by the PLC in the control panel. Two clock functions will be allowed for in the program. The clock may be set to either “On” or “Auto/timer” via at the PLC. If the clock is set to “On” the plant will run for as long as the main switch is set to “ Auto”. When the clock is set to “ Auto/Timer” the plant will operate in accordance with the clock settings.

2. Clock function settings will allow the operator to set the dewatering press and all associated equipment to switch on and off, at pre-designated times on pre-designated days with no operators being present. A minimum of two (2) different “clock programs” will be allowed for in the PLC program.

D. Sludge Feed to Plant

1. Sludge is fed to the plant by a pump controlled from the control panel. A VFD will control the speed of the pump. In the event of a pump overload or a VFD fault the plant will shut down and an alarm will occur.

2. A flow meter will monitor the sludge flow. The operator will be able to set the flow and the feed pump will operate to maintain that flow via a PID loop. Any variations from the preset flow will cause the system to shut down and an alarm to occur.

E. Polymer Feed

1. Polymer feed to the plant is achieved by the integral polymer preparation system connected to the plant. This system is controlled and powered by the control panel. Outputs from the control panel to the polymer preparation system will include power, start and stop signals, and variable speed control for the polymer feed pump.

2. Manual adjustment of the speed control for the polymer dilution mixing chamber will be make from the control panel. The control panel will also monitor the polymer preparation system for faults due to low water pressure, or no polymer flow and shut the system down with an alarm should this occur.

F. Flocculation Tank Agitation

1. Whenever the plant is operating 2 motorized agitators will operate continuously, stirring the contents of the flocculation tank. These are geared motors and will be controlled by a VFD in the control panel. The VFD will be adjustable from 5 Hz up to 75 Hz

2. A high level sensor will detect any high fluid level in the flocculation tank and will shut the plant down and cause an alarm should this occur.

G. Dewatering Drums

1. The Dewatering Drums will operate whenever the plant is operating. The motor is controlled by a single VFD. The Range of Adjustment for this will be 15 Hz to 100Hz. When the plant shuts down the dewatering drum will continue to operate for a pre-set time before they shut down. Sprays will periodically switch on while the dewatering drum is operating. The frequency and duration of the spray are adjustable in the PLC.

H. Conveyor

1. The Conveyor will operate whenever the dewatering drums are operating and will shut down following a pre-set delay following the shut down of the dewatering drums. E-stop and no-motion sensors on the conveyor will shut down the system and cause an alarm in the event they are activated. The conveyor will also shut down the system and cause an alarm on over torque

PART 3 - MANUFACTURER'S SERVICES

3.1 INSTALLATION SUPERVISION

A. Services of the manufacturer's factory trained representative, who is specifically knowledgeable in the type of equipment specified herein, shall be provided during the equipment installation period. The manufacturer's representative shall assist the installation contractor in determining the location of anchor bolts, setting and leveling the equipment, and coordinating the process piping and electrical connections to all the equipment specified herein.

3.2 START-UP AND COMMISSIONING

A. Upon completion of the installation, the services of the manufacturer's factory trained representative shall be provided at the project site for equipment start-up and calibration. During the start-up and calibration phase the manufacturer's representative shall inspect all system components for proper connection and alignment and assist the installation contractor in placing the equipment in a proper operating condition.

B. Start-up or commissioning service provided by any one other than the equipment supplier shall limit or void equipment warrantee.

3.3 OPERATOR TRAINING

A. Upon satisfactory completion of the start-up and calibration, a representative of the manufacturer shall be provided to instruct Owner's personnel in the proper operation and maintenance of the equipment.

3.4 OPERATION AND MAINTENANCE MANUALS

A. Upon completion of commissioning, the manufacturer will provide the owner with four (4) copies of the operation and maintenance manuals for the Volute Dewatering Press.

3.5 OTHER SERVICES

A. Additional services, other than those provided for by warranties or as specified herein, may be charged to the Owner/Contractor at the manufacturer's standard service rates.

END SECTION

SECTION 11338
RIGHT ANGLE VERTICAL ENTRY MIXERS

PART 1- GENERAL

1.01 DESCRIPTION

A. Provide and test right angle drive, combination helical and spiral bevel gear drive mixers as indicated and specified.

1.02 RELATED WORK

A. Section 01300: Shop Drawings, Submittals, and Samples

B. Section 01620: Delivery, Storage, and Protection

C. Section 0900: Painting and Protective Coatings

D. Electrical Specification Sections as required

1.03 REFERENCES

A. American Society for Testing and Materials (ASTM) Publications

B. Anti-Friction Bearing Manufacturers Association (AFBMA)

C. American Gear Manufacturers Association (AGMA)

D. American National Standards Institute (ANSI) Standards

E. Occupational Safety and Health Administration (OSHA) Standards

1.04 SUBMITTALS:

A. Submit the following in accordance with Section 01300 - Shop Drawings, Submittals, and Samples.

1. Manufacturer's ISO9001:2008 Certificate
2. Certified shop and working drawings
3. Certified Gear and Bearing Life Calculations based on actual experienced torque and bending moments
4. Operating and maintenance instructions and parts lists
5. Certified test reports verifying quality of gears in Gear Reduction Units
6. Shop drawing data for accessory items
7. Templates or certified setting plans, with tolerances for anchor bolts

8. Motor data
9. Motor shop test results
10. Field inspection/testing reports
11. Mixer shop test results
12. Recommendations for short and long term storage
13. Shop and field testing procedures and equipment to be used
14. Tag numbers for all equipment
15. Special Tools
16. Test Plans for any required field and factory performance testing

1.05 QUALITY ASSURANCE

A. Manufacturer Qualifications

1. Manufacturer regularly engaged in manufacturing of mixing and aeration equipment in the United States for not less than 10 years. Mixer gearboxes and wetted parts shall be designed, manufactured, and tested by the Equipment Supplier.

2. The manufacturer must possess an in-house aeration and mixing technology center capable of verifying full scale geometrically correct performance witnessed by the Engineer at the Manufacturer's facility using the contract wetted parts.

3. The manufacturer must possess in-house Laser Measurement equipment capable of mapping flow velocities. This shall be accomplished through the use of Particle Imaging Velocimetry.

4. The manufacturer must possess the capability to conduct project specific Computational Fluid Dynamics (CFD) analysis for each specific installation configuration in order to provide confirmation that the proposed mixing system will meet the process requirements.

5. The manufacturer must possess the capability to conduct project-specific Finite Element Analysis (FEA) for both the wetted parts and mixer gearboxes in order to verify that the loads enountered do not exceed the specified allowable conditions under the actual installed loading conditions.

B. Warranty

1. The manufacturer shall provide a full mechanical warranty for a period of 12 months after successful completion of equipment installation, not to exceed 18 months after shipment. If the equipment should fail during the warranty period due to a defect in the workmanship, design, or material, the manufacturer shall replace the affected part(s), and restore the equipment to service.

C. Quality Assurance System Compliance

1. Manufacturer shall have Quality Assurance System in place which is certified compliant with ISO 9001:2008. Manufacturer shall submit a copy of their ISO certificate.

1.06 DELIVERY, STORAGE, AND HANDLING

A. Provide in accordance with Section 01620

B. Shipping

1. SUPPLIER to ship equipment, material and spare parts complete except where partial disassembly is required by transportation regulations or for protection of components.

C. Receiving

1. CONTRACTOR to inspect and inventory items upon delivery to site. The supplier must be notified of any damaged or missing items within 24 hours of delivery. Any damages not noted within 24 hours of delivery shall be assumed to be the responsibility of the contractor.

2. CONTRACTOR to store and safeguard equipment, material and spare parts in accordance with manufacturer's recommendation.

3. CONTRACTOR to unload, haul, and store items.

4. CONTRACTOR to pay all demurrage charges for failure to promptly unload items.

PART 2- PRODUCTS

2.01 MANUFACTURERS

A. Mixers shall be manufactured by Philadelphia Mixing Solutions Limited (PMSL), Palmyra, PA. 3800 Series Mixer Drive, or equal.

B. In order to qualify for approval, mixer manufacturer must submit the following:
   a. Sizing criteria
   b. Proposed Model Number (specific to the size to be provided)
   c. Mixer literature
   d. Project Specific Computational Fluid Dynamics (CFD) Model of all mixing chambers with the proposed alternative mixers
   e. Particle Imaging Velocimetry (PIV) data for the impeller design to be proposed

f. Installation lists with a minimum of 10 installations of similar size and type in satisfactory operation (no warranty claims against the supplier)

2.02 PROCESS PERFORMANCE REQUIREMENTS:

A. A quantity of 1 mixer drives is required for 1 tanks. The mixer shall be designed to meet the following requirements:

Number of Mixers per Tank	1	
Tank Dimensions (DiamxDepth)	15 x 25	feet
Normal Liquid Level	272.33	inches
Mixer Operation through Liquid Level	No	
Design Volume	30000	gallons
Maximum Motor Nameplate Power	3	hp
Maximum Nominal Motor Speed	1800	RPM
Continuous Operation	Yes	
Motor Starts/Stops Per Day	NA	
Material of Wetted Parts	316 Stainless Steel	
Impeller Type	Qty 2- 3 Bladed Anti-Ragging Hyperfoil	
Maximum Output Speed	37	RPM
Minimum Impeller Diameter	72	inches
Lower Impeller Off Bottom Spacing	96	inches
Minimum Shaft Diameter	3	inches

2.03 MATERIALS:

A. Wetted parts shall be defined as the bottom half of the upper most coupling, the agitator shaft, any additional shafts (excluding the gearbox output shaft), impeller hubs, impeller blades and hardware below the mounting surface with exception of the gearbox output shaft coupling hardware. Wetted parts shall be of the specified material.

B. Non-wetted parts shall be any component other than the wetted parts. Any non-wetted parts shall be of a material appropriate to the location and design conditions.

2.04 MECHANICAL REQUIREMENTS:

A. Gear Reduction Units:

1. The mixer gear drive must be built and rated in accordance with the current appropriate applicable helical and spiral bevel AGMA Standards. The AGMA calculated drive horsepower rating shall be stamped on drive nameplate. Drive housings shall be of high quality close-grained grade 30 cast iron, stress relieved and reinforced, and shall be provided with lifting

lugs or holes. Housings not composed entirely of metal will not be allowed. Fabricated housings will not be allowed.

2. All gear reducers shall incorporate a combination of helical and spiral bevel gearing to insure highest efficiency coupled with convenience of mounting, maintenance, and installation. Spiral bevel gearset shall be the final reduction. It shall not be necessary to remove the gearbox from its mounting structure to perform routine maintenance on the speed reducer. Worm gears are not acceptable.

3. Input and intermediate gearing shall be of AGMA Quality 12 (twelve) or better per the current applicable helical AGMA standard.

4. All gearing and bearings shall be located in a single housing and lubricated by a common oil bath. The use of an auxiliary reducer to achieve the required output speed will not be acceptable.

5. The drive's minimum AGMA service factor, based upon motor nameplate horsepower, will be 2.0. Mixer supplier must submit gear rating calculations with approval drawings. Calculations shall be based upon the actual loads, including both torque and bending moments, encountered in the specific installation and not allow for pitting and shall account for drive housing rigidity as confirmed through finite element analysis (FEA). Calculations shall be based on using mineral oil and reflect the operational duty specified above. Details of FEA results shall be provided upon Engineer's request. Deflections used in gear and bearing calculations shall match those demonstrated by FEA results.

6. The mixer gear drive shall be designed with a shaft and bearing system suitable for the loadings imposed by the application. All designs shall be based upon the hydraulic loadings, including both torques and bending moments, experienced in this specific mixing application. Standard commercial gear drives will not be acceptable.

7. All components of each gear drive shall be designed, manufactured and assembled in full compliance with all applicable AGMA requirements.

8. All drive bearings shall be of antifriction type, tapered roller bearings. All bearings within the drive, except for the output shaft bearings, shall have minimum ABMA L10a lives of 100,000 hours when operating at full motor nameplate horsepower at design speed. Output shaft bearings shall have a minimum L10a life of 100,000 hours. Mixer supplier must submit bearing life calculations with approval drawings. Bearing calculations must be based upon all loadings, including both torques and bending moments, and the resulting gearbox housing deflections as seen in this specific mixing application.

9. The gearbox output shaft shall be composed of carbon steel. Any portion of the output shaft external to the gearbox housing will be painted using the same system used for the remainder of the gear reducer.

10. The thermal rating of the gear reducer must exceed the design mechanical rating. No external cooling devices are allowed.

11. Lubrication of each speed reducer shall be accomplished by bearings and gears being dipped and immersed in oil. The drive shall be provided with a sight glass to observe oil level. Grease lubricated bearing are acceptable on the output shaft, provided adequate sealing is provided to separate them from the oil bath.

12. Drive input speed shall range from 0 rpm to full motor nameplate speed.

13. Each drive must have an true drywell feature to eliminate oil leakage down the output shaft. The base of this drywell feature must be integral to the reducer housing casting. Drywell configurations in which the base is threaded into or bolted onto the gearbox housing will not be acceptable. Drywell configurations consisting of multiple lip seal arrangements will not be acceptable.

14. All oil fill and drain lines shall be located so as to be easily accessible, with the oil drain located at least 12 inches above the mounting elevation (pedestal mounted).
15. The pedestal mount shall be of the “milk stool” type. I-beam type pedestals will not be accepted.

16. Gearmotor attachments to reduce speed will not be allowed.

17. Drives which utilize an oil pump feature will not be allowed.

18. In order to ensure system responsibility, the drive must be designed, tested, and manufactured by the wetted parts supplier. Commercially available gear drives will not be acceptable.

B. Impellers:

1. Impeller blades shall be bolted to the impeller hub.

2. The impeller hub shall attach to the shaft by means of a hook key designed to prevent the impeller from slipping down the shaft even if the set screws are not tightened.

3. The maximum stress in any impeller component shall not exceed 12,000 psi under maximum operating loads.

4. The shaft-impeller system design shall be such that its operating speed shall not exceed 75% of its first lateral critical speed. The use of stabilizing rings or fins will not change this limitation.

5. Impeller blades shall be designed with a swept profile to prevent the accumulation of rags anywhere on the impeller leading edges.

C. Impeller Shafts:

1. The shaft shall be designed such that the maximum nominal shear stress shall not exceed 9,000 psi under maximum operating loads. It shall be of overhung design - the use of underwater steady bearings is not permitted.

2. Shafts shall be manufactured to a minimum straightness such that they are straight to within 1/8 inches per every 10 feet of length. Certification of straightness at time of shipment shall be provided by the manufacturer for each shaft.

3. The lower mixer shaft shall be connected to the upper, or drive output shaft, by means of a rigid flanged coupling, of either the welded or interference fit hub type. Coupling face shall have a rabbeted male and female piloted connection for accurate concentricity and shall not require match marks for alignment. A shaft arrangment which does not include a separate gearbox output shaft and a flange style coupling located below the gear reducer shall not be acceptable.
4. Shaft support bearings located below top cover of mixing tank are NOT ACCEPTABLE. All loads, including torques and bending moments, are to be constrained by the mixer gear drive output bearings.

D. Drive Motors:

1. The electric motor driver shall be commercially available standard NEMA C-Face, TEFC.

2. Insulation shall be Class F, limited to Class B temperature rise at 40^{0}C ambient at 1.0 service factor.

3. Service factor shall be 1.15 on sine wave power and 1.0 on inverter power

4. Rating: 230/460 Volt/3 Phase/60 Hertz

5. Maximum Speed as indicated above

6. Motors will be supplied using the motor manufacturer's standard paint system.

E. Flexible Couplings

1. Connect motor and gear reducer

2. Design to withstand continuous full load motor horsepower including torques to 150 percent of full load running torque. Minimum 1.5 service factor

F. Guards

1. Supply rotating shafts above platform level with guards conforming to OSHA Requirments.

G. Anchor Bolts

1. Anchor Bolts are to be provided by the CONTRACTOR and set per the requirements of the mixer manufacturer. The mixer manufacturer will supply any required templates for setting the anchor bolt dimensions.

2.05 Gearbox Appurtenances

A.

Part Description	Required (YES/NO)
Desiccant Breather	
Oil Immersion Heater	
Tank Seals	

B. (FILL IN DETAILS)

C. (FILL IN DETAILS FOR WHEN USED)

D. (FILL IN DETAILES FOR WHEN USED)

2.06 SHOP PAINTING

A. Specified in section 09940

2.07 SPARE PARTS

A. As recommended by the mixer manufacturer for 2 years of operation.

PART 3 - EXECUTION

3.01 INSTALLATION

A. Install mixers per manufacturer's printed instructions and templates.

3.02 FIELD PAINTING

A. Per Specification Section 09941.

B. Only touch up painting will be performed in the field.

3.03 FIELD SERVICE

A. Provide the services of a manufacturer's factory trained representative for a total of 1 trip of 1 day to provide start up assistance and instruction on the proper operation of the equipment to the Owner's personnel.

3.04 ACCEPTANCE TESTS

A. Perform a full scale factory test of all equipment before shipment.

B. Operate mixers for a period of 24 hours after installation to ensure that all parts are installed correctly and fully functional.

C. Make all adjustments necessary to provide for proper operation and full functionality.

3.05 CONTRACT CLOSEOUT

A. Provide O&M manuals in accordance with Section 01780.

B. Provide all other contract closeout requirements in accordance with Section 01700.

END OF SECTION

SECTION 11350
SEPTAGE SCREEN EQUIPMENT

PART 1 – GENERAL

1.01 SUMMARY

A. This section includes the furnishing of two (2) front-cleaning, front-return link driven mechanically cleaned bar screen assemblies and any auxiliary equipment or accessories to be installed in the locations as indicated on the drawings and as specified herein.

B. All equipment supplied under this section shall be furnished by or through a single Screening System Supplier who shall coordinate with the Contractor, the design, fabrication, delivery, installation and testing of the screening components. The Screening System Supplier shall have the sole responsibility for the coordination and performance of all components of the screenings system with the performance and design criteria specified herein.

C. The Contractor shall be responsible to coordinate all details of the screening equipment with other related parts of the Work, including verification that all structures, piping, wiring, and equipment components are compatible. The Contractor shall be responsible for all structural and other alterations in the Work required to accommodate the equipment differing in dimensions or other characteristics from that contemplated in the Contract Drawings or Specifications.

1.02 RELATED SECTIONS

A. The following list of related sections is provided for the convenience of the Contractor and is for reference only to support commonly referenced sections that are in-general applicable to all equipment supplied. (For complete list of sections see specification index.)

B. All sections of Division 1 including but not limited to Submittal Procedures, Shop Drawings, Product Data and Samples, Operating and maintenance information, Protection of Materials and Equipment, Installation, Testing, and Commissioning, Instruction of Operations and Maintenance Personnel, and Spare Parts Maintenance Manuals.

1.03 REFERENCE STANDARDS

A. American National Standards Institute (ANSI)
B. American Society for Testing and Materials (ASTM)
C. American Welding Society (AWS)
D. American Institute of Steel Construction (AISC)
E. American Bearing Manufacturers Association (ABMA)
F. American Gear Manufacturers Association (AGMA)
G. National Electrical Manufacturers Association (NEMA)
H. Underwriters Laboratory (UL)

1.04 SUBMITTALS

A. The equipment manufacturer shall submit the following items:
   1. (6) Sets of General Arrangement drawings that illustrate the layout of the equipment, equipment weight, principal dimensions with related verifications required for installation including anchorage locations. Other related data including descriptive literature, Electrical Control Drawings, Catalog Cut Sheets for individual components and Drive Motor Data.
   2. A list of recommended Spare Parts including any Special Tools required for routine maintenance of the equipment is provided in Section 2.5.
   3. (6) Sets of O & M Manuals including As-Built Drawings of the Mechanically Cleaned Bar Screen Arrangement, Controls and Accessories shall be provided in digital format after equipment ship for inclusion in the Close-Out Submittal process.
   4. For sites that have (3) ft or greater head differential, equipment manufacturer shall provide Structural Certification from licensed Civil engineer.

1.05 QUALITY ASSURANCE

A. The Mechanically Cleaned Bar Screens shall be fully assembled and shop tested at the manufacturing facility prior to shipment. Shop testing shall include a minimum of 4 hours of run time.

B. To assure quality and performance: All equipment furnished under this Section and related sections shall be of a single manufacturer who has been regularly engaged in the design and manufacture of the equipment and demonstrates, to the satisfaction of the Engineer, that the quality is equal to equipment made by those manufacturers specifically named herein. And the screen manufacturer shall have at least 25 installations of

the specified model of mechanically cleaned bar screen equipment that has been in successful operation, at similar installations, for at least five (5) years.

C. The equipment furnished shall be fabricated, assembled, installed and placed in proper operation condition in full conformity with approved drawings, specifications, engineering data, and/or recommendations furnished by the equipment manufacturer.

1.06 WARRANTY

A. Manufacturer shall provide a written one year standard warranty from the date of use of the mechanically cleaned bar screen equipment to guarantee that there shall be no defects in material or workmanship in any item supplied.

PART 2 – PRODUCTS

2.01 MANUFACTURERS

A. The screens shall be the FlexRake® Model, Full Penetration Bar Screens, as manufactured by Duperon Corporation, 1200 Leon Court, Saginaw, Michigan (1-800-383-8479), or the Flo-MultiRake Coarse Bar Screens as manufactured by Enviro-Care Co., Inc. 5701 Industrial Ave., Rockford, IL (815-636-8306).

2.02 BASIS OF DESIGN

A. The mechanically cleaned bar screen shall have a head sprocket only, with no sprockets, bearings, idlers, or similar drive components under water to trap the chain. Equipment featuring reciprocating rake arms or lower bearings/sprockets/tracks below the water is not acceptable.

B. The mechanically cleaned bar screens shall be designed to run continuously (24/7), without operator.

C. The equipment shall have multiple scrapers on the bar screen at one time cleaning continuously from bottom to top, the entire width of the bar screen. The drive output shaft rotation shall be constant and in one direction in order to reduce maintenance and increase product life. Units which have single raking arms or that require cycle times shall not be allowed. Cleaning mechanisms that utilize shock absorbers, springs or other dampening or hydraulic actuations are unacceptable.

D. The link system shall have jam evasion capability by flexing around and collecting large objects such as a 2 X 4, bowling ball, grease balls and surges of solids at peak loading times without overloading and shutting down the unit. The link system shall be such that it bends in one direction only which allows it to become its own lower sprocket and frame and shall have a 1,000 pound lifting capacity.

E. Designs employing the use of endless moving media or cables and hydraulic cylinders to remove debris from the channel and units utilizing proximity or limit switches for reverse cycles are not acceptable.

F. Equipment utilizing a greater than ½ HP motor or two or more motors to complete a screen cleaning cycle is not acceptable.

G. The design shall be such to ensure that all maintenance can be accomplished at the operating floor level or above. No part of the drive system including sprockets shall be located below the water surface at maximum design flow.

H. Design Conditions:
1. 1.00 ft of head differential structural design
2. 0.25 inch x 1.00 inch SSTL304 rectangular shaped bar screen
3. 4.00 ft assumed conveyor / compactor / dumpster height
4. 150.00 mph wind design (High wind reinforcement)
5. 15.00 degree from vertical
6. 1.00 inch clear opening
7. 6.00 ft bar screen height
8. 14.00 ft nominal length of FlexLink and scraper system
9. 4.00 ft channel height
10. 4.00 ft channel width
11. 4,200 lbs estimated weight, each

2.03 COMPONENTS

A. Bar screen assembly: Bar screen assembly shall be of stainless steel and designed to withstand 1 foot head differential unless noted otherwise in Section 2.2 J Design Conditions. Unless noted otherwise materials of construction shall be 304 Stainless Steel. The Bar screen assembly shall be shipped in one piece.

B. Screen Bars: Bars shall be 304 stainless steel and be rectangular shaped, true bar with a the minimum dimensions of 0.25 inch x 1.00 inch. Bars shall be individually replaceable or replaced in sections without welding.

C. Side Fabrication: The screen framework shall be 304 stainless steel bent plate with minimum of 3/16 inch cross section.. Horizontal members shall be of stainless steel bent plate or stainless steel pipe. Support members and frame shall adequately support the bar screen based on site specific requirements.

D. Dead Plate: Dead plate shall be 0.25 inch thick 304 stainless steel. The dead plate shall be flat and true; span the entire width of the unit; and transition from bar screen to discharge point.

E. Discharge Chute: The discharge chute shall be 11ga. (0.12 inch) 304 stainless steel. The discharge chute shall be bolted to the dead plate and shall be designed to allow debris to be transferred from discharge point into the debris containment.

F. Link Slides: Link slide assembly shall be provided per manufacturer standard design and shall be constructed of UV Stable UHMW PE rollers and 304 stainless steel supports and components.

G. Return Guide/Closeouts: Return guide/Closeouts shall be 304 stainless steel and shall assure proper alignment of scrapers as they enter the bar screen and assure that there is no space wider than the clear opening between bars to prevent passage of larger solids than allowed through the screen.

H. Debris Blade: A 304 stainless steel and UV Stable UHMW-PE debris blade assembly, which does not require a separate drive, shall be installed to assist in removing debris from the scraper on the mechanically cleaned bar screen unit as recommended by the manufacturer.

I. Screen Enclosure: The screens shall be provided with full, front and rear, standard covers above the channel. Covers shall be easily removed and provide access to the front and rear of the screens without tools. A 6-inch knockout at the top screen cover shall be provided. If the screens do not come with full standard covers, which are a minimum of 14ga. 304 SST, a 14ga. #4 brushed satin finish 304 SSTL enclosure shall be installed to cover the screen above the operating deck level. Front enclosure shall have removable 304 SSTL panels for access to equipment. Removable panels shall be 16ga. 304 SSTL and shall be provided with knurled knobs for access without tools. Alignment notches shall be included to support repositioning of removable panels. The top of the front enclosure shall include a knock out for a customer site option to install a 6-inch diameter pipe stub. (The option of connecting to the site's exhaust system, to provide a positive air exchange from interior of enclosure, by Others.) Rear enclosure shall have hinged removable doors and shall be secured with a lift-slide-latch handle. Rear removable door shall include an integral viewing door that shall be secured with a lift-slide-latch handle to provide access for a quick look inside.

J. Link System: The link system shall be 304 stainless steel conveyor chain with a minimum working load of 10,000 lbs. each, or stainless steel castings with a minimum ultimate strength of 60,000 lbs and a minimum cross section of 1.5 inches and weighing a minimum of 4.5 lbs each.

K. 304 stainless steel link system shall include 302 stainless steel retaining rings and 304 stainless steel pins.

L. Scrapers: Scrapers shall be spaced 21 inches apart. To provide long product life the scraper shall move at no greater than 28 inches per minute at standard operating speed of ½ rpm allowing for approximately 1 debris discharge per minute. Scrapers shall be 1.00 inch thick, UV Stable UHMW-PE or ½ inch thick laser cut 304 stainless steel and shall fully penetrate the bar screen, cleaning all three sides of the bars as well as through to the cross members in openings of 0.625 through 4 inches.

M. Drive Head: The Drive Heads hall be located at the top of the mechanically cleaned bar screen.

N. Drive Unit: Each mechanically cleaned bar screen unit shall operate independently and shall have its own drive unit and driven components.

O. Drive Sprockets and end castings shall be cast 304 stainless steel.

P. Drive Shaft shall be 304 stainless steel.

Q. Gearbox shall be shaft-mounted, right angle type and include spiral bevel gearing. The output shaft speed shall be controlled by a vector type inverter or per rake manufacturer's recommendation. It shall have at least a 1.52 or greater service factor based on machine torque requirements. The gearbox shall not be vented to the outside atmosphere. The gearbox shall be grease filled. Oil filled gearboxes are not allowed.

R. The motor shall be AC induction type, inverter duty, 3 phase240/480 volt and mounted to the gear reducer. The motor shall be ½ hp, designed for 1800 RPMs base speed and rated for Class I, Groups C & D, Class II Groups F & G environments. The motor shall have an EPNV enclosure, NEMA design B with a 56C frame size. Service factor shall be 1.0 or greater, Class F insulation and be optimized for IGBT type inverters. The motor must be UL listed and designed for continuous operation.

S. Motor shall have built in, normally closed, thermostat to protect from overheating that is to be field wired to corresponding terminal in control panel for redundant (ambient) overload protection.

T. All drive head components shall be of components available in the United States.

U. Bearing: Bearing shall be greased ball bearing type, non self-aligning, sealed and lubricated and shall have a 24/7/365 L10 life of 20 years when in compliance with stated O&M recommendations.

V. Speed Reducer: Speed reducer shall be a double-reduction, cycloidal style and shall comply with all applicable AGMA standards. The speed reducer shall be capable of a 4/1 speed range with variable output speeds between 0.50 to 2.2 output RPMs (in high flow conditions). The speed reducer shall produce an output torque of 11,417 in.lb. and have a gear ratio of 809:1.

W. Standard Coating: All non-stainless bar screen components shall be coated in strict accordance with the paint manufacturer's specification. Surface Preparation shall be done in accordance with SSPC-SP-10 Near White. The three-part coating system shall be manufactured by Tnemec as follows: Prime Coat Series 90-97 Tneme Zinc at 2.5-3.5 mils DFT, Intermediate Coat Series 27 F.C. Typoxy at 3.0-5.0 mils DFT, and Top Coat Series 1075U Endura-Shield II at 2.0-3.0 mils DFT. Standard color

is 11SF Safety Blue. Material shall meet all state and federal VOC and other regulatory requirements.

X. Alternatives: Any alternate products must provide certified test reports when submitting products other than those specified herein the specification. Test reports shall indicate the test method, system and requirements for those products being submitted, and shall meet or exceed the test criteria and performance values of the specified coatings herein.

2.04 ELECTRICAL, CONTROLS, INSTRUMENTATION

A. General: Controls for each rake shall be in enclosures provided by the bar screen manufacturer. The bar screen manufacturer shall be responsible for proper sizing and function of the controls at 480V, unless specified otherwise.

B. Main control panels require shading from the sun and shall be operated within a temperature range between 35°F and 104°F. Sunshields, visors or other structures needed to provide shade are by others. (If the controls will experience temperatures outside this range, then special climate provisions are available.)

C. Controls shall be designed to accept incoming power supply per plans/specs and shall include a step-down transformer as needed to achieve 120V.

D. Control Panel(s) shall be constructed to meet the appropriate NEMA classification requirements and will include a main, lockable disconnect. The panel will be constructed by a UL certified control panel build facility and will be supported by the appropriate UL labeling.

E. Controls shall be tested prior to shipment to owner. The rake manufacturer shall verify all overload settings in the rake controller to insure proper overload and speed settings required for the application are properly programmed.

F. Control panel(s) shall be wired complete with a minimum of #16 MTW wire in the appropriate colors for the circuits being supplied. 120VAC control shall be red, grounded AC neutral shall be white, DC control shall be blue, DC neutral shall be blue with a white tracer, equipment ground shall be green and all incoming and outgoing external power source wires shall be a yellow configuration. All AC power wiring shall be a minimum of #12

Black. All wires shall be labeled at both ends with heat-shrink wire markers. Internal panel wiring shall be contained in non-flammable, covered wire way.

G. All panel(s) and panel mounted devices shall be labeled with engraved I.D. markers that reference back to the system schematics. Tags shall be white with black core, engraved as required.

H. All field wiring and power cables between the bar screen Main Control Panel and the Local Push Button Station shall be provided by others under the Electrical Section.

I. Components:

1. Main Control Panel
2. Enclosure(s) shall be NEMA 4X 316 SSTL for outdoor installations. For (2) FlexRakes in outside environment
3. Enclosure shall not be located in an explosive environment.
4. Main Control Panel shall be designed with a SCCR rating of 18KA at 480 VAC minimum and labeled as such, unless otherwise specified.
5. All terminals utilized in the main panel shall be 600V rated terminals and 20% spare terminal space shall be provided for any potential future revisions.
6. The Main Control Panel shall include at a minimum the following
7. Main fusible disconnect with lockable operator, unless otherwise specified.
8. Physical or virtual Hand/Off/Auto (HOA) Selector and Push/pull E-Stop button.
9. Elapsed run-time meter
10. Indication for "Power On", "Forward" and necessary faults.
11. AC Tech, Variable Frequency Drive (VFD)
12. Electronic torque control
13. Hard contact SCADA Interlock(s)
14. Adjustable on/off cycle timers
15. Local Control Push Button Station

J. Enclosure shall be NEMA 4X rated for unclassified installation. Local push button station must be local to the equipment to maintain requirements of local safety codes as determined by the Engineer.

K. Local station shall be mounted within 10 feet or as close to the equipment as safely possible and be field wired by the electrical subcontractor to the corresponding terminal inputs in the main control panel.

L. The remote pushbutton station shall include Forward, Jog Reverse and E-Stop buttons.

M. A remote shall be provided for each FlexRake

N. Instrumentation: Each rake shall have a separate level system that shall be installed and field wired by others per the manufacturer's instructions.

O. Controls Design Conditions:

Incoming Power: (Voltage/Phase)	480/3/60
Enclosures:	2
Installation location:	Outdoors
Approx. distance between main panel and equipment motor	Within 30 ft
Climate controlled location:	No
Outdoor location (must be shaded): For temperatures below 35° F select Outdoors Option 1. For temperatures above 104° F select Outdoors Option 2	Canopy by others
Outdoors Option 2: Thermostat, air conditioner and heater	Yes
Transducer/Float cable length (50 ft standard):	None

2.05 SPECIALTY TOOLS, SPARE PARTS AND LUBRICATION

A. Manufacturer shall provide any specialty tools and recommend spare parts required for maintaining the equipment as follows:

1. Drive Clevis Pin 1
2. Snap/Retaining Rings 10
3. Link Clevis Pins 4
4. Scraper Bolts 4
5. Scraper Nuts 4
6. Snap Ring Tool 1
7. Never Seez, 3 oz. tube 1

B. Manufacturer shall provide a 5-year supply of lubrication required for maintaining all bar screen components.

PART 3 – EXECUTION

3.01 INSTALLATION

A. Equipment shall be installed in strict conformance with the manufacturer's installation instructions, as submitted with Shop Drawings, Operation and Maintenance Manuals and/or any pre-installation checklists. Installation shall utilize standard torque values and be installed secure in position and neat in appearance. Installation shall include any site preparation tasks as required by the engineer or manufacturer; such as unloading, touch-up painting, etc. and any other installation tasks and materials such as wiring, conduit, controls stands as determined by the customer and/or specified by the manufacturer.

B. Anchor Bolts: Anchor bolts and nuts shall be 316 stainless steel and furnished for each item of equipment by the CONTRACTOR.

C. Anchor bolt template drawings shall be included in the submittal to permit verification of the location structural elements, new or existing in the concrete.

D. Anchor bolt sizes, quantity and requirements will be indicated on the submittal drawings. Quantity is site specific but typically each Barscreen assembly requires (8) to (12) 1/2" dia. x 4 1/2" Lg. embed HILTI HAS RODS w/ RE-500 SDA dhesive system anchor bolts for Mechanical Screen anchorage and typically (8) to (12) 3/8" dia. x 3 3/8" Lg. embed HILTI HAS RODS w/ RE-500 adhesive system anchor bolts for the Return Guide/Closeouts anchorage.

3.02 TESTING

A. After completion of installation, CONTRACTOR shall provide for testing and shall be performed in strict conformance with the manufacturer's start up instructions. Testing of the bar screen shall demonstrate that the equipment is fully operational by picking up and depositing materials into specified containment.

B. Field certification shall include inspection of the following:

1. Verify equipment is properly aligned and anchored per the installation instruction and drawings. Assure the bar screen unit is square, flat and unobstructed with required clearances maintained.
2. Assure controls and instrumentation work in all modes.

3. Check equipment for proper operation of debris blade, scrapers, etc as well as completion of the Start-Up requirements in the installation guide.

3.03 ONSITE TECHNICAL ASSISTANCE

A. Manufacturer shall provide services to include Installation Certification, and shall include (1) day for Start-Up and (1) day for Training. Manufacturer shall be given minimum 14 days notification prior to the need for such services. To assure the best outcome for the Owner and Contractor, the Contractor shall provide certification for completion of the PRE-COMMISSIONING CHECKLIST.

END OF SECTION

SECTION 11365
ROLL-OFF FILTER SYSTEM

PART 1 – GENERAL

1.01 SUMMARY

A. This section includes the furnishing of a roll-off filter system and any auxiliary equipment or accessories to be installed in the location as indicated on the drawings and as specified herein.

B. All equipment supplied under this section shall be furnished by or through a single supplier who shall coordinate with the Contractor, the design, fabrication, delivery, installation and testing of the roll-off filter components. The supplier shall have the sole responsibility for the coordination and performance of all components of the roll-off filter system with the design criteria specified herein.

C. The Contractor shall be responsible to coordinate all details of the equipment with other related parts of the Work, including verification that all structures, piping, wiring, and equipment components are compatible. The Contractor shall be responsible for all structural and other alterations in the Work required to accommodate the equipment differing in dimensions or other characteristics from that contemplated in the Contract Drawings or Specifications.

D. To assure quality and performance: All equipment furnished under this Section and related sections shall be of a single manufacturer who has been regularly engaged in the design and manufacture of the equipment and demonstrates, to the satisfaction of the Engineer, that the quality is equal to equipment made by those manufacturers specifically named herein. The roll-off filter manufacturer shall have at least three installations of the specified equipment that have been in successful operation, at similar installations, for at least five (5) years.

1.02 RELATED SECTIONS

A. The following list of related sections is provided for the convenience of the Contractor and is for reference only to support commonly referenced sections that are in general applicable to all equipment supplied. (For complete list of sections see specification index.)

1. Section 1110 - General Requirements for Equipment
2. All sections of Division 1 including but not limited to Submittal Procedures, Shop Drawings, Product Data and Samples, Operating

and maintenance information, Protection of Materials and Equipment, Installation, Testing, and Commissioning, Instruction of Operations and Maintenance Personnel, and Spare Parts Maintenance Manuals.

1.03 SUBMITTALS

A. The equipment manufacturer shall submit the following items:
   1. (6) Sets of General Arrangement drawings that illustrate the layout of the equipment, equipment weight, principal dimensions with related verifications required for installation including anchorage locations. Other related data including descriptive literature and Catalog Cut Sheets for individual components.
   2. Six (6) sets of O&M Manual books and one (1) CD that includes instructions and spare parts lists, that allow the operator to operate and maintain the equipment supplied. The instructions shall be prepared as a system manual applicable solely to the equipment supplied by the manufacturer to these specifications, and shall include those devices and equipment supplied by him.

PART 2 – PRODUCTS

2.01 MANUFACTURERS

A. Container Filter shall be 25 cubic yard Roll-Off Style Container Filter Model RB-25-C-B as manufactured by Flo Trend Systems, Inc. of Houston, Texas (800-762-9893), or equal.

2.02 BASIS OF DESIGN

A. Dimensions shall not exceed 23'-1" L x 8'-6" W x 5-5" H nor shall it weigh over 10,000 lb. Internal area shall yield a minimum of 25 cubic yards of sludge storage.

B. Container Filter shall be constructed of A-36 carbon steel plate with ¼" floor and 3/16" walls with solid cover. The unit shall be round bottom in shape. Floor cross members are structural channels spaced on 16" centers.

C. Container Filter shall have two 3" threaded drainage ports on each lower side at opposing ends for the floor and two 3" drainage ports for walls. Each port to have a 3" hose cam connection with cap and chain.

D. The drainage system shall be constructed in such a way to allow the walls and the floor drainage to be independent of each other, allow walls to drain by gravity while floor can drain by gravity and use pump assist to pull vacuum aiding the dewatering process if necessary.

E. Rails are constructed of 6" x 2" x 3/16" structural tubing with 36 1/2 " inside spacing.

F. The Container Filter shall be equipped with four (4) wheels, 8" diameter x 8" wide diagonally braced. Tracking wheels shall be 4" diameter x 6" wide.

G. Wall gussets are 7 gauge formed plate.

H. Door sealing face shall be totally watertight and have a one-piece extruded gasket made of a SBR neoprene 50/50 blend. The gasket shall be held in place by a welded metal seal retainer. Doorframe shall be made of 4" x 3" x 3/16" structural tubing and with three steel hinges located on the side. Door sealing shall have 1" ratchet chain binders, one on each side and one in the middle of the door. Hinges are constructed of ½" wall steel tubing and 1" diameter hot rolled bar pins with welded retainer washers.

I. Internal filter support system shall be comprised of ¼" angles, structural channels and removable filter support panels made from ¼ " thick perforated plate with ¼" diameter holes at 3/8" staggered centers.

J. All removable filter panels shall have a ¼ " x 2" wide neoprene gasket installed between the panel and framework. Chalking or other sealant is not an acceptable gasket material.

K. Filter media shall be as recommended by roll-off manufacturer. Filter media with back-up material shall be contour fitted onto support panels and secured in place with retainer bars, stainless steel socket set screws with fender washers, and acorn nuts. Filter support and filter media shall cover the floor of container. Filter support shall be removable for cleaning of container. A pump can be used to pull a vacuum on cavity below filter support.

L. Single point inlet connection at the front of the unit shall be minimum of 4" NPT and equipped with female cam hose connector. (Optional)

2.03 MATERIALS OF CONSTRUCTION

A. Hot-rolled structural steel shapes and plates shall be ASTM A36.

B. Hot-rolled carbon steel sheet and strip structural quality shall conform to ASTM-A570 grades D & E.

C. Hot-formed welded and seamless steel tubing shall conform to ASTM A500 grade B.

D. Welded and seamless steel pipe shall conform to ASTM A53 grade B.

E. Stainless steel fasteners shall conform to AISI grade 304/305.

F. Welding electrodes are E70S used in gas metal arc process conforming to the specifications for mild steel electrodes for gas metal ARL welding AWS A518.

G. All exposed welds shall be cleaned of welding slag and rounded. All exposed sharp edges and corners shall be rounded.

H. All steel metal surfaces shall be sandblasted to near white metal and commercially coated with a two-part epoxy primer.

I. The external final surface shall receive 5 mils dry Corothane II industrial/marine coating.

J. Interior surfaces shall have a final coating of industrial epoxy applied totaling 5 mils dry.

PART 3 – EXECUTION

3.01 INSTALLATION

A. Equipment shall be installed in strict conformance with the manufacturer's installation instructions, as submitted with Shop Drawings, Operation and Maintenance Manuals and/or any pre-installation checklists. Installation shall include any site preparation tasks as required by the engineer or manufacturer; such as unloading, touch-up painting, etc. and any other installation tasks and materials required as indicated on the Drawings or by the manufacturer for a complete installation.

3.02 TESTING

A. After completion of installation, CONTRACTOR shall provide for testing that shall be performed in strict conformance with the manufacturer's start up instructions.

B. Unit shall be water tested for complete water tightness.

3.03 ONSITE TECHNICAL ASSISTANCE

A. Manufacturer shall provide a qualified field engineer for a minimum of four (4) hours to provide services onsite including equipment installation check, start up of the equipment, and operator training. Field engineer shall provide field testing for proper operation and any necessary field adjustments to ensure that the equipment installation and operation comply with requirements.

B. Field Engineer shall instruct personnel in the operation and maintenance of the equipment, including step-by-step troubleshooting with necessary test equipment.

END OF SECTION

SECTION 13120
GLASS FUSED TO STEEL, BOLTED-STEEL TANK

PART 1-GENERAL

1.1 SCOPE OF WORK

A. Furnish and erect two (2) Glass-Fused-to-Steel, bolted tanks, including foundations, tank structure and tank appurtenances as shown on the contract drawings and described herein. All required labor, materials and equipment shall be included.

1.2 SUBMITTALS

A. Construction shall be governed by the Owner's drawings and specifications showing general dimensions and construction details, after written approval by the Engineer of detailed erection drawings prepared by the tank bidder. There shall be no deviation from the drawings and specifications, except upon written order from the Engineer.

B. The bidder is required to furnish, for the approval of the Engineer and at no increase in contract price, 6 sets of complete specifications and construction drawings for all work not shown in complete detail on the bidding drawings. A complete set of structural calculations shall be provided for the tank structure and foundation. All such submissions shall be stamped by a Registered Professional Engineer licensed in the state of project location, as well as, by a Registered Professional Engineer employed on the tank manufacturer's engineering staff.

C. When approved, two sets of such prints and submittal information will be returned to the bidder marked "APPROVED FOR CONSTRUCTION" and these drawings will then govern for the work detailed thereon. The approval by the Engineer of the tank supplier's drawings shall be an approval relating only to their general conformity with the bidding drawings and specifications and shall not guarantee detail dimensions and quantities, which remains the bidder's responsibility.

D. The tank manufacturer's and installing contractor's standard published warranty shall be included with submittal information. Submit detailed design drawings sealed by a professional engineer registered in the state where the tank is located.

E. Submit design calculations sealed by a professional engineer registered in the state where the tank is located.

F. Submit mix designs for floor and dome roof concrete mixes.

G. Submit mix designs for shotcrete mixes.

1.3 QUALIFICATIONS OF TANK SUPPLIER

A. The Engineer's selection of factory applied glass-fused-to-steel bolt together tank construction for this facility has been predicated upon the design criteria, construction methods specified, and optimum coating for resistance to internal and external tank surface corrosion. Deviations from the specified design, construction, or coating details, will not be permitted.

B. The bidder shall offer a new tank structure as supplied from a U.S.A. manufacturer specializing in the design, fabrication and erection of factory applied glass-fused-to-steel, bolt together tank systems. The manufacturer shall employ a staff of full time engineers, and shall own and operate its production plant, fabricate and glass coat the tank at one U.S.A. location.

C. The tanks shown on the contract drawings and specified herein are Model 2015 Aquastore Tank Systems as manufactured by CST Storage of DeKalb, Illinois.

D. Alternate glass-fused-to-steel tank products, as provided by other manufacturers, will be considered for prior approval by the Engineer. Manufacturers lacking the experience requirement will not be considered. The Owner's decision or judgement on these matters will be final, conclusive and binding.

E. Strict adherence to the standards of design; fabrication; erection; product quality; and long term performance, established in this Specification will be required by the Owner and Engineer.

F. Tank substitutions which cause engineering and contract changes - the tank installation as shown on the plans and specified herein, is based on the equipment furnished by one manufacturer. A tank which is offered as a substitute to the specific requirements of these Specifications and which differs in detail and arrangement from that shown may require changes in design and construction. All costs which result from such changes in design and construction are to be borne entirely and unconditionally by the Contractor; said costs to include but not be limited to structural, piping, mechanical and electrical changes and all engineering costs incurred as a result of the substitution, in the revision of Plans and Specifications, review of design changes by others, preparation of change orders, and any other costs directly resulting from said substitution.

G. The Engineer reserves the right to evaluate all bids based on long term, 30 year minimum operation, coating and maintenance costs. Values to be used in this evaluation will be at the discretion of the Engineer, as detailed in this specification and bid tabulation form. The Engineer will add such costs,

dependent upon the type of tank offered, to the bidder's bid price to determine the effective low bid for purposes of making the award.

1.4 TANK DESIGN CRITERIA

A. Tank Design Standards
   a. The materials, fabrication, and erection of the bolt together tank shall conform to the AWWA Standard for "Factory Coated Bolted Steel Tanks For Water Storage" - ANSI/AWWA D103, latest revision (potable water applications) or AISC for wastewater tank applications.
   b. The tank coating system shall conform solely to Section 10.4 of ANSI/AWWA D103. NOTE: Baked-on epoxy painted or galvanized bolt-together tanks are not considered equal.
   c. The glass coating on the tank, bolt head encapsulation material, and joint sealant shall have been approved for listing under ANSI/NSF Standard 61 for Indirect Additives.
   d. The tank manufacturer shall be ISO-9001 certified to assure product quality.
   e. The tank manufacturer shall certify during the shop drawing approval phase that they undergo an annual FM (Factory Mutual) inspection and provide proof thereof to assure product quality.

B. Tank Size: The factory-coated glass-fused-to-steel, bolt together tank shall have a nominal diameter of 19.58 feet, with a nominal sidewall height of 14.68 feet.

C. Tank Capacity: Tank effective capacity shall be 30,500 gallons (nominal, U.S. gallons) with 12" freeboard.

D. Floor Elevation: Finished floor elevations shall be as shown on the Drawings.

E. Design Loads:
   a. Specific Gravity 1.0 (Min. design shall be 1.0)
   b. Wind Velocity 160 mph (ASCE 7-05 Design)
   c. Allowable Soil Bearing Capacity 3000#PSF (Per Eng.'s Bearing Capacity Soils Report)
   d. Roof Snow Load _n/a__ psf
   e. Seismic Zone 0

PART 2 - PRODUCTS

2.1 PLATES AND SHEETS

A. All steel shall be smelted and produced in the U.S.A.

B. Plates and sheets used in the construction of the tank shell shall comply with the minimum standards of AWWA D103, Section 2.4.

C. Design requirements for mild strength steel shall be ASTM A570 Grade 30 with a maximum allowable tensile stress of 14,566 psi.

D. Design requirements for high strength steel shall be ASTM A607 Grade 50 with a maximum allowable tensile stress of 26,000 psi.

E. The annealing effect created from the glass coated firing process shall be considered in determining ultimate steel strength. In no event shall a yield strength greater than 50,000 psi be utilized for calculations detailed in AWWA D103, Sections 3.4 and 3.5.

F. When multiple vertical bolt line sheets and plates of ASTM A1011 Grade 50 are used, they shall be manufactured such that holes are staggered in the vertical bolt lines and that no two adjoining holes are in-line horizontally, except at the center of the sheet or plate; and the effective net section area shall not be taken as greater than 85% of the gross area.

G. Sheet edge protection: after initial sheet preparation, all full height vertical wall sheets shall be beveled. A metal coating of stainless steel shall then be thermally bonded on these edges at a thickness of 1.5 to 5 mils (0.0015 to 0.005 inches). The coating shall have a tensile strength of >1500 psi (10 MPa) (per ASTM C633-79). Concrete materials shall meet the requirements of ACI 301. Cement shall be Portland Type I or II. Up to 25% of cement may be replaced by fly ash.

2.2 ROLLED STRUCTURAL SHAPES

A. Material shall conform to minimum standards of ASTM A36 or AISI 1010.

2.3 HORIZONTAL WIND STIFFENERS

A. Design requirements for intermediate horizontal wind stiffeners shall be of the "web truss" design with extended tail to create multiple layers of stiffeners, permitting wind load to be distributed around the tank.

B. Web truss stiffeners shall be of steel with hot dipped galvanized coating.

C. Rolled steel angle stiffeners are not permitted for use as intermediate stiffeners.

2.4 BOLT FASTENERS

A. Bolts used in tank lap joints shall be 1/2" - 13 UNC - 2A rolled thread, and shall meet the minimum requirements of AWWA D103, Section 2.2.

B. Bolt Material
   1. SAE J429 Grade 2 (1" bolt length)
      a. Tensile Strength - 74,000 psi Min.
      b. Proof Load - 55,000 psi Min.
      c. Allowable shear stress - 18,163 psi Min.
   2. SAE J249 Grade 5 (1-1/4" bolt length)
      a. Tensile Strength - 120,000 psi Min.
      b. Proof Load - 85,000 psi Min.
      c. Allowable shear stress – 29,454 psi Min.
   3. SAE J249 Grade 8 (> 1-1/4" bolt length)
      a. Tensile Strength - 150,000 psi Min.
      b. Proof Load - 120,000 psi Min.
      c. Allowable shear stress – 36,818 psi Min.

C. Bolt Finish - Zinc, mechanically deposited. 2.0 mils minimum - under bolt head, on shank and threads.

D. Bolt Head Encapsulation - High impact polypropylene co-polymer encapsulation of entire bolt head up to the splines on the shank. Natural resin with UV (ultraviolet) light inhibitor. Color to be black.

E. All tank shell bolts shall be installed such that the head portion is located inside the tank, and the washer and nut are on the exterior.

F. All lap joint bolts shall be properly selected such that threaded portions will not be exposed in the "shear plane" between tank sheets. Also, bolt lengths shall be sized as to achieve a neat and uniform appearance. Excessive threads extending beyond the nut after torqueing will not be permitted.

G. All lap joint bolts shall include a minimum of four (4) splines on the underside of the bolt head at the shank in order to resist rotation during torqueing.

H. Polyethylene co-polymer "bolt caps" and sealant shall be used to cover the bolts, nuts, and washers exposed on the outside of the tank sidewall.

2.5 SEALANTS

A. The lap joint sealant shall be a one component, moisture cured, polyurethane compound. The sealant shall be suitable for contact with potable water and meet applicable FDA Title 21 regulations, as well as, ANSI/NSF Additives Standard 61.

B. The sealant shall be used to seal lap joints and bolt connections. The sealer shall not be used as a coating except for minimal exposed panel edges for the embedded starter ring, notches of sidewall panels, and edges exposed for nozzle connections. The sidewall panel edges shall be protected by the fused glass coating (spray or brush on coatings are not acceptable). The sealant shall cure to a rubber like consistency, have excellent adhesion to the glass coating, have low shrinkage, and be suitable for interior and exterior exposure.

C. Sealant curing rate at 73° F and 50% RH

1. Tack-free time: 6 to 8 hours.
2. Final cure time: 10 to 12 days.

D. Neoprene gaskets and tape type sealers shall not be used.The steel diaphragm shall conform to ASTM A366 for black and shall be a minimum of 26 gauge thickness. It shall be vertically ribbed with reentrant angles which provide a mechanical keyway within the wall.

2.6 GLASS PROCESS

A. Surface Preparation: The tank sheets shall be steel grit-blasted on both sides to the equivalent of SSPC-10 (near white blast cleaning). Sand blasting and chemical pickling of steel sheets is not acceptable. The surface anchor pattern shall be not less than 1.0 mil. These sheets shall be evenly oiled on both sides to protect them from corrosion during fabrication.

B. Cleaning: After fabrication and prior to application of the coating system, all sheets shall be thoroughly cleaned by a caustic wash and hot rinse process followed immediately by hot air drying. Inspection of the sheets shall be made for traces of foreign matter, soil particles, grease, or rust. Any such sheets shall be re-cleaned or grit-blasted to an acceptable level of quality.

C. Coating:

1. A base coat of glass frit containing nickel oxide shall be applied to both sides of the sheet.
2. A second coat of milled cobalt blue glass shall be applied to both sides of the sheet.
3. A third coat of glass shall be applied to all interior sidewall and floor sheet surfaces which must be a titanium dioxide reinforced mixture, white color. The specified coating shall be Aquastore Vitrium. An acceptable alternate three coat system must be submitted for approval at least three weeks prior to the bid.

4. The same glass coating as applied to the exterior sheet surfaces shall be applied to the exposed edges.
5. The sheets shall then be fired at a minimum temperature of 1500 degrees F in strict accordance with the manufacturer's ISO 9001 quality control procedures, including firing time, furnace humidity, temperature control, etc.
6. The interior coating process for sidewall sheets and floor must be a 3 coat process. The interior color shall be white. The exterior color shall be cobalt blue.
7. Dry film interior coating thickness shall be 10.0 -18.0 mils (0.010 to 0.018 inches) minimum.
8. Dry film exterior coating thickness shall be 7.0 – 15.0 mils (0.007 to 0.015 inches) minimum.
9. The finished exterior color shall be the manufacturer's standard cobalt blue.

D. Factory Inspection: The manufacturer's quality system shall be ISO 9001 certified and refer to ISO (International Organization for Standardization) for the following testing and procedures.

1. Chemical Resistance of Glass Coating: Frits shall be individually tested in accordance with pertinent sections of ISO 28706-1:2008.

2. Measurement of Glass Thickness: Glass thickness shall be measured using an electronic dry film thickness gage (magnetic induction type). The thickness gage shall have a valid calibration record.

    a. The thickness of the glass shall be between 10.0 and 18.0 mils (0.010 and 0.018 inches).

3. Measurement of Color: The exterior color of the sheets shall be measured using a colorimeter. The colorimeter shall have a valid calibration record. The color must fall within the tolerances specified by the tank manufacturer, CST Storage, else the panel shall be rejected.

4. Factory Holiday Test: A dry volt test using a minimum of 1100 volts is required. Frequency of the test shall be every sheet. Any sheet registering a discontinuity on the interior surface or floor shall be rejected.

5. Fishscale test: The glass coating shall be tested in-house for fishscale by placing the full size production sheets in an oven at 400° F for one hour. The sheets shall then be examined for signs of fishscale. Any sheet exhibiting fishscale shall be rejected and all sheets from the gage lot will be similarly tested.

6. Impact Adherence Test: The adherence of the glass coating to the steel shall be tested in accordance with ISO standards. Any sheet that has poor adherence shall be rejected.

2.7 PACKAGING

A. All approved sheets shall be protected from damage prior to packing for shipment.

B. Heavy paper or plastic foam sheets shall be placed between each panel to eliminate sheet-to-sheet abrasion during shipment.

C. Individual stacks of panels will be wrapped in heavy mil black plastic and steel banded to special wood pallets built to maintain the roll-radius of the tank panels and minimize contact or movement of finished panels during shipment.

D. Shipment from the factory to the job site will be by truck, hauling the tank components exclusively. No common carrier, drop, or transfer shipments.

PART 3- EXECUTION

3.1 FOUNDATION

A. The tank foundation is a part of this contract and shall be installed by the tank supplier per the engineer's drawings.

B. The tank foundation shall be designed by the manufacturer to safely sustain the structure and its live loads.

C. Tank stemwall design shall be based on the soil bearing capacity given in section 2.5.4 above as determined by geotechnical analysis performed by a licensed soils engineer. The cost of this investigation and analysis is not to be included in the bid price. Copies of the soils report are to be provided to the bidder prior to bid date by the Owner or Engineer.

D. Foundation designs for soil bearing strengths less than that specified, and those designs deviating from tank manufacturers' standard shall be the responsibility of the Owner and his Engineer based on tank live and dead loading data provided by the tank manufacturer.

E. Embedded starter ring shall be 19" minimum or as determined by the manufacturer.

F. Slot m ount c oncrete f ooting i s n ot ac ceptable. The floor shall be reinforced concrete construction and shall be designed as a membrane slab in accord with AWWA D-110.

3.2 TANK F LOOR

A. The standard floor design is of reinforced concrete with an embedded glass fused to steel starter sheet per the manufacturer's design, and is an integral element of the tank assembly; therefore, the tank floor slab with embedded starter sheet shall be constructed by the tank supplier using manufacturer trained personnel regularly engaged in this type of tank construction.

B. Leveling of the starter ring shall be required and the maximum differential elevation within the ring shall not exceed one-eighth (1/8) inch, nor exceed one-sixteenth (1/16) inch within any ten (10) feet of length.

C. A leveling plate assembly (per Engineered Storage Products Company - U.S. Patent No. 4,483,607), consisting of two 18" anchor rods (3/4" dia.) and a slotted plate (3 1/2" X 11" X 3/8" thick) shall be used to secure the starter ring, prior to encasement in concrete. Installation of the starter ring on concrete blocks or bricks, using shims for adjustment, is not permitted.

D. Two w ater s top s eals m ade of a bu tyl r ubber el astomer s pecial f or this application shall be placed on the inside surface of the starter ring below the concrete floor line. These materials shall be installed as specified by the tank manufacturer.

3.3 SIDEWALL ST RUCTURE

A. Field erection of the Glass Fused to Steel, bolted-steel tank shall be in strict accordance with the procedures outlined in the manufacturer's erection manual, and performed by an authorized dealer of the tank manufacturer, regularly engaged in erection of these tanks. Dealer's field supervisor shall be certified by t he m anufacturer as h aving u ndergone f actory t raining i n proper tank erection techniques.

B. Specialized erection jacks and building equipment developed and manufactured by the tank manufacturer shall be used to erect the tanks.

C. Particular care shall be taken in handling and bolting of the tank panels and members to avoid abrasion of the coating system. Prior to liquid test, all surface areas shall be visually inspected by the Engineer.

D. An electrical leak test shall be performed during erection using a nine (9) volt leak detection device. All electrical leak points found on the inside surface shall be repaired in accordance with manufacturer's published touch up procedure.

E. The placement of sealant on each panel may be inspected prior to placement of adjacent panels. However, the Engineer's inspection shall not relieve the bidder from his responsibility for liquid tightness.

F. No backfill shall be placed against the tank sidewall without prior written approval and design review of the tank manufacturer. Any backfill shall be placed according to the strict instructions of the tank manufacturer.

3.4 ROOF

A. Tank roof shall be constructed of non-corrugated triangular aluminum panels which are sealed and firmly clamped in an interlocking manner to a fully triangulated aluminum space truss system of wide flange extrusions, thus forming a spherical dome structure.

B. The dome shall be clear-span and designed to be self-supporting from the periphery structure with primary horizontal thrust contained by an integral tension ring. The dome dead weight shall not exceed 3 pounds per square foot of surface area.

C. The dome and tank shall be designed to act as an integral unit. The tank shall be designed to support an aluminum dome roof including all specified live loads.

D. Aluminum flashing shall be used to make the dome perimeter weather-tight and to prevent the entrance of animals or insects where the dome mounts to the tank wall. Fabric or synthetic rubber type flashing is NOT permitted.

E. Materials:

1. Triangulated space truss: 6005A-T6 or 6061-T6 aluminum struts and gussets.
2. Triangular closure panels: .050"t 3003-H16 aluminum sheet.
3. Tension ring: 6005A-T6 or 6061-T6 aluminum.
4. Fasteners: 2024-T4 or 7075-T73 anodized aluminum or series 300 stainless steel as required by the manufacturer’s design.
5. Sealant and gaskets: silicone rubber.
6. Dormers, doors, vents and hatches: 6061-T6, 5086-H34 or 3003-H16 aluminum.

F. Roof supplier shall be CST Storage of DeKalb, Illinois; TEMCOR of Gardena, California; or Conservatek of Conroe, Texas.

G. Vent: A properly sized vent assembly in accordance with AWWA D103 shall be furnished and installed above the maximum water level of sufficient capacity so that at maximum possible rate of water fill or withdrawal, the

resulting interior pressure or vacuum will not exceed 0.5" water column. The overflow pipe shall not be considered to be a tank vent. The vent shall be constructed of aluminum. The vent shall be so designed in construction as to prevent the entrance of birds and/or animals by including an expanded aluminum screen (1/2 inch) opening. An insect screen of 23 to 25 mesh polyester monofilament shall be provided and designed to open should the screen become plugged by ice formation.

H. Hatch: The manufacturer shall furnish a 30" square roof opening located adjacent to the tank ladder and fitted with an aluminum manway cover and frame assembly having a 4" high curb. The cover shall have a 2" overlap on the frame. The assembly shall include a hasp to accommodate the Owner's padlock.

3.5 APPURTENANCES

A. Pipe Connections: Where pipe connections are shown to pass through tank panels, they shall be field located, saw cut, (acetylene torch cutting or welding is not permitted), and utilize an interior and exterior flange assembly. A single component urethane sealer shall be applied on any cut panel edges or bolt connections.

B. Overflow piping shall be Fabricated from aluminum.

C. Outside Tank Ladder: An outside tank ladder shall be furnished and installed as shown on the contract drawings. Ladders shall be fabricated of aluminum and utilize grooved, skid-resistant rungs. Safety cage and step-off platforms shall be fabricated of galvanized steel. A galvanized steel top observation platform shall be provided adjacent to the ladder. A hinged, lockable gate shall be installed at the base of the ladder safety cage to deter unauthorized access to of the tank. The owner shall provide and install the lock.

D. Sidewall Access Manway: One sidewall access manway shall be provided as shown on the contract drawings in accordance with AWWA D-103. Such manway shall be a minimum of 30 inches in diameter and shall include a properly designed reinforcing frame and cover plate. A davit to hold the cover plate, when opened, is required.

E. Identification Plate: A manufacturer's nameplate shall list the tank serial number, tank diameter and height, and maximum design capacity. The nameplate shall be affixed to the tank exterior sidewall at a location approximately five (5') feet from grade elevation in a position of unobstructed view.

F. Cathodic Protection: The manufacturer shall design and supply a passive, sacrificial anode cathodic protecting system. The anodes shall be floor

mounted. The resistivity of the water for design is _____ megohm-cm. The cathodic protection system shall be designed for protection of uncoated steel surfaces in the product zone, including rebar within the uncoated concrete tank floor.

3.6 TESTING

A. Hydrostatic Testing: Following completion of erection and cleaning of the tank, the structure shall be tested for liquid tightness by filling tank to its overflow elevation. Any leaks disclosed by this test shall be corrected by the erector in accordance with the manufacturer's recommendations. Water required for testing shall be furnished by the owner at the time of tank erection completion, and at no charge to the tank erector. Disposal of test water shall be the responsibility of the owner. Labor and equipment necessary for tank testing is to be included in the price of the tank.

3.7 WARRANTY

A. Tank Manufacturer's Warranty: The tank manufacturer shall include a warranty for the tank materials and coating. As a minimum, this warranty shall provide assurance against defects in material or workmanship and corrosion of the glass-coated surface for the minimum period specified. The tank manufacturer shall warrant the liquid storage tank shall be free from any defect in material or workmanship under normal and proper use, maintenance and operation, during the period expiring on the earlier of one (1) year after liquid is first introduced into the tank or 14 months after the substantial portion of the tank sheets is delivered to the site where the tank is erected.

B. Tank Erector's Warranty: The tank erector shall warrant the concrete foundation and tank erection/installation to be free from defects in workmanship and materials during the period expiring on the earlier of one (1) year after liquid is first introduced into the tank or 14 months after notice of substantial completion of the tank erection. In addition, any defect to be corrected under the tank manufacturer's warranty shall be corrected by the Tank Erector at no cost to the Owner.

END OF SECTION

SECTION 13121

PRE-ENGINEERED METAL BUILDINGS AND CANOPIES

PART 1 - GENERAL

1.01 SCOPE OF WORK

A. This section includes materials, installation, and manufacturer's design of prefabricated metal buildings.

1.02 SUBMITTALS

A. Submit shop drawings in accordance with the General Conditions, Section 01300, and the following:

B. Submit letter of certification identifying the metal building manufacturer is an AISC Class MB certified fabricator and that all building components will be designed in accordance with the current edition of the FBC Building Code.

C. Submit certification that the metal building manufacturer has been in business for at least 10 years and has designed and supplied at least five buildings similar to the specified project building. Include names of owners and locations for the referenced buildings.

D. Submit manufacturer's catalog data describing the building construction and components. Submit project-specific design and erection drawings, shop painting and finishing specifications, instruction manuals, and other data to describe the design, materials, sizes, layouts, construction details, fasteners, and erection.

E. Submit engineering design calculations for structural members and covering components, bracing, equipment supports, and anchor bolts. Submit the stress values utilized in the analysis stating the design criteria and procedures used. Design calculations shall be signed by a civil engineer registered in the state of Florida.

F. Submit certificate that the design meets the specified building codes.

G. Submit erection drawings and diagrams for each building. Submit calculations indicated the project-specific metal building reactions. Show column base anchor details and anchor bolt sizes. Show roof and wall bracing.

H. Submit color charts of the colors available for wall and roof panels, however, contract to include the cost to custom color match owners' preferred color for exterior and interior wall panels & liners.

1.03 GUARANTEE

A. Buildings shall be guaranteed against water leaks arising out of or caused by ordinary wear and tear by the elements for a period of five years. Such guarantee is in addition to the guarantee required in the General Conditions and shall start upon final acceptance of the work by the Owner.

B. Special Warranty on Metal Panel Finishes: Manufacturer's standard form in which manufacturer agrees to repair finish or replace metal panels that show evidence of deterioration of factory-applied finishes within specified warranty period, ABC Standard..

C. Finish Warranty Period: 20 years from date of Substantial Completion.

PART 2 - MATERIALS

A. Manufacturers: Prefabricated metal buildings shall be manufactured by American Buildings, Butler, Varco-Pruden, or equal.

B. Design Criteria

1. Buildings shall be of the size and shapes hown, complete with all accessories.

2. The design of the building and components shall be in accordance with Metal Building Manufacturer's Association's " Recommended Design Practices Manual," latest edition, and the FBC Building Code.

3. Design building for the dead load, specified live load, and the combinations of these loads as specified below. Reduction of loads due to tributary loaded area is permitted only for the rigid frames. Include the following loads in addition to the dead load:

   a. Live load 20 psf.

   b. A uniform collateral load of 5 psf in addition to the dead load of the building.

   c. Weights of mechanical equipment and process piping supported by the structure if greater than 10 psf.

   d. Wind load per the FBC requirements supplemented by ASCE 7-10: See Drawings.

4. Rigid frame shall consist of welded up plate section columns and foot beam complete with necessary splice plates for bolted field assembly.

5. End rigid frames shall be the same as interior rigid frames

6. Design structural steel members in accordance with AISC publication, "Specification for the Design, Fabrication, and Erection of Structural Steel for Buildings." Design structural cold-formed steel framing members in accordance with AISI publication, " Specification for the Design of Cold-Formed Steel Structural Members."

7. Purlins and Girts shall be 8 in. minimum deep "Z" sections, precision roll formed.

8. Eve struts shall be 8in. minimum deep "C" sections.

9. All columns shall be designed as " Pin" connected. Moment transfer to footings will not be allowed.

10. The building foundation plan is a preliminary design, the foundation design will be reviewed by the engineer once the Prefabricated Metal Building submittal is approved.

11. Design framed openings to replace structurally the covering and framing displaced.

12. Welding of steel shall be in accordance with AWS D1.1.

13. Except as modified hereinafter, design steel covering in accordance with AISI publication " Specification for the Design of Cold-Formed Steel Structural Members."

14. Maximum wind load deflection for Primary Framing shall not exceed 1/60 of the eave height of the building.

15. Maximum wind load deflection for wall sheets shall not exceed 1/180 of the span between supports, and maximum live load deflection for roof sheets shall not exceed 1/180 of the span between supports. Maximum deflections shall be based on sheets continuous across two or more supports with sheets unfastened and fully free to deflect.

B. Bracing

Provide roof bracing. Design bracing for controlling wind or seismic load combinations. Brace compression flanges of structural members as required by the code.

C. Assembly and Disassembly

1. The size of the prefabricated components and the field connections required for erection shall permit easy assembly and disassembly by means of the building manufacturer's standard fasteners and construction tools. The maximum size of any shop-assembled component of the building shall permit transportation from factory to site by commercial carrier.

2. Clearly and legibly mark each and every piece and part of the assembly to correspond with previously prepared erection drawings, diagrams, and/or instruction manuals.

D. Exterior Covering Components--Steel

1. Roof Covering shall be standing seam with minimum 24-gauge galvanized steel conforming to ASTM A 653, G 90 coating designation, factory color finished. Panels shall have 2 major corrugations, 2 inches high not exceeding 24inches.

2. Wall Covering shall be rib panel with minimum 24-gauge galvanized steel conforming to ASTM A653, G90 coating designation, factory color finished.

E. Accessories

Flashing, trim, metal closure strips, caps, and similar metal accessories shall be not less than the minimum thicknesses specified for covering. Molded closure strips shall be bituminous-saturated fiber, closed-cell or solid-cell synthetic rubber or neoprene, or PVC premolded to match configuration of the covering.

F. Dissimilar Metal Isolation

Coat steel in contact with aluminum or aluminum-coated steel covering per Section 09900, System No. 51 or provide rubber or nylon gaskets between steel and aluminum surfaces.

G. Fasteners

1. All structural framing shall utilize high-strength (H-S) bolts. H-S bolts, nuts, and washers shall conform to ASTM A325, Type 1 galvanized, ASTM A563, and ASTM F436, respectively.

2. Fasteners for securing covering and accessory items shall be Type 316 stainless steel.

3. Use stainless steel or aluminum fasteners with aluminum items and covering. Use stainless steel fasteners with steel items and covering.

4. Provide gasketed washers of a material compatible with the covering and with a minimum diameter of 3/8 inch for structural connections to waterproof the fastener penetration on the exterior side. Gasketed portion of washers shall be neoprene or other equally durable elastomeric material approximately 1/8 inch thick. Exposed wall fasteners shall be factory color finished or provided with plastic color caps to match the covering.

H. Painting of Roof Panels

1. Color finish roof covering at the factory on both sides. Prepare surfaces for coating by thoroughly cleaning, pretreating, and priming (if required by the finish coat) to provide a film that is compatible with the metal surface and the color finish. Treat galvanized steel surfaces per DOD-P-15328D. Clean surfaces of oil, grease, loose scale, and other foreign substances. Prime coat shall be in accordance with the manufacturer's standard system.

2. Color finish shall consist of a Kynar 500/Hylar 5000 fluoropolymer coating.

3. Dry-film coating thickness of the color coat shall be not less than 1.0 mil for exterior and interior surface finish. The exterior and interior finishing systems shall meet the quality standards specified in The Aluminum Association publication, "Aluminum Standards and Data," except that for salt spray resistance, exposure shall be 450 hours, and maximum undercutting from the scored line shall not exceed 1/8 inch. Colors shall be as selected by the Owner's Representative from manufacturer's standard colors.

I. Painting of Girts, Purlins, Beams, Columns, Bracing, and Eave Strut

1. Rigid frames and special structural framing shall be shop coated with a primer meeting the following:

   a. Solids by Volume: 61% (percent ±2)

   b. Type: Zinc Rich Aromatic Urethane

   c. Dry Film Thickness: 3 to 3.5 mils

   d. Number of Coats: One

   e. V.O.C. (Max): 2.67 (Unthinned)

2. Shop primer shall be compatible with specified field paint system

3. Field paint with a 5 mil DFT Polyamide epoxy and a finish coat of 3 mil of acrylic polyurethane. Polyamide epoxy product shall be Tnemec N 69 or Sherwin-Williams Macropoxy 646. Acrylic polyurethane product shall be Tnemec Series 73 or Sherwin-Williams B 65-350. Color to be selected by Owner.

J. Sealant

Provide sealant of the type recommended by the building manufacturer at each joint.

K. Spare Parts

Provide a minimum of 5% excess over the required amount of nuts, bolts, screws, washers, and other required fasteners with each building. Provide separate boxes for the parts for each building. Label each box with the name of the building to which it pertains; the building manufacturer's name; and the local representative's name, address, and telephone number. Provide individual boxes for each item (nuts, bolts, washers, etc.).

PART 3 - EXECUTION

A. Storage and Protection

1. Deliver, store, handle, and erect prefabricated components, sheets, panels, and other manufactured items such that they will not be damaged or deformed. Stock materials stored on the site before erection on platforms or pallets and cover with tarpaulins or other weathertight covering. Store metal sheets or panels so that water will drain off. Upon arrival on the jobsite, remove moisture on sheets and panels, restack, and protect until used.

2. Do not store the sheets or panels in contact with materials that might cause staining. Remove stained, discolored, or damaged sheets from the site.

B. Erection

1. Determine anchor bolt layouts before pouring concrete footings, walls, or slabs to support the buildings.

2. Erect in accordance with the manufacturer's erection instructions and drawings and the requirements herein. Plug improper or mislocated drill holes with an oversize screw fastener and gasketed washers. Do not use sheets with an excess of such holes or with such holes in critical locations. Keep exposed surfaces clean and free from sealant, metal cuttings, and other foreign materials.

3. Accurately set anchor bolts by template while the concrete is in a plastic state. Provide uniform bearing under baseplates and sill members using nonshrink grout. Accurately space members to assure proper fitting of covering. As erection progresses, securely fasten the work and brace to resist vertical loads and horizontal wind or earthquake loads.

4. Apply wall covering with the longitudinal configurations in the vertical position. Apply roof covering with the longitudinal configurations in the direction of the roof slope.

5. Except for self-framing buildings, make end laps over framing members with fasteners into framing members approximately 2 inches from the end of the overlapping sheet. Side lap distances, end lap distances, joint sealing, and spacing of fasteners shall be in accordance with the manufacturer's standard practice insofar as the maximum fastener spacing specified is not exceeded and provided such standard practice will result in a structure that will be free from water leaks and meet design requirements.

6. Spacing of fasteners shall present an orderly appearance and shall not exceed 8 inches on center at end laps of covering, 12 inches on center at connection of covering to intermediate supports, 12 inches on center at side laps of roof coverings, and 18 inches on center at side laps of wall covering. Install fasteners in straight lines within a tolerance of 1/2 inch in the length of a bay.

7. Seal side laps and end laps of roof and wall covering and joints at accessories. Drive fasteners normal to the surface and to a uniform depth to properly seat the gasketed washers. Fasten accessories into framing members.

8. Insulate incompatible dissimilar materials that are in contact by means of gaskets or insulating compounds.

C. Field Painting

1. Touch up factory-coated finish surfaces with the building manufacturer's touch-up paint for the particular finish coat used.

END OF SECTION

SECTION 13300
CONTROLS AND INSTRUMENTATION GENERAL PROVISIONS

PART 1 - GENERAL

1.01 SCOPE OF WORK

A. Furnish all labor, materials, devices, equipment, appurtenances, and incidentals required for a complete electrical system as hereinafter specified and/or shown on the Contract Drawings. This work may necessarily include interfacing with and/or completely installing devices and/or equipment furnished under other sections of these Specifications.

B. The Contractor shall provide the services of BCI Technologies as a SYSTEMS INTEGRATOR to provide programming of any/all Programmable Logic Controllers (PLCs). The SYSTEMS INTEGRATOR shall also be responsible for the modification of the SCADA System's Human Machine Interface (HMI) screens as required.

B. It is the intent of these Specifications that the electrical systems required for the SCADA System's new Inputs and Outputs (I/O) be suitable in every way for the service required. All materials and all work/labor which may be reasonably implied as being incidental to the requirements of this Section shall be furnished at no additional cost to the County.

C. All interruptions to the existing control systems shall be at the County's convenience. Each interruption shall have prior approval. Request(s) for control system interruption(s) shall be made at least forty-eight (48) hours in advance.

D. The work shall include complete testing of all electrical components, including wiring.

E. All workmanship shall be of the highest quality. Substandard work will be rejected and it shall be replaced entirely at the Contractor's expense with no cost to the County.

F. It shall be the responsibility of each bidder or his authorized representative to physically visit the job site in order that he may be personally acquainted with the area(s), buildings and/or structures intended for use in the installation/construction under this Specification. The submittal of a proposal/bid by a bidder shall be considered evidence that he has complied with this requirement and accepts all responsibility for a complete knowledge of all factors governing his work. Therefore, failure to comply with this requirement of the Specifications will NOT be grounds for the successful bidder (Contractor) to request approval of change orders and/or additional monetary compensation.

1.02 DIVISION OF WORK

A. The Electrical Contractor shall be responsible for, and his/her scope of work shall include:

1. Providing and installing all conduit, fittings, conductors, and raceways as indicated on the drawings and as defined in Division 16 Specifications.

2. Termination of control and power wiring to supplied control panels, existing control panels and field elements. The electrical subcontractor shall mark on the record drawings the field wire numbers used for each termination point.

3. Physical installation of manufacturer supplied Septage Receiving and Grease Receiving control panels, Hauler Access Control Panels, PLC Control Cabinet and Fiber Optic Panels. This installation shall include all conduit, fittings, conductors and structural rack(s) as required.

4. Physical installation of manufacturer supplied tank level transmitters. This installation shall include all conduit, fittings, conductors, structural rack(s) and sun shields as required.

5. Providing the PLC input/output modules as indicated on the drawings and the physical installation of the cards provided.

6. Providing conduit, fittings and conductors as required to accommodate the new flow meters, float switches, pH sensors and any/all new field devices that are supplier or installed by others.

7. Providing accessory devices including furnishing and installation of interposing relays, surge protection devices, terminal blocks, etc. necessary to perform the intent as described by the control strategies and services necessary to achieve a fully integrated and. and operational system as shown on the Contract Drawings and defined in the Specifications.

8. Coordinating all interface requirements with mechanical and electrical system suppliers and furnish any devices that might be required in order to insure compatibility between all equipment.

9. Calibration of all field instruments.

10. Obtaining, <u>in writing</u>, a final acceptance from the SYSTEMS INTEGRATOR to indicate that all conductors and their terminations, as well as, all field devices and their associated I/O are in proper working order. The Electrical Contractor shall make any corrections necessary, <u>at no charge to the County,</u> for items identified as unsatisfactory by the SYSTEMS INTEGRATOR.

B. The Mechanical Contractor shall be responsible for, and his/her scope of work shall include:

1. Included within the mechanical subcontractor's scope installation of any in-line instrumentation. This instrumentation shall include the devices required at the Septage Receiving and Grease Receiving stations.

C. The SYSTEM INTEGRATOR (under a separate Manatee County contract) shall be responsible for, and his/her scope of work shall include:

1. Programming of any/all PLC's and the modification of the SCADA System's Human Machine Interface (HMI) screens as required.

1.03 SUBMITTALS

A. Furnish, as prescribed under the General Requirements, all required submittals covering the items included under this section and its associated sections of the work.

B. Submit complete, neat, orderly, and indexed submittal packages. Handwritten diagrams are not acceptable and all documentation submittals shall be made using CADD generated utilities as specified herein.

C. Partial submittals or submittals that do not contain sufficient information for complete review or are unclear will not be reviewed and will be returned by the ENGINEER as not approved.

D. Provide all shop-drawing submittals on disk in AutoCad format.

E. Design Related Submittals: Provide individual shop drawing submittals as further defined in each specification section defining the SCADA System. Provide the following additional submittals covering the complete system:

1. Loop diagrams, consisting of complete wiring and/or plumbing diagrams for each control loop showing all terminal numbers, the location of the dc power supply, surge arrestors, etc. The loop diagrams shall meet the minimum requirements of ISA S5.4 plus divide each loop diagram into four areas for identification of element locations: SCADA System I/O point(s), panel face, back-of-panel, and field, respectively. On each diagram present a tabular summary of:

a. The output capability of the transmitting instruments

b. The input impedance of each receiving instrument

2. System interconnect diagram that shows all connections required between component parts of the items covered in this section and between the various other systems specified in this Contract. Number all electrical terminal blocks and field wiring. Identify each line at each termination point with the same number. Do not use this number again for any other purpose in the complete control scheme.

3. Test Procedures: Submit the procedures proposed to be followed during all system testing. Procedures shall include test descriptions, forms, and check lists to be used to control and document the required tests.

F. Instrument Installation Details Submittal

1. The Electrical Contractor shall develop and submit for review, complete installation details for each field mounted device and panel furnished prior to shipment and installation. Common details may be referenced by an index showing the complete instrument tag number, service, location, and device description. Installation details shall be provided as required to adequately define the installation of the components. Drawings may be included in the Control Panel Submittal when only a few are required.

G. System Calibration and Test Documentation Submittal

1. The Electrical Contractor shall submit an example of each type of Instrument Calibration Report and Loop Functional Test Report that will be used to verify that all preliminary calibration and testing has been performed and the system is considered, by the supplier, to be ready for testing.

2. After approval of the examples, the Electrical Contractor shall prepare Loop Functional Test Report(s) for each loop and an Instrument Calibration Sheet for each active element (except simple hand switches, lights, etc.). These sheets shall be completed and submitted to the Engineer after completion of the operational availability field tests.

3. An Instrument Calibration report shall be used to certify that each instrument requiring calibration has been calibrated to its published specified accuracy shall be submitted to the Engineer. This report shall include all applicable data as listed below plus an area to identify any defects noted, corrective action required, and corrections made. This report shall include:

   a. Facility identification (Name, location, etc.)

   b. Loop identification (Name or function)

   c. Scale ranges and units

   d. Actual readings at 0, 10, 25, 50, 75, 90 and 100 percent of span

   e. Tester's certification with name and signature

4. Upon completion of all preliminary calibration and functional testing, the Electrical Contractor, shall submit a certified report for each control panel and its associated field instruments certifying that the equipment (1) had been properly installed under his or her supervision, (2) is in accurate calibration, (3) was placed in operation, (4) has been checked, inspected, calibrated, and adjusted as necessary, (5) has been operated under maximum power variation conditions and operated satisfactorily, and (6) is fully covered under the terms of the warranty.

1.04 STANDARDS

A The design, testing, assembly, and methods of installation of the wiring materials, electrical equipment and accessories proposed under this Contract shall conform to the National Electrical Code and to applicable state and local requirements. UL listing and labeling shall be adhered to under this Contract.

B Any equipment that does not have a UL, FM CSA, or other approved testing laboratory label shall be furnished with a notarized letter signed by the supplier stating that the equipment famished has been manufactured in accordance with the National Electric Code and OSHA requirements.

C Any additional work needed resulting from any deviation from codes or local requirements shall be at no additional cost to the OWNER.

D Instrument Society of America (ISA) and National Electrical Manufacturers Association (NEMA) standards shall be used where applicable in the design of the Control System.

E All equipment used on this project to test and calibrate the installed equipment shall be in calibration at the time of use. Calibration shall be traceable to National Institute of Standards (NIS - formally NBS) calibration standards.

1.05 TESTS

A. The Contractor shall test all items individually and as a system for proper operation.

B. The Contractor shall, at his expense, make all the requisite repairs, adjustments and/or alterations to correct any shortcomings found as a result of the tests performed under Item 1.02.A.10 above.

C. A representative of the County shall be present during all testing. The County shall be notified at least two (2) days prior to any testing.

1.06 GUARANTEES AND WARRANTIES

A. All items furnished under the Electrical Specifications shall be guaranteed and/or warranted, in writing, against defects in materials, construction and workmanship as specified under Section 01740 of these Specifications.

PART 2 - PRODUCTS

2.01 GENERAL REQUIREMENTS

A. All SCADA System equipment shall produce or be activated by signals, which are established standards for the water and wastewater industries. Outputs of equipment that are not of the standard signals as outlined, shall have the output immediately raised and/or converted to compatible standard signals for remote transmission. No zero based signals will be allowed.

B. All equipment and devices furnished hereunder shall be heavy-duty type, designed for continuous industrial service. The System shall contain products of a single MANUFACTURER, insofar as possible, and shall consist of equipment models that are the latest design currently in production.

C. All equipment shall be designed to operate on a 60-Hertz alternating current power source at a normal 120 volts, plus or minus 10 percent, except where specifically noted. All regulators and power supplies required for compliance with the above shall be provided between power supply and interconnected instrument loop. Where equipment requires voltage regulation, constant voltage transformers shall be supplied.

D. Materials and equipment used shall be U.L. approved wherever such approved equipment and materials are available.

E. All SCADA System equipment shall be designed and constructed so that in the event of a power interruption, the equipment shall resume normal operation without manual resetting when power is restored.

2.02 MATERIALS

A. PLC HARDWARE

1. The existing programmable logic controllers are as manufactured by Allen Bradley (1746 SLC System) all new components shall be of the same type manufacturer. The required I/O modules include : one (1) digital AC input module (1746-IA16), one (1) analog output module (1746-NO4I) and on e (1) analog input module (1746-NI8). NO SUBSTITUTIONS!

B. All ot her pr oducts r equired s hall be as s pecified i n ot her sections o f t he specifications.

PART 3 EXECUTION

3.01 PRODUCT HANDLING

A. Store and protect equipment until installation following the storage and handling instructions recommended by the equipment manufacturers. Place special emphasis on proper anti-static protection of sensitive equipment.

B. Protection During Construction: Throughout this Contract, provide protection for materials and equipment against loss or damage and from the effects of weather. Prior to installation, store items in indoor, dry locations. Provide heating in storage areas for items subject to corrosion under damp conditions. Provide covers for panels and other elements that may be exposed to dusty construction environments.

C. Corrosion Protection: Protect all consoles, panels, enclosures, and other equipment containing electrical or instrumentation and control devices, including spare parts, from corrosion through the use of corrosion-inhibiting vapor capsules. Prior to shipment, include capsules in the shipping containers, and equipment as recommended by the capsule manufacturer. During the construction period, periodically replace the capsules in accordance with the capsule manufacturer's recommendations. Replace all capsules just prior to Final Acceptance.

D. ESD Protection: Provide for the proper handling, storage, and environmental conditions required for the components deemed static sensitive by the equipment manufacturer. The components of the SCADA System shall be protected in particular. Utilize anti-stat wrist straps and matting during installation of these items to prevent component degradation.

E. Adequately pack manufactured material to prevent damage during shipping, handling, storage and erection. Pack all material shipped to the project site in a container properly marked for identification. Use blocks and padding to prevent movement.

F. Ship materials that must be handled with the aid of mechanical tools in wood-framed crates.

G. Ship all materials to the project site with at least one layer of plastic wrapping or other approved means to make it weatherproof. Anti-stat protection shall be provided for all sensitive equipment.

H. Inspect the material prior to removing it from the carrier. Do not unwrap equipment until it is ready to be installed. If any damage is observed, immediately notify the carrier so that a claim can be made. If no such notice is given, the material shall be assumed to be in undamaged condition, and any subsequent damage that is discovered shall be repaired and replaced at no additional expense to the OWNER.

I. The Contractor shall be responsible for any damage charges resulting from the handling of the materials.

3.02 INSTALLATION

A. Install materials and equipment in a workmanlike manner utilizing craftsmen skilled in the particular trade. Provide work, which has a neat and finished appearance. Coordinate work with the OWNER and work of other trades to avoid conflicts, errors, delays, and unnecessary interference with operation of the existing plant during construction.

B. Provide finish on instruments and accessories that protects against corrosion by the elements in the environment in which they are to be installed. Finish both the interior and exterior of enclosures. Provide extra paint of each color used in the material from the manufacturer for touch-up purposes.

C. Ground each analog signal shield on one end at the receiver end only. Properly ground all surge and transient protection devices. Coordinate grounding system with Division 16, Electrical.

D. For the purposes of uniformity and conformance to industry standard, provide analog signal transmission modes of electronic 4-20 ma DC. No other signal characteristics are acceptable.

E. Fully isolate outputs for transmitted electronic signals between transmitters and receivers, equipment of different manufacturers and between control panels to conform to ISA Standard S 50. 1.

F. Discrete signal are two-state logic signals. Use 120V ac sources on all discrete signals unless otherwise noted or shown.

G. Surge Protection: Provide appropriately sized electrical transient protection devices for all electrical elements of the system to protect the SCADA System equipment and equipment which interfaces with the SCADA System from transient surges in power and signal wiring (from lightning and other ground potential differences). Locate and properly ground surge suppressors at: any connection between power sources and electrical equipment including panels, assemblies, and field devices; and at both ends of all analog signal circuits.

3.03 TESTING

A. All elements of the SCADA System shall be tested to demonstrate that the total system satisfies all of the requirements of the Contract Documents

B. As a minimum, the testing shall include shop tests, operational check-out tests, and Demonstration Tests.

C. Each test shall be in the cause and effect format. The person conducting the test shall initiate an input (cause) and, upon the system producing the correct result (effect), the specific test requirements will have been satisfied.

D. All tests shall be conducted in accordance with, and documented on, prior approved procedures, forms, and checklists. Each specific test to be performed shall be described and a space provided after it for signoff by the appropriate party after its satisfactory completion. Copies of these signoff test procedures, forms, and checklists will constitute the required test documentation.

E. Provide all special testing materials and equipment. Wherever possible, perform tests using actual process variables, equipment, and data. Where it is not practical to test with real process variables, equipment, and data, provide suitable means of simulation. Define these simulation techniques in the test procedures.

F. The Electrical Contractor shall coordinate all of their testing with the SYSTEMS INTEGRATOR, the ENGINEER, all affected suppliers, and the OWNER.

G. The SYSTEMS INTEGRATOR shall reserve the right to test or retest any and all specified functions whether or not explicitly stated in the approved test procedures. The SYSTEM INTEGRATOR's decision shall be final regarding the acceptability and completeness of all testing.

END OF SECTION

SECTION 13300
CONTROLS AND INSTRUMENTATION GENERAL PROVISIONS

PART 1 - GENERAL

1.01 SCOPE OF WORK

A. Furnish all labor, materials, devices, equipment, appurtenances, and incidentals required for a complete electrical system as hereinafter specified and/or shown on the Contract Drawings. This work may necessarily include interfacing with and/or completely installing devices and/or equipment furnished under other sections of these Specifications.

B. The County, as part of an independent contract, shall provide the services of a SYSTEMS INTEGRATOR to provide programming of any/all Programmable Logic Controllers (PLC's). The SYSTEMS INTEGRATOR shall also be responsible for the modification of the SCADA System's Human Machine Interface (HMI) screens as required.

B. It is the intent of these Specifications that the electrical systems required for the SCADA System's new Inputs and Outputs (I/O) be suitable in every way for the service required. All materials and all work/labor which may be reasonably implied as being incidental to the requirements of this Section shall be furnished at no additional cost to the County.

C. All interruptions to the existing control systems shall be at the County's convenience. Each interruption shall have prior approval. Request(s) for control system interruption(s) shall be made at least forty-eight (48) hours in advance.

D. The work shall include complete testing of all electrical components, including wiring.

E. All workmanship shall be of the highest quality. Substandard work will be rejected and it shall be replaced entirely at the Contractor's expense with no cost to the County.

F. It shall be the responsibility of each bidder or his authorized representative to physically visit the job site in order that he may be personally acquainted with the area(s), buildings and/or structures intended for use in the installation/construction under this Specification. The submittal of a proposal/bid by a bidder shall be considered evidence that he has complied with this requirement and accepts all responsibility for a complete knowledge of all factors governing his work. Therefore, failure to comply with this requirement of the Specifications will NOT be grounds for the successful bidder (Contractor) to request approval of change orders and/or additional monetary compensation.

1.02 DIVISION OF WORK

A. The Electrical Contractor shall be responsible for, and his/her scope of work shall include:

1. Providing and installing all conduit, fittings, conductors, and raceways as indicated on the drawings and as defined in Division 16 Specifications.

2. Termination of control and power wiring to supplied control panels, existing control panels and field elements. The electrical subcontractor shall mark on the record drawings the field wire numbers used for each termination point.

3. Physical installation of manufacturer supplied Septage Receiving and Grease Receiving control panels, Hauler Access Control Panels, PLC Control Cabinet and Fiber Optic Panels. This installation shall include all conduit, fittings, conductors and structural rack(s) as required.

4. Physical installation of manufacturer supplied tank level transmitters. This installation shall include all conduit, fittings, conductors, structural rack(s) and sun shields as required.

5. Providing the PLC input/output modules as indicated on the drawings and the physical installation of the cards provided.

6. Providing conduit, fittings and conductors as required to accommodate the new flow meters, float switches, pH sensors and any/all new field devices that are supplier or installed by others.

7. Providing accessory devices including furnishing and installation of interposing relays, surge protection devices, terminal blocks, etc. necessary to perform the intent as described by the control strategies and services necessary to achieve a fully integrated and. and operational system as shown on the Contract Drawings and defined in the Specifications.

8. Coordinating all interface requirements with mechanical and electrical system suppliers and furnish any devices that might be required in order to insure compatibility between all equipment.

9. Calibration of all field instruments.

10. Obtaining, in writing, a final acceptance from the SYSTEMS INTEGRATOR to indicate that all conductors and their terminations, as well as, all field devices and their associated I/O are in proper working order. The Electrical Contractor shall make any corrections necessary, at no charge to the County, for items identified as unsatisfactory by the SYSTEMS INTEGRATOR.

B. The Mechanical Contractor shall be responsible for, and his/her scope of work shall include:

1. Included within the mechanical subcontractor's scope installation of any in-line instrumentation. This instrumentation shall include the devices required at the Septage Receiving and Grease Receiving stations.

C. The SYSTEM INTEGRATOR (under a separate Manatee County contract) shall be responsible for, and his/her scope of work shall include:

1. Programming of any/all PLC's and the modification of the SCADA System's Human Machine Interface (HMI) screens as required.

1.03 SUBMITTALS

A. Furnish, as prescribed under the General Requirements, all required submittals covering the items included under this section and its associated sections of the work.

B. Submit complete, neat, orderly, and indexed submittal packages. Handwritten diagrams are not acceptable and all documentation submittals shall be made using CADD generated utilities as specified herein.

C. Partial submittals or submittals that do not contain sufficient information for complete review or are unclear will not be reviewed and will be returned by the ENGINEER as not approved.

D. Provide all shop-drawing submittals on disk in AutoCad format.

E. Design Related Submittals: Provide individual shop drawing submittals as further defined in each specification section defining the SCADA System. Provide the following additional submittals covering the complete system:

1. Loop diagrams, consisting of complete wiring and/or plumbing diagrams for each control loop showing all terminal numbers, the location of the dc power supply, surge arrestors, etc. The loop diagrams shall meet the minimum requirements of ISA S5.4 plus divide each loop diagram into four areas for identification of element locations: SCADA System I/O point(s), panel face, back-of-panel, and field, respectively. On each diagram present a tabular summary of:

a. The output capability of the transmitting instruments

b. The input impedance of each receiving instrument

2. System interconnect diagram that shows all connections required between component parts of the items covered in this section and between the various other systems specified in this Contract. Number all electrical

terminal blocks and field wiring. Identify each line at each termination point with the same number. Do not use this number again for any other purpose in the complete control scheme.

3. Test Procedures: Submit the procedures proposed to be followed during all system testing. Procedures shall include test descriptions, forms, and check lists to be used to control and document the required tests.

F. Instrument Installation Details Submittal

1. The Electrical Contractor shall develop and submit for review, complete installation details for each field mounted device and panel furnished prior to shipment and installation. Common details may be referenced by an index showing the complete instrument tag number, service, location, and device description. Installation details shall be provided as required to adequately define the installation of the components. Drawings may be included in the Control Panel Submittal when only a few are required.

G. System Calibration and Test Documentation Submittal

1. The Electrical Contractor shall submit an example of each type of Instrument Calibration Report and Loop Functional Test Report that will be used to verify that all preliminary calibration and testing has been performed and the system is considered, by the supplier, to be ready for testing.

2. After approval of the examples, the Electrical Contractor shall prepare Loop Functional Test Report(s) for each loop and an Instrument Calibration Sheet for each active element (except simple hand switches, lights, etc.). These sheets shall be completed and submitted to the Engineer after completion of the operational availability field tests.

3. An Instrument Calibration report shall be used to certify that each instrument requiring calibration has been calibrated to its published specified accuracy shall be submitted to the Engineer. This report shall include all applicable data as listed below plus an area to identify any defects noted, corrective action required, and corrections made. This report shall include:

a. Facility identification (Name, location, etc.)

b. Loop identification (Name or function)

c. Scale ranges and units

d. Actual readings at 0, 10, 25, 50, 75, 90 and 100 percent of span

e. Tester's certification with name and signature

4. Upon completion of all preliminary calibration and functional testing, the Electrical Contractor, shall submit a certified report for each control panel and its associated field instruments certifying that the equipment (1) had been properly installed under his or her supervision, (2) is in accurate calibration, (3) was placed in operation, (4) has been checked, inspected, calibrated, and adjusted as necessary, (5) has been operated under maximum power variation conditions and operated satisfactorily, and (6) is fully covered under the terms of the warranty.

1.04 STANDARDS

A The design, testing, assembly, and methods of installation of the wiring materials, electrical equipment and accessories proposed under this Contract shall conform to the National Electrical Code and to applicable state and local requirements. UL listing and labeling shall be adhered to under this Contract.

B Any equipment that does not have a UL, FM CSA, or other approved testing laboratory label shall be furnished with a notarized letter signed by the supplier stating that the equipment famished has been manufactured in accordance with the National Electric Code and OSHA requirements.

C Any additional work needed resulting from any deviation from codes or local requirements shall be at no additional cost to the OWNER.

D Instrument Society of America (ISA) and National Electrical Manufacturers Association (NEMA) standards shall be used where applicable in the design of the Control System.

E All equipment used on this project to test and calibrate the installed equipment shall be in calibration at the time of use. Calibration shall be traceable to National Institute of Standards (NIS - formally NBS) calibration standards.

1.05 TESTS

A. The Contractor shall test all items individually and as a system for proper operation.

B. The Contractor shall, at his expense, make all the requisite repairs, adjustments and/or alterations to correct any shortcomings found as a result of the tests performed under Item 1.02.A.10 above.

C. A representative of the County shall be present during all testing. The County shall be notified at least two (2) days prior to any testing.

1.06 GUARANTEES AND WARRANTIES

A. All items furnished under the Electrical Specifications shall be guaranteed and/or warranted, in writing, against defects in materials, construction and workmanship as specified under Section 01740 of these Specifications.

PART 2 - PRODUCTS

2.01 GENERAL REQUIREMENTS

A. All SCADA System equipment shall produce or be activated by signals, which are established standards for the water and wastewater industries. Outputs of equipment that are not of the standard signals as outlined, shall have the output immediately raised and/or converted to compatible standard signals for remote transmission. No zero based signals will be allowed.

B. All equipment and devices furnished hereunder shall be heavy-duty type, designed for continuous industrial service. The System shall contain products of a single MANUFACTURER, insofar as possible, and shall consist of equipment models that are the latest design currently in production.

C. All equipment shall be designed to operate on a 60-Hertz alternating current power source at a normal 120 volts, plus or minus 10 percent, except where specifically noted. All regulators and power supplies required for compliance with the above shall be provided between power supply and interconnected instrument loop. Where equipment requires voltage regulation, constant voltage transformers shall be supplied.

D. Materials and equipment used shall be U.L. approved wherever such approved equipment and materials are available.

E. All SCADA System equipment shall be designed and constructed so that in the event of a power interruption, the equipment shall resume normal operation without manual resetting when power is restored.

2.02 MATERIALS

A. PLC HARDWARE

1. The existing programmable logic controllers are as manufactured by Allen Bradley (1746 SLC System) all new components shall be of the same type manufacturer. The required equipment shall be as indicated on the drawings. NO SUBSTITUTIONS!

B. All other products required shall be as specified in other sections of the specifications.

PART 3 EXECUTION

3.01 PRODUCT HANDLING

A. Store and protect equipment until installation following the storage and handling instructions recommended by the equipment manufacturers. Place special emphasis on proper anti-static protection of sensitive equipment.

B. Protection During Construction: Throughout this Contract, provide protection for materials and equipment against loss or damage and from the effects of weather. Prior to installation, store items in indoor, dry locations. Provide heating in storage areas for items subject to corrosion under damp conditions. Provide covers for panels and other elements that may be exposed to dusty construction environments.

C. Corrosion Protection: Protect all consoles, panels, enclosures, and other equipment containing electrical or instrumentation and control devices, including spare parts, from corrosion through the use of corrosion-inhibiting vapor capsules. Prior to shipment, include capsules in the shipping containers, and equipment as recommended by the capsule manufacturer. During the construction period, periodically replace the capsules in accordance with the capsule manufacturer's recommendations. Replace all capsules just prior to Final Acceptance.

D. ESD Protection: Provide for the proper handling, storage, and environmental conditions required for the components deemed static sensitive by the equipment manufacturer. The components of the SCADA System shall be protected in particular. Utilize anti-stat wrist straps and matting during installation of these items to prevent component degradation.

E. Adequately pack manufactured material to prevent damage during shipping, handling, storage and erection. Pack all material shipped to the project site in a container properly marked for identification. Use blocks and padding to prevent movement.

F. Ship materials that must be handled with the aid of mechanical tools in wood-framed crates.

G. Ship all materials to the project site with at least one layer of plastic wrapping or other approved means to make it weatherproof. Anti-stat protection shall be provided for all sensitive equipment.

H. Inspect the material prior to removing it from the carrier. Do not unwrap equipment until it is ready to be installed. If any damage is observed, immediately notify the carrier so that a claim can be made. If no such notice is given, the material shall be assumed to be in undamaged condition, and any subsequent damage that is discovered shall be repaired and replaced at no additional expense to the OWNER.

I. The Contractor shall be responsible for any damage charges resulting from the handling of the materials.

3.02 INSTALLATION

A. Install materials and equipment in a workmanlike manner utilizing craftsmen skilled in the particular trade. Provide work, which has a neat and finished appearance. Coordinate work with the OWNER and work of other trades to avoid conflicts, errors, delays, and unnecessary interference with operation of the existing plant during construction.

B. Provide finish on instruments and accessories that protects against corrosion by the elements in the environment in which they are to be installed. Finish both the interior and exterior of enclosures. Provide extra paint of each color used in the material from the manufacturer for touch-up purposes.

C. Ground each analog signal shield on one end at the receiver end only. Properly ground all surge and transient protection devices. Coordinate grounding system with Division 16, Electrical.

D. For the purposes of uniformity and conformance to industry standard, provide analog signal transmission modes of electronic 4-20 ma DC. No other signal characteristics are acceptable.

E. Fully isolate outputs for transmitted electronic signals between transmitters and receivers, equipment of different manufacturers and between control panels to conform to ISA Standard S 50. 1.

F. Discrete signal are two-state logic signals. Use 120V ac sources on all discrete signals unless otherwise noted or shown.

G. Surge Protection: Provide appropriately sized electrical transient protection devices for all electrical elements of the system to protect the SCADA System equipment and equipment which interfaces with the SCADA System from transient surges in power and signal wiring (from lightning and other ground potential differences). Locate and properly ground surge suppressors at: any connection between power sources and electrical equipment including panels, assemblies, and field devices; and at both ends of all analog signal circuits.

3.03 TESTING

A. All elements of the SCADA System shall be tested to demonstrate that the total system satisfies all of the requirements of the Contract Documents

B. As a minimum, the testing shall include shop tests, operational check-out tests, and Demonstration Tests.

C. Each test shall be in the cause and effect format. The person conducting the test shall initiate an input (cause) and, upon the system producing the correct result (effect), the specific test requirements will have been satisfied.

D. All tests shall be conducted in accordance with, and documented on, prior approved procedures, forms, and checklists. Each specific test to be performed shall be described and a space provided after it for signoff by the appropriate party after its satisfactory completion. Copies of these signoff test procedures, forms, and checklists will constitute the required test documentation.

E. Provide all special testing materials and equipment. Wherever possible, perform tests using actual process variables, equipment, and data. Where it is not practical to test with real process variables, equipment, and data, provide suitable means of simulation. Define these simulation techniques in the test procedures.

F. The Electrical Contractor shall coordinate all of their testing with the SYSTEMS INTEGRATOR, the ENGINEER, all affected suppliers, and the OWNER.

G. The SYSTEMS INTEGRATOR shall reserve the right to test or retest any and all specified functions whether or not explicitly stated in the approved test procedures. The SYSTEM INTEGRATOR's decision shall be final regarding the acceptability and completeness of all testing.

END OF SECTION

SECTION 13310
PLC CONTROL CABINET

PART 1 - GENERAL

1.01 DESCRIPTION OF WORK

A. The control system will utilize a standard industrial Programmable Logic Controller (PLC).

B. The PLC shall be connected to every major instrument and piece of equipment to provide complete monitoring of all equipment and process measurements and provide local sequencing logic.

C. The PLC shall communicate to the existing SEWRF SCADA systemvia an Industrial Ethernet Network, over fiber-optic cable.

D. PLC Limits of Responsibility : The contractor shall provide the Control Cabinet, PLC hardware, instrumentation, wiring and physical installation of all the control system components. The System Integrator shall be responsible for the PLC programming or control algorithms. Refer also to specification section 13300.

1.02 INSTRUMENTATION RESPONSIBILITY

A. It is the intent of these Contract Documents that the CONTRACTOR to have overall responsibility for designing, furnishing, interfacing, adjusting, testing, documenting, and starting-up the various CONTROL SYSTEM equipment described in the Contract Documents. The specified intent is to have an experienced firm or entity on-site that will have overall responsibility for making sure the various systems, trades, suppliers, vendors, subcontractors, etc. come together as a complete coordinated system which will reliably perform the specified functions.

B. The CONTRACTOR shall provide all equipment, materials, calibrations and services that are required to successfully interface and interconnect the system and any other control systems and associated equipment that are specified or designated in any drawings or provisions of these specifications for the purpose of providing a fully integrated and functional control system.

1. The CONTRACTOR shall coordinate closely with suppliers of other specialty equipment. In particular, the Control System is to interconnect with the following equipment supplied by others:

   a. Septage Receiving stations, Grease Receiving station, hauler access equipment, dewatering and polymer feed equipment.

   b. Motor Control Center (MCC).

c. Variable Frequency Drives (VFD).

d. Process Instrumentation.

e. Fiber Optic Cable System.

C. Division of Work. Refer to specification section 13300 for division of work and contractor responsibilities.It is the ultimate responsibility of the Contractor to furnish a complete and fully operable Control System that reliably performs the specified functions. The Contractor is to assume full responsibility for additional costs, which may result from unauthorized deviations from the specifications. The Contractor is to establish the actual division of work with the minimum requirements as specified herein.

1. The CONTRACTOR shall be responsible for:

a. The integration of the system components including field instruments.

b. Panel layouts and wiring.

c. System Calibration and Test Documentation Submittal

i. The System Integrator shall submit an example of each type of Instrument Calibration Report that will be used to verify that all preliminary calibration and testing has been performed and the system is considered, by the supplier, to be ready.

ii. After approval of the examples, the System Integrator shall prepare Loop Functional Test Report(s) for each loop and an Instrument Calibration Sheet for each active element (except simple hand switches, lights, etc.). These sheets shall be completed and submitted to the Engineer after completion of the operational availability field tests.

iii. Instrument Calibration Reports

1. An Instrument Calibration report shall be used to certify that each instrument requiring calibration has been calibrated to its published specified accuracy shall be submitted to the Engineer. This report shall include all applicable data as listed below plus an area to identify any defects noted, corrective action required, and corrections made.

2. Identification (Name, location, etc.)

3. Loop identification (Name or function)

4. Equipment tag and serial numbers

5. Scale ranges and units

6. Test mode or type of test

7. Input values or settings

8. Expected outputs and tolerances

9. Actual readings at 0, 10, 25, 50, 75, 90 and 100 percent of span

10. Percent of error for each reading

11. Explanations or special notes as applicable

12. Date, time, and weather conditions

13. Tester's certification with name and signature

d. Functional Acceptance Test Procedures Submittal

i. Submit for approval not later than 30 days prior to the functional acceptance test demonstration, a written plan for demonstrating that each device and function of the equipment provided under these specifications meets the specified operational requirements.

ii. Immediately correct defects and malfunctions with approved methods and materials in each case and repeat the testing.

e. Termination of field and power wiring to CONTROL SYSTEM supplied control panels and field elements. Termination shall be made in accordance with final accepted interconnection diagrams developed by the SYSTEM INTEGRATOR. The electrical subcontractor shall mark on the interconnect diagram the field wire numbers used for each termination point. The SYSTEM INTEGRATOR shall finalize the interconnect diagrams by including these field wire numbers in the final as built version.

f. Installing all network cables, (including fiber optic cable), interconnecting CONTROL SYSTEM supplied equipment.

g. Physical installation of CONTROL SYSTEM supplied control panels.

2. The Mechanical Contractor shall be responsible for :

i. The installation of any in-line instrumentation. Installation shall be made in accordance with the manufacturer's recommendations and under the direction of the SYSTEM INTEGRATOR.

1.03 SUBMITTALS

A. Copies of all materials required to establish compliance with the Specifications shall be submitted in accordance with the General Conditions. Submittals shall include, but not be limited to, the following:

1. Shop drawings prepared by the manufacturer and submitted to the Engineer for review prior to the manufacture of the equipment. The shop drawings shall include outline dimensions and external connection diagrams. A list of components, interface cables, specifications and a copy of the manufacturer's warranty shall be included with the submitted data.

2. Operating Instructions: The CONTRACTOR shall submit operation and I maintenance manuals for:

a. General - equipment function, description and normal and limiting operating characteristics.

b. Installation instructions - assembly procedures and alignment and adjustment procedures.

c. Operation instructions - start-up procedures, normal operating conditions, emergency and normal shutdown procedure.

d. Maintenance instructions.

e. Trouble-shooting guide.

f. Parts list and predicted life of parts subject to wear.

g. Drawings -cross sectional view, assembly and wiring diagrams.

3. Complete master wiring diagrams and control schematics shall be furnished 3 for approval before proceeding with manufacture.

4. Certifications: The CONTRACTOR shall furnish the Engineer with a written certification signed by the manufacturer's representative that the equipment has been properly installed, tested, calibrated, and operated under typical operating conditions, and satisfactory operation has been obtained.

1.04 OPERATING INSTRUCTIONS

A. Operating and maintenance manuals shall be furnished in accordance with Section 01730. The manuals shall be prepared specifically for this installation and shall include all required cuts, drawings, equipment lists, descriptions, calibration requirements, etc., that are required to instruct operating and maintenance personnel unfamiliar with such equipment the number and special requirements shall be as specified.

B. A representative who has complete knowledge of the proper operation and maintenance of the equipment and system shall be provided for two (2) days to instruct representatives of the Owner and the Engineer on the proper operation and maintenance. This work may be conducted in conjunction with the inspection of the installation and test run. If there are difficulties in operation of the system, additional service shall be provided at no cost to the Owner.

1.05 SPARES AND EXPENDABLES

A. Provide the following spare parts:

1. One spare process indicator unit of each type used.

2. One spare D.C. power supply of each type provided.

3. Five percent (rounded up) spare relays of each type provided.

4. Five percent (rounded up) spare surge suppressors of each type provided

B. Provide the following expendables:

1. Two year supply of corrosion inhibitor capsules

2. Ten percent (rounded up) spare fuses (minimum of 10) of each type and rating supplied.

3. Ten percent (rounded up) spare indicator light bulbs (minimum of 20) of each type and color supplied.

C. Spare parts shall be properly protected for long periods of storage and packed in a box clearly identified with indelible markings as to the contents.

1.06 WARRANTY

A. The instrumentation system supplier/controls integrator shall provide a warranty in accordance with Specification 01740 and shall guarantee that the equipment furnished is suitable for the purpose intended and free from defects of design, material and workmanship. In the event the equipment fails to perform as specified, the controls integrator shall promptly repair or replace the defective equipment without any cost to the Owner (including handling, shipment and labor costs).

PART 2 - PRODUCTS

2.01 GENERAL REQUIREMENTS

A. Electronic equipment shall utilize printed circuitry suitably coated to prevent contamination by dust, moisture and fungus. Solid-state components shall be conservatively rated for their purpose, to assure optimum long-term performance and dependability over ambient atmosphere fluctuations and 0 to 100 percent relative humidity. The field mounted equipment and system components shall be designed for installation in dusty, humid, and slightly corrosive service conditions.

B. All equipment shall be designed to operate on a 60-Hertz alternating current power source at a normal 120 volts, plus or minus 10 percent, except where specifically noted. All regulators and power supplies required for compliance with the above shall be provided between power supply and interconnected instrument loop. Where equipment requires voltage regulation, constant voltage transformers shall be supplied.

C. All equipment, cabinets and devices furnished hereunder shall be heavy-duty type, designed for continuous industrial service. The system shall contain products of a single MANUFACTURER, insofar as possible, and shall consist of equipment models which are currently in production.

D. The equipment furnished shall be designed to operate satisfactorily between 0 degrees C and 40 degrees C at up to 95 percent Relative Humidity (non-condensing).

E. All outdoor panels and enclosures containing electronic or electrical components shall be equipped with aluminum sunshields on both sides, the back and the top.

F. All switches shall have double-pole, double-throw contacts rated at a minimum of 600 volts-amperes (VA), unless specifically noted otherwise.

G. All equipment shall be designed and constructed so that in the event of a power interruption, the equipment specified hereunder shall resume normal operation without manual resetting when power is restored.

2.02 PROGRAMMABLE LOGIC CONTROLLER (PLC) HARDWARE

A. The programmable controllers shall be Allen Bradley SLC-5/05 (1747-L552), with I/O Chassis, analog and discrete inputs and outputs as required to fulfill the SCADA requirements of this project. The SLC memory shall be backed by an EEPROM. There shall be NO SUBSTITUTIONS

B. Analog input modules shall be equipped with four 16-bit differential current analog inputs, configured for operation as 4-20 ma inputs. Analog input cards shall be Allen Bradley 1746-NI8.

C. Discrete input cards shall be rated for 120V and be equipped with 16-points per card. Discrete input cards shall be Allen Bradley 1746-IA16.

D. Discrete output cards relay type, shall be rated for 120V and be equipped with 16-points per card. Discrete output cards shall be Allen Bradley 1746-OX8.

E. The PLC processor shall be connected to an Ethernet Switch (refer to this specification for switch requirements). The Ethernet Switch shall connect to the Ethernet port of the SLC , using a suitable Cat 5e cable, and shall provide an Ethernet link between this equipment.

F. The PLC shall be a self-contained, microprocessor-based device capable of stand-alone operation. The unit shall be capable of performing logic, timing, counting, computation, and shall be provided with a library of 14 preprogrammed subroutines necessary for the specific unit process application including a time of day clock for time stamping events.

G. Each Rack power supply shall be over-sized so that it can operate any combination of equipment which may be installed if the I/O rack were fully loaded. Calculations shall be provided in the shop drawings to support the selected power supply.

H. Inputs and Outputs. The PLC shall be capable of handling the required number of process inputs and outputs plus 20 percent active spares for each type.

I. Environmental. The PLC unit shall be furnished which shall be provided with suitable environmental control accessories to assure proper system operation, including heating and cooling as required. The installation must operate properly within a temperature range of -30 C to +60 C and a relative humidity of 100%.

J. Self-Diagnostics. The PLC unit shall indicate low battery power, I/O malfunction, and forced output status. A watchdog timer shall supervise operation of data lines, control lines and address lines.

K. PLC Processing Requirements

1. The PLC processor shall perform the following general tasks:

a. Logic Control: The processor shall be capable of performing the same functions as conventional logic systems, including relays, ON-delay timers, OFF-delay timers, counters, and drum sequencers.

b. Scale Function: The processor shall perform a scaling function that converts an internal binary number or an analog input signal (4-20 mA), representing temperature, pressure, differential pressure, flow or level, into engineering units for use within the programmable controller. In addition, perform all integration and totalization, as well as any special computational requirements including signal conditioning, linearization, etc. In addition the PLC shall screen any analog input for reasonableness, based on high limit, low limit, or rate of change.

c. Unscale Function: The processor shall perform the unscale function that converts a number in engineering units to a scaled binary number and allow for its transmission as a 4-20 mA signal (if the latter is required).

d. Analog Switches: The processor shall have the capability to sense when an analog value in engineering units is less than, equal to, or greater than a predetermined value (e.g., a set point) also in engineering units. When the programmed function is satisfied, tile process shall energize an internal logic relay in the ladder logic section.

e. Compare Function: The processor shall perform the compare function that compares two numbers for less than, equal to, greater than, and not equal to. The programmed function shall energize a relay when true and de-energize it when false.

f. Move Function: The move function shall move an integer or floating point value from one memory location to another memory location when an internal permissive is enable.

g. Math Function: The processor shall be capable of performing addition, subtraction, multiplication, and division in both integer and floating point math.

h. Square Root Function: The processor shall be capable of taking the square root of a positive integer or floating point number.

I. Binary to Binary Coded Decimal (BCD) Function: The processor shall be capable of converting a positive binary number to a positive four-digit BCD coded number.

j. BCD to Binary Function: The processor shall be capable of converting a positive four-digit BCD coded number to a positive binary number.

k. PID Function: The processor shall be capable of closed-loop Proportional-Integral-Derivative (PID) process control. In addition, standard process control algorithms shall be provided. The control algorithms are to be a complete set of modular control elements, which may be used to configure feedforward, feedback, computational, and advanced control strategies.

l. The PLC shall have the capability for control schemes using lead-lag, ratio, bias, auto select, calculations, sequence control utilizing common logic functions, etc.

m. All analog variables, such as rate of flow, weight, and kilowatt usage, shall have their instantaneous values integrated with respect to time and their quantities totaled.

n. Running times for all equipment shall be accumulated by periodic inspection (at least once a minute) of discrete inputs relating to running/off status.

o. Every two minutes, all analog parameters shall be averaged and the result passed to the data management system historic application for further processing.

p. PLC System Alarm: The PLC processor shall monitor the internal operation of the programmable controller system for failures. If a failure is detected, the system shall shut down, energize or de-energize a normally closed failure relay, and freeze all inputs and outputs in their last states until the error is cleared. As a minimum, the following failures shall cause the system to shut down:

1. Watchdog timer time out

2. Time of day timer

L. I/O Chassis

1. Slotted I/O chassis must be available in 7 slot configuration.

2. The chassis shall be sized such that there is room to add an additional module for future process expansion.

M. Diagnostics

1. The processor shall have built-in diagnostics and self-test, such that each test. Additionally the power-up test will momentarily light up all diagnostic LEDs to be sure they are working. The processor shall be capable of reporting major and minor fault codes and processor status information back to the polling master, provided the fault is not a catastrophic hardware failure where the processor is unable to power up.

2. The processor shall have a built-in watchdog timer to ensure that all processor program scans occur within the time limit set by the watchdog timer. The watchdog timer cycle shall be adjustable from 20 msec to 2.5 seconds in 10 msec increments.

3. The processor shall have individual LED indicators that are clearly visible and labeled for easy identification. At a minimum the following indicators must be provided:

   a. CPU is in RUN mode
   b. CPU is FAULTED
   c. CPU battery is LOW
   d. I/O points are FORCED and are not under program control
   e. COMMUNICATION channels are active

2.03 LIGHTNING/SURGE PROTECTION

A. Surge suppressors and arrestors meeting the requirements of ANSI Standard C-62.41 (latest revision) shall be provided on all wiring entering all panels and enclosures.

B. DC signals. Lightning and surge protection shall be provided on all 4-20 mA signal wires. The protectors shall meet the following criteria:

1. DIN rail mounted.

2. Response time of less than five nanoseconds.

3. Automatic reset.

4. Operating signal voltage: up to 30 Volts DC

5. Operating signal current: up to 250 mA

6. 10kA maximum surge current.

7. Internal 250mA fuse.

8. Manufacturer/model:

    a) MTL Surge Technologies Cat# SD32
    b) EDCO DRS-036 (with additional fusing)
    c) Approved equal.

C. Single phase AC Power (to 15 Amps). Lightning and surge protectors for AC power supply lines up to 15 Amps service shall meet the following criteria:

1. Serial protection with replaceable fuse.

2. Failure indicator

3. Response time of less than five nanoseconds.

4. Capable of withstanding up to 10,000 Amps at IEEE/ANSI C-62.41 8 x 20 microseconds combination wave.

5. Manufacturer/model:
    a) MTL Surge Technologies Cat# MA15
    b) EDCO HSP121BT
    c) Approved equal.

D. Single phase AC Power (over 15 Amps). Lightning and surge protectors for AC power supply lines over 15 Amps service shall meet the following criteria:

1. Capable of withstanding up to 6,500 Amps at IEEE/ANSI C-62.41 8 x 20 microseconds combination wave.

2. Manufacturer/model:
    a) EDCO HSP121BT-1RU
    b) Approved equal.

E. Discrete Signals.

1. All discrete input signals from outside the building shall be equipped with interposing relays to electrically isolate them from the control system I/O.

F. All discrete outputs regardless of their destination shall be equipped with surge protection devices. The protectors shall meet the following criteria:

1. DIN rail mounted.

2. Response time of less than five nanoseconds.

3. Automatic reset.

4. 10kA maximum surge current.

5. Manufacturer/model:

a) MTL Surge Technologies Cat# SD150X
b) Approved equal.

2.04 ENCLOSURE

A. Finish:

1. All front panel openings for panel-mounted equipment shall be cut with counter-boring and provided with trim strips as required to give a neat finished appearance.

2. All steel panel surfaces shall be treated with phosphatized treatment inside and out, and then finished on the exterior with two coats of baked enamel of the approved color. Interiors of panels shall be white, ANSI No. 51.

B. Door:

1. Control cabinet shall have a continuous piano hinge door for ease of access. A minimum of 80% of the panel interior shall be exposed by the door.

2. NEMA 4x stainless steel door openings shall be sealed and fully gasketed with 3-point latching system.

3. The inside of the door shall be equipped with a print pocket.

4. Cabinet door shall be equipped with a three-point latching mechanism.

C. All components and terminals shall be accessible without removing other components except for covers.

D. Cabinet shall be provided with an isolated copper grounding bus to ground all signal and shield connections.

E. Nameplates:

1. All front-face panel mounted controls shall be equipped with screw mounted laminated plastic nameplates to completely define their use. The use of adhesive to mount front panel nameplates will not be acceptable.

2. All internal components shall be equipped with identification tags

3. All wiring shall be labeled.

F. Construction:

1. Minimum metal thickness: 14-gauge.

2. Stiffeners as required to prevent deflection under instrument loading and permit lifting without racking or distortion.

3. When required, removable lifting rings and fill plugs to replace rings after installation.

G. Miscellaneous Equipment:

1. All panels shall be protected from internal corrosion by the use of corrosion – inhibiting vapor capsules, Northern Instruments Model Zerust VC, Hoffman Model A-HCI, or equal.

H. All panels shall be manufactured items, Hoffman Engineering, or equal.

2.05 UNINTERRUPTIBLE POWER SUPPLIES (UPS)

A. Uninterruptible Power Supply (UPS) shall be provided as follows:

1. Provide and install 350VA UPS, Allen Bradley 1609-S350NS with dry contact I/O communication cable, Allen Bradley 1609-SDC1. There shall be NO SUBSTITUTIONS

2.06 VOLT DC POWER SUPPLIES

A. Provide isolated 24 Volt DC power supplies as follows:

1. Power supply with separately fused connections to power the PLC and miscellaneous field instruments as shown in the Contract Drawings.

2. A wetting supply for interposing relay contacts that provide discrete inputs to the PLC, separately fused for each input group. An additional, separately fused connection, from this supply shall also power the discrete output isolation relay coils.

3. 24Volt DC power supplies shall 24 Watt capacity and have 120VAC input/24VDC output. 24VDC power supplies shall be Phoenix Contact # MINI-PS-100-240AC/24DC/1 or approved equal.

2.07 ANALOG SIGNAL ISOLATION/LOOP POWER

A. Provision shall be made for providing loop power and signal isolation of the two-wire transmitters as indicated on the drawings.

B. Signal Isolators shall be Moore Industries ECT model with two-wire transmitter excitation option. There shall be no approved equals.

2.08 FIBER OPTIC ETHERNET SWITCH

1.02. Fiber optic Ethernet switch shall be compatible with the existing SEWRF SCADA system and shall be Phoenix Contact # 2832658. There shall be NO SUBSTITUTIONS

2.09 ELECTRICAL WIRING

A. Wiring:

1. Branch circuit breakers shall be Square-D QOU115 as applicable.

2. Thermal c ircuit br eakers s hall be 120 V and shall be T ype T CP as manufactured by Phoenix Contact.

3. Power wiring shall be 600 volt, type THWN stranded copper, No. 12 AWG size, for 120V service.

4. Discrete wiring shall be 600-volt type THWN stranded copper, sized for the current carried, but not smaller than No. 16 AWG.

5. Analog signal wiring shall be 300 volt, stranded copper in twisted shield pairs, no smaller than No. 16 AWG.

6. Panel wiring shall be routed within wire troughs or panduits.

7. Analog or dc wiring shall be separated from any ac power or control wiring by at least six inches.

8. Each wire shall be uniquely identified using plastic, snap-on numbered tags.

9. Terminal blocks shall be provided for all field wiring entering the panel. The greater of 4 or 15% spare terminal blocks shall be provided.

10. No more than one wire per screw and yoke termination.

2.10 Panel Mounted Devices

A. Control/Interposing Relays: All relays shall meet the following:

1. Compact, general-purpose, plug-in type.

2. Socket mounted.

3. Contacts rated for not less than 10 amperes at 120V.

4. Square-D “R” type relays or approved equal.

B. Terminal Blocks. Terminal blocks shall meet the following requirements:

1. Screw terminals capable of accepting 10-26 AWG wire.

2. Fused disconnect style (when applicable).

3. DIN-rail mounting.

4. Allen Bradley 1492-W10 or 1492-WFB4 as applicable.

5. Provide Allen Bradley end barriers 1492-EBL16 and end anchors1492-EA35 as required.

PART 3 - EXECUTION

3.01 INSTALLATION

A. The work included in this section consists of furnishing, installing and placing in operation the instruments and appurtenances, including all conduit, wiring and circuitry necessary to provide the Owner with a fully operable system properly calibrated and installed.

B. Install and mount equipment in accordance with the Contract Documents, manufacturer's instructions and installation detailed shop drawings. Mount equipment so that they are rigidly supported, level and plumb, and in such a manner as to provide accessibility; protection from damage; isolation from heat, shock and vibration; and freedom from interference with other equipment, piping and electrical.

C. All workmanship utilized in the manufacture and installation of this system shall be of the highest quality and performed in a manner consistent with all accepted practices for industrial controls.

3.02 WIRING AND GROUNDING

A. General Wiring Guidelines : Ethernet cables should not be routed near equipment that generates strong electric or magnetic fields. The major concern is with routing near and around :

1. Lights
2. Motors
3. Drive Controllers
4. AC Power Lines

B. Route your cable at least this distance from noise sources of this strength:

1. 6” – Category 1 conductors of less than 20 amps
2. 12” – AC power lines of 20 amps or more, up to 100KVA
3. 24” – AC power lines greater than 100 KVA. Install and mount

3.03 EQUIPMENT CALIBRATION

A. Every analog instrument, control or related device shall be properly calibrated, tuned, adjusted and commissioned so that the accuracy and operation of the device equals the highest level of performance which that device can achieve.

B. Accurate and appropriate test equipment and industry standard test procedures shall be used to demonstrate that the equipment operates within its expected tolerance of accuracy at various points throughout its operating range.

C. Whenever calibration adjustments are being made, the CONTRACTOR supplied technician(s) shall notify the members of the plant electrical/instrumentation staff so that they may witness the procedure as an educational process. The technicians shall assist the operator in any way possible in becoming well versed in the start-up, operation, maintenance and calibration of the equipment provided.

D. The technician(s) shall be fully familiar, trained and qualified to service and support the items that are being serviced.

3.04 CALIBRATION AND SERVICE REPORTS

A. The CONTRACTOR shall prepare a written, dated, report for each start-up, calibration, troubleshooting or maintenance event. This report shall identify the instrument serviced, define the procedures, and provide conclusions. This shall include every instrument or system provided in this project, and shall apply to every visit by equipment suppliers and system subcontractors. The reports shall also document each wiring modification, warranty repair and problem analysis.

B. All reports shall be distributed to the Engineer, the Contractor and copied to the Owner’s staff, and a copy shall be kept in a permanent file on site for future reference.

3.05 WARRANTY

A. The CONTRACTOR shall guarantee the material and/or workmanship of all installed equipment and systems for a period of (12) twelve months from the date of final acceptance of the complete system by the Owner.

B. During this warranty period, the CONTRACTOR shall provide, at no additional cost to the Owner, the services of a trained, competent field service engineer who shall arrive on site within 36 hours of notification by the Engineer or Owner to repair and/or replace any faulty device or equipment supplied by the system supplier as part of this contract. All preventive and corrective activities shall be documented with service reports, which shall identify the equipment being serviced, state the

condition of the equipment, describe all work performed, and list materials used. A copy of all service reports shall be delivered to the Engineer and Owner on or before the next business day.

END OF SECTION

SECTION 13320
FIBER OPTIC PANELS

PART 1 - GENERAL

1.01 DESCRIPTION OF WORK

A. Fiber Optic Panels shall be provided and installed in order to terminate the new fiber optic cables installed between the new Septage Receiving Station and the existing SEWRF Administration Building. Refer also to specification section 16745.

1.02 SUBMITTALS

A. Copies of all materials required to establish compliance with the Specifications shall be submitted in accordance with the General Conditions. Submittals shall include, but not be limited to, the following:

1. Shop drawings prepared by the manufacturer and submitted to the Engineer for review prior to the manufacture of the equipment. The shop drawings shall include outline dimensions and external connection diagrams. A list of components, interface cables, specifications and a copy of the manufacturer's warranty shall be included with the submitted data.

1.03 OPERATING INSTRUCTIONS

A. Operating and maintenance manuals shall be furnished in accordance with Section 01730. The manuals shall be prepared specifically for this installation and shall include all required cuts, drawings, equipment lists, descriptions, calibration requirements, etc., that are required to instruct operating and maintenance personnel unfamiliar with such equipment the number and special requirements shall be as specified.

1.04 WARRANTY

A. The instrumentation system supplier/controls integrator shall provide a warranty in accordance with Specification 01740 and shall guarantee that the equipment furnished is suitable for the purpose intended and free from defects of design, material and workmanship. In the event the equipment fails to perform as specified, the controls integrator shall promptly repair or replace the defective equipment without any cost to the Owner (including handling, shipment and labor costs).

PART 2 - PRODUCTS

2.01 GENERAL REQUIREMENTS

A. Electronic equipment shall utilize printed circuitry suitably coated to prevent contamination by dust, moisture and fungus. Solid-state components shall be conservatively rated for their purpose, to assure optimum long-term performance and dependability over ambient atmosphere fluctuations and 0 to 100 percent relative humidity. The field mounted equipment and system components shall be designed for installation in dusty, humid, and slightly corrosive service conditions.

B. All equipment shall be designed to operate on a 60-Hertz alternating current power source at a normal 120 volts, plus or minus 10 percent, except where specifically noted. All regulators and power supplies required for compliance with the above shall be provided between power supply and interconnected instrument loop. Where equipment requires voltage regulation, constant voltage transformers shall be supplied.

C. All equipment, cabinets and devices furnished hereunder shall be heavy-duty type, designed for continuous industrial service. The system shall contain products of a single MANUFACTURER, insofar as possible, and shall consist of equipment models which are currently in production.

D. The equipment furnished shall be designed to operate satisfactorily between 0 degrees C and 40 degrees C at up to 95 percent Relative Humidity (non-condensing).

E. All equipment shall be designed and constructed so that in the event of a power interruption, the equipment specified hereunder shall resume normal operation without manual resetting when power is restored.

2.02 ENCLOSURES

A. Finish:

1. All front panel openings for panel-mounted equipment shall be cut with counter-boring and provided with trim strips as required to give a neat finished appearance.

2. All steel panel surfaces shall be treated with phosphatized treatment inside and out, and then finished on the exterior with two coats of baked enamel of the approved color. Interiors of panels shall be white, ANSI No. 51.

B. Door:

1. Control cabinet shall have a continuous piano hinge door for ease of access. A minimum of 80% of the panel interior shall be exposed by the door.

2. NEMA 4x stainless steel door openings shall be sealed and fully gasketed with 3-point latching system.

3. The inside of the door shall be equipped with a print pocket.

4. Cabinet door shall be equipped with a three-point latching mechanism.

C. All components and terminals shall be accessible without removing other components except for covers.

D. Cabinet shall be provided with an isolated copper grounding bus to ground all signal and shield connections.

E. Nameplates:

1. All front-face panel mounted controls shall be equipped with screw mounted laminated plastic nameplates to completely define their use. The use of adhesive to mount front panel nameplates will not be acceptable.

2. All internal components shall be equipped with identification tags

3. All wiring shall be labeled.

F. Construction:

1. Minimum metal thickness: 14-gauge.

2. Stiffeners as required to prevent deflection under instrument loading and permit lifting without racking or distortion.

3. When required, removable lifting rings and fill plugs to replace rings after installation.

G. Miscellaneous Equipment:

1. All panels shall be protected from internal corrosion by the use of corrosion – inhibiting vapor capsules, Northern Instruments Model Zerust VC, Hoffman Model A-HCI, or equal.

H. All panels shall be manufactured items, Hoffman Engineering, or equal.

2.03 UNINTERRUPTIBLE POWER SUPPLIES (UPS)

A. Where indicated in the contract documents, provide a Uninterruptible Power Supply (UPS) as follows:

1. Provide and install 350VA UPS, Allen Bradley 1609-S350NS. There shall be NO SUBSTITUTIONS

2.04 FIBER OPTIC MEDIA CONVERTERS

A. Fiber optic media converters shall be as specified in section 16745.

2.05 LIGHTNING/SURGE PROTECTION

A. Single phase AC Power (over 15 Amps). Lightning and surge protectors for AC power supply lines over 15 Amps service shall meet the following criteria:

1. Capable of withstanding up to 6,500 Amps at IEEE/ANSI C-62.41 8 x 20 microseconds combination wave.

2. Manufacturer/model:
   a) EDCO HSP121BT-1RU
   b) Approved equal.

2.06 FIBER OPTIC PATCH PANELS

A. When directed by the contract documents, the contractor shall provide a Fiber Optic Panel.

1. The patch panel to be installed shall accommodate two (2) CCH Panels.

2. The fiber optic patch panels shall accommodate the number of splice trays as required.

3. The fiber optic patch panels shall be Corning WCH-02P or approved equal.

2.07 ELECTRICAL WIRING

A. Wiring:

1. Branch circuit breakers shall be Square-D QOU115 as applicable.

2. Power wiring shall be 600 volt, type THWN stranded copper, No. 12 AWG size, for 120V service.

3. Panel wiring shall be routed within wire troughs or panduits.

4. Each wire shall be uniquely identified using plastic, snap-on numbered tags.

5. Terminal blocks shall be provided for all field wiring entering the panel. The greater of 4 or 15% spare terminal blocks shall be provided.

B. Terminal Blocks. Terminal blocks shall meet the following requirements:

1. Screw terminals capable of accepting 10-26 AWG wire.

2. Fused disconnect style (when applicable).

3. DIN-rail mounting.

4. Allen Bradley 1492-W10 or 1492-WFB4 as applicable.

5. Provide Allen Bradley end barriers 1492-EBL16 and end anchors1492-EA35 as required.

PART 3 - EXECUTION

3.01 INSTALLATION

A. The work included in this section consists of furnishing, installing and placing in operation the instruments and appurtenances, including all conduit, wiring and circuitry necessary to provide the Owner with a fully operable system properly calibrated and installed.

B. Install and mount equipment in accordance with the Contract Documents, manufacturer's instructions and installation detailed shop drawings. Mount equipment so that they are rigidly supported, level and plumb, and in such a manner as to provide accessibility; protection from damage; isolation from heat, shock and vibration; and freedom from interference with other equipment, piping and electrical.

C. All workmanship utilized in the manufacture and installation of this system shall be of the highest quality and performed in a manner consistent with all accepted practices for industrial controls.

3.02 WARRANTY

A. The CONTRACTOR shall guarantee the material and/or workmanship of all installed equipment and systems for a period of (12) twelve months from the date of final acceptance of the complete system by the Owner.

B. During this warranty period, the CONTRACTOR shall provide, at no additional cost to the Owner, the services of a trained, competent field service engineer who shall arrive on site within 36 hours of notification by the Engineer or Owner to repair and/or replace any faulty device or equipment supplied by the system supplier as part of this contract. All preventive and corrective activities shall be documented with service reports, which shall identify the equipment being serviced, state the condition of the equipment, describe all work performed, and list materials used. A copy of all service reports shall be delivered to the Engineer and Owner on or before the next business day.

END OF SECTION

SECTION 13420
LEVEL MEASUREMENT SYSTEM

PART 1 - GENERAL

1.01 SCOPE OF WORK

A. Scope:

1. Contractor shall provide all labor, materials, equipment and incidentals as shown, specified and required to furnish, install, calibrate, test, adjust and place into satisfactory operation the Radio Frequency (RF) Admittance / Capacitance Level Measurement System shown and specified herein.

2. Contract Documents illustrate and specify functionality and general construction requirements of the level measurement system and do not necessarily show or specify all components, wiring, piping and accessories required to make a completely integrated system. Contractor shall provide all components, piping, wiring, accessories and labor required for a complete, workable, and integrated system.

B. Coordination: Coordinate with others suppliers for installation of all items specified herein and required to ensure the complete and proper interfacing of all components and systems.

C. Related Sections:

1. Section 01300: Shop Drawings, Submittals and Samples.
2. Section 01700: Contract Closeout
3. Section 01780: Operation and Maintenance Manuals
5. Division 16

1.02 SUBMITTALS

A. The Contractor shall submit shop drawings in accordance with Section 01300, Shop Drawings, Submittals and Samples, and all Sections of Division 16.

1.04 PRODUCT DELIVERY, STORAGE AND HANDLING

A. The CONTRACTOR shall adhere to the requirements specified in Section 01600, Material and Equipment, and all Sections of Division 16.

B. Level sensors and associated equipment shall not be delivered to the site until all product information and system Shop Drawings for the sensors and instruments have been approved by the Engineer.

PART 2 - PRODUCTS

2.01 RF ADMITTANCE / CAPACITANCE LEVEL SENSOR AND TRANSMITTER

A. The 2-wire smart RF Admittance / Capacitance continuous level transmitter shall produce a HART compatible output of 4-20 mA that is proportional to level. It shall be capable of making the measurement independent of changes in material density and not be affected by the presence of material clinging to the sensing element.

B. The PRO model shall ignore the effects from insulating or conductive coatings on the probe while the LITE model shall ignore the effects from insulating coatings only.

C. The measurement shall be free from the effects of changes in temperature, density, foam or acoustic noise in the vapor space above the level.

D. System configuration and calibration shall be accomplished from a PC based software with a HART Communication modem connected anywhere in the 2-wire loop. Configuration may be entered in user's choice of engineering units and system calibration can be accomplished by entering any two known level points, not necessarily empty and full. The output shall be compatible with the HART Protocol specification revision 5 or later.

E. The level measuring system shall he intrinsically safe and explosion proof without the need for IS barriers. The system shall be suitable for installation in Class I Division 1, Zone 1 and Zone 0 hazardous areas. The electronic unit shall be mounted in an explosion-proof enclosure and be capable of being either located integrally with the sensor or remotely from the sensor up to 100 feet (30 meters) away.

F. The electronic unit shall be equipped with a built-in keypad and display module for ease of configuration and troubleshooting. The electronic unit shall be capable of operating in harsh environments with temperature ranges from -40°F to 167°F (-40°C to 75°C) and be protected from corrosion with a NEMA 4X rated housing. The system shall include probe selection that is capable to operate with varying process temperature and pressure (up to 537°C/1000°F and 690 Bar/10,000 PSI).

G. The electronic unit shall be a single device capable of use over a wide range of level applications by having an auto-ranging capacitance of 1 to 45, 000 pF (PRO model) or 20 to 7,000 pF (LITE model).

H. The electronic unit shall have provision for field changeable damping time and phasing (PRO model) in the event the measurement requires such changes to optimize the system performance.

I. The output signal shall be free from effects of Radio Frequency Interference (RFI) when plant radios (walkie-talkies) are in the vicinity of the level transmitter.

J. Further, the system shall be free from harmful effects of static electricity on the sensing element with discharges up to 4,000V being tolerated without damage.

K. The level sensor shall be as manufactured by Drexelbrook Universal IV, or approved equal.

PART 3 -- EXECUTION

3.1 INSTALLATION

A. Install level measurement system in accordance with manufacturer's recommendations and in accordance with the Contract Documents. Transmitters and instruments, which require access for periodic calibration or maintenance, shall be mounted so they are accessible. Care shall be taken in the installation to ensure sufficient space is provided between instruments and other equipment or piping to allow for easy removal and servicing.

B. All items shall be mounted and anchored using stainless steel hardware, unless otherwise noted.

C. All field instruments shall be rigidly secured to walls, stands or brackets as required by the manufacturer and as shown.

D. Conform to all applicable provisions of the NEMA standards, NEC and Local, State and Federal codes when installing the equipment and interconnecting wiring.

3.2 START-UP, CALIBRATION, TESTING, AND TRAINING

A. Comply with the applicable requirements of Division 16.

B. Level measurement system manufacturer shall provide a minimum of 4 hours of start-up assistance on site.

C. Provide O&M manuals as specified in Section 01780.

END OF SECTION

SECTION 13440
ELECTROMAGNETIC FLOW METER

PART 1 - GENERAL

1.01 SCOPE OF WORK

A. Scope:

1. Contractor shall provide all labor, materials, equipment and incidentals as shown, specified and required to furnish, install, calibrate, test, adjust and place into satisfactory operation the electromagnetic flow meters shown and specified herein.

2. Contract Documents illustrate and specify functionality and general construction requirements of the flow meters and do not necessarily show or specify all components, wiring, piping and accessories required to make a completely integrated system. Contractor shall provide all components, piping, wiring, accessories and labor required for a complete, workable, and integrated system.

3. Contractor shall be responsible for installing in-line flow elements (magnetic flow meter flow tubes, insert flow tubes) and for providing taps in the process piping systems for wastewater sampling.

B. Coordination: Coordinate with others suppliers for installation of all items specified herein and required to ensure the complete and proper interfacing of all components and systems.

C. Related Sections:

1. Section 01300: Shop Drawings, Submittals and Samples.
2. Section 01700: Contract Closeout
3. Section 01780: Operation and Maintenance Manuals
5. Division 16

1.02 SUBMITTALS

A. The Contractor shall submit shop drawings in accordance with Section 01300, Shop Drawings, Submittals and Samples, and all Sections of Division 16.

1.04 PRODUCT DELIVERY, STORAGE AND HANDLING

A. The CONTRACTOR shall adhere to the requirements specified in Section 01600, Material and Equipment, and all Sections of Division 16.

B. Flow meters and associated equipment shall not be delivered to the site until all product information and system Shop Drawings for the sensors and instruments have been approved by the Engineer.

PART 2 - PRODUCTS

2.01 MAGNETIC FLOW METER AND TRANSMITTER

A. The flow meter shall be suitable for wastewater and of the microprocessor-based electromagnetic type. The magnetic flow meter shall indicate, totalize, and transmit flow in full pipes. It shall provide an instantaneous flow rate indication, and a totalization of flow volume.

B. The magnetic flow meter shall utilize DC bipolar pulsed coil excitation, operating at frequencies up to 100 Hz and automatically re-zeroing after every cycle.

C. The flow meter tube shall be constructed of 304 stainless steel with flanged connections. The flow sensor liner shall be FEP/teflon.

D. The flow meter shall include Type 316 stainless steel grounding rings and Type 316 stainless steel grounding straps.

E. The flow meter shall have a microprocessor-based signal converter and have an accuracy of at least plus or minus 0.5% of flow rate over a 33:1 turndown at all flow rates range from 1.0 feet per second to the upper end of the range specified for the meter. Accuracy shall be verified by calibration in a flow laboratory traceable to the U.S. National Institute of Standards and Technology. Flow test curves of the actual meters being furnished shall be submitted.

F. Meter shall include low flow cutoff. The low flow cutoff shall be selectable from 0 to 9 percent of flow span and there shall be two flow alarms settable from 0 to 99 percent of span.

G. The integrally-mounted flow sensor and transmitter shall be FM approved for Class I, Division 1 and 2, Groups B, C, D environments without use of air purge. The flow meter shall be suitable for operation at temperatures from -40 °F to 266 °F and at pressures from full vacuum to 740 psi.

H. The meter shall incorporate HI-Z circuitry. The preamplifier input impedance shall not be less than 10^{12} ohms. External ultrasonic electrode cleaners shall not be acceptable.

I. Available outputs shall be 1) Isolated analog 4 -20 mAdc into 800 ohms (standard); 2) scaled pulse 24 Vdc with selectable 12.5/25/50/100 ms on time, max. freq. 60 Hz.; 3) 0-1000 Hz freq., for 0-100% flow rate. 15 Vdc; 4) two flow alarms; 5) fault, with open collector; 6) RS232 communication; 7) flow direction with open collector; 8) Positive Zero Return (PZR) for external relay contacts. Outputs 2 & 3 can be open collector if required.

J. A two-line 16-character backlit alphanumeric display shall indicate user-defined flow units and total flow. All menu advice and commands shall be visible on this display. The display shall be modular and rotatable 360°, in 90° increments. Characters shall be at least 0.125" high for ease of readability. Totalizer shall be visible through viewing window, or shall be externally mounted in a separate NEMA 4X enclosure with viewing window and installed adjacent to the transmitter.

K. The flow meter shall include a feature to allow menu selection and changes to be made from the outside of the housing. It shall not be necessary to remove covers, panels, or fasteners to accomplish calibration or program changes.

L. The meter software shall incorporate a password feature preventing inadvertent program changes.

M. The flow meter shall feature E^2PROM memory and universal electronics module compatibility between meters.

N. The flow meter transmitter shall be remote-mounted and furnished in a NEMA 4X enclosure with a larger 3/8-inch character, 2-line 16 digit backlit display and 15 feet of cable.

O. The flow meter shall have a switching power supply having an operating range from 77 to 265 VAC 50/60 Hz. Power consumption shall not exceed 20 watts.

P. Flow meter manufacturer shall have meters of the DC pulse type installed in similar flowing mediums for a minimum of five years.

Q. The flow meter shall be warranted against defective workmanship or materials for a period of two years from date of shipment.

R. The flow meter shall be Model FM 656 TigermagEP, as manufactured by Sparling Instruments, Inc., Rosemount Series 8705, as manufactured by Emerson Process Management, or approved equal.

PART 3 -- EXECUTION

3.1 INSTALLATION

A. Install each item in accordance with manufacturer's recommendations and in accordance with the Contract Documents. Transmitters and instruments, which require access for periodic calibration or maintenance, shall be mounted so they are accessible. Care shall be taken in the installation to ensure sufficient space is provided between instruments and other equipment or piping to allow for easy removal and servicing.

B. All items shall be mounted and anchored using stainless steel hardware, unless otherwise noted.

C. All field instruments shall be rigidly secured to walls, stands or brackets as required by the manufacturer and as shown.

D. Conform to all applicable provisions of the NEMA standards, NEC and local, State and Federal codes when installing the equipment and interconnecting wiring.

3.2 START-UP, CALIBRATION, TESTING, AND TRAINING

A. Comply with the applicable requirements of Division 16.

B. Flow meter manufacturer shall provide a minimum of 4 hours of start-up assistance on site.

C. Provide O&M manuals as specified in Section 01780.

END OF SECTION

SECTION 13700
HAULER ACCESS SYSTEM

PART 1 - GENERAL

1.01 WORK INCLUDED

A. The work included under this section of the specifications consists of furnishing all materials and equipment and performing all labor and services necessary for the complete installation of the Septage Receiving Station Hauler Access system, including all related systems and accessories, as shown on the drawing or hereinafter specified. The system shall be provided with any surge suppression devices as recommended by the system manufacturer.

1.02 SYSTEM DESCRIPTION

A. The Contractor shall furnish, install, and place into operation a complete Waste Receiving System that shall enable the facility to manage waste delivered by haulers from remote sites. This specification outlines the required control system and software that shall, at a minimum, identify permitted haulers and automatically transfer the transaction data to a new office Personal Computer (PC) located in the SEWRF Administration Building. The PC shall be supplied as part of the Septage Receiving Station Hauler Access system. Networking of the PC to the Manatee network shall be via Manatee County.

B. The Septage Receiving Station Hauler Access system components shall be from a single manufacturer to insure single-source responsibility.

1.03 SUBMITTALS

A. General: Furnish all submittals, including the following, as specified in the Specific/General Provisions and Section 16050.

B. Product Data and Information: Provide catalog data for all associated equipment, devices and conductors.

1.04 QUALITY ASSURANCE

A. The control system and software furnished under the section shall be provided by a manufacturer who has been regularly engaged in the design and manufacture of waste receiving systems for at least 10 years.

B. The approved manufacturer of the control system and software shall be required to demonstrate a fully functional system that complies with this specification. The manufacturer shall provide a WEB presentation to show how the control system and software shall work.

C. The control system shall be manufactured in accordance with all local and applicable standards and shall be inspected as an “Industrial Control Assembly” with either UL508A or CSA label identification.

D. The manufacturer shall provide documentation necessary for the installation and operation of all associated components of the control system.

E. The control system and software shall be furnished complete. All features outlined in this specification shall not impose any obligation to the SCADA supplier or the owner of the facility. Any control systems and software that reference these features as being provided by SCADA shall not be accepted on this project.

1.05 WARRANTY

A. The manufacturer shall guarantee all components furnished as part of this specification for a period of two (2) years from date of shipment.

B. The manufacturer shall provide software updates and phone support services for a period of two (2) years from date of shipment.

1.06 APPROVED MANUFACTURER

A. The control system and software shall be the PortALogic System supplied by EleMech Inc of Aurora, IL.

1.07 TRAINING AND FIELD SERVICE

A. The manufacturer shall provide a minimum of eight (8) hours of online orientation and WEB-based training for initial software installation and configuration.

B. The manufacturer shall provide one service (1) trip. The trip shall include two (2) days of onsite service for administrative training, field configuration, and testing of the system.

1.08 USAGE AND LICENSING

A. The manufacturer shall provide a multi-user software license to the facility. The license shall allow the software to be installed on multiple PCs at no additional cost.

PART 2 - PRODUCTS

2.01 HAULER ACCESS STATION

A. The manufacturer shall provide a secured Hauler Access Station that shall identify waste haulers and be configurable to interface with associated equipment such as doors, gates, valves, samplers, and screens & washers.

B. Hauler access shall be established via keypad enter.

C. The Hauler Access Station shall be constructed with an outer door that can be closed to enable a wash down of the area without damaging the internal mounted devices.

D. The Hauler shall access the station by opening the door to the enclosure and entering a truck ID number using the keypad.

E. The Hauler Access Station shall include a day light visible display and out door-rated robust keypad. The display shall provide log-on instructions for the hauler and prompt the hauler for additional information such as waste type.

F. The Hauler Access Station shall include a receipt printer and integral light. The printer shall quickly print and cut each receipt and the integral light shall inform the hauler that a receipt has been printed. A journal copy of hauler transactions shall be stored and printed upon request. A low paper alarm shall be configured with the management software to alert personnel that the receipt paper roll must be changed.

G. Each printed receipt shall include the following:

1. Date and Time of Transaction
2. Station ID and Ticket Number
3. Hauler ID number
4. Volume Unloaded
5. Elapsed Time
6. pH Reading
7. Alarm ID
8. Waste Type

9. Capacity Balance (If configured for debit-based accounting).

H. The Hauler Access Station shall continue to function normally even without a network connection to the Septage Receiving Station Hauler Access system PC. All hauler transaction data shall be stored in non-volatile memory. If a network connection is established, all transaction data shall be automatically synchronized and stored securely in an IT managed SQL database.

I. The hauler access station shall be maintained without requiring Arc Flash protective clothing. All permitted personnel shall be able to access the Hauler Access Station without high risk. Activities such as changing the receipt paper shall be simple and possible by all permitted personnel. Motor Starters or other high voltage devices must be located in a separate control panel. Control circuits greater than 24VDC shall not be accepted.

K. The Hauler Access Station shall include the following components:

1. Enclosure

    a. NEMA 4X Stainless Steel
    b. Internal Swing-out Door (Stainless Steel)
    c. Lockable Full-Grip Handle with 3-Point Latch
    d. Drip Shield
    e. Instruction Decals

2. Access Keypad

    a. Secure, Robust, and Outdoor Rated
    b. Clear, Backlit LCD Display, Visible in All Levels of Light
    c. Compliant with Local and Global Security Standards
    d. Advanced Tamper-Proof Design

3. Programmable Logic Controller, PLC, Including:

    a. Ethernet Connection to PortALogic Software
    b. Configurable Spare Analog and Digital I/O
    c. Printer Interface
    d. Detachable Terminals
    e. Non-Volatile Memory

4. Printer Terminal

   a. Compact Thermal Printer
   b. Exclusive Anti-Paper-Jam System (Self feeding, Self Correcting)
   c. Integral Auto-cutter
   d. Backlit Receipt Dispenser
   e. Printed Receipt for Each Hauler
   f. RS232 and USB Data Port

5. Pilot Devices

   a. Heavy Duty, 30mm. AB Type 800H or Equal
   b. 2-Position Switch with Done-Start Legend
   c. 2-Position Keyed Switch with Emergency Bypass Legend
   d. Green Light with System Ready Legend

6. 24VDC Power Supply

7. Ethernet Switch (Non-Managed)

2.02 MANAGEMENT SOFTWARE

A. The necessary management software shall be installed on the Septage Receiving Station Hauler Access system PC (or more site owned PCs). The PC(s) must have a network card to communicate with Hauler Access Stations. The PC(s) must have Windows XP Pro OS or Windows 7 OS.

B. The software shall allow local or remote networked PCs to seamlessly interface with one or more Hauler Access Stations at one or more receiving sites using an Ethernet Connection.

C. The software shall monitor the Hauler Access Station(s) and automatically upload hauler transaction data to the networked office PC(s).

D. The data from each hauler transaction shall be collected and stored in a secure SQL database. The following data shall be collected:

   1. Site ID
   2. Station ID
   3. Ticket Number (On Hauler Receipt)
   4. Hauler ID
   5. Date and Time of Transaction
   6. Volume Unloaded
   7. pH

8. Waste ID
9. Alarm ID
10. Volume remaining (if using debit-based account)
11. Five (5) additional fields will be available for the administrator to define

E. The software shall be used to configure the hauler's pin number used at the Hauler Access Station(s).

F. The software shall be used to configure any devices that will measure the volume or pH. The software shall be used to configure any samplers. If other analog devices are installed, they shall be configured with the software.

G. A user-friendly interface shall be provided to allow the facility to view hauler transaction data and enter/edit information when necessary. The software shall have a built in sorting tool that allows the user to create multiple data views. The software shall have a "Main Screen" view that displays all transaction data divided into the following sections:

1. Transaction Log
2. Customers
3. Truck Status
4. Customer Balances
5. Link to Reports

H. The software shall allow the facility to define the Hauler Access Station's operating time schedule. If the station is closed, a message will alert the hauler that the station is closed.

I. Customer (Hauler) and Truck Features:

1. The software shall allow the facility to create a list of customers that will be billed for use of the Hauler Access Station(s). The software shall not limit the facility as to the number of customer accounts that can be created.

2. The software shall allow the facility to create multiple truck accounts and link these accounts to the corresponding customers. The software shall not limit the facility as to the number of trucks that can be assigned to each customer.

3. The facility shall be able to enter customer ID numbers, pin numbers, and details regarding the truck including capacity, weight, and vehicle information into the system.

4. Each customer shall receive a Hauler ID number and 4-digit PIN number for each truck. PIN number assignment can be unique per owned truck or common to all owned trucks, depending on the facility and customer preference. The software shall auto-generate customer PIN numbers or shall allow the administrator to manually assign pin numbers to customers.

5. The software shall allow the facility to enable or disable a truck's access privilege. Once disable, a hauler's access will immediately be denied at all sites. A message shall be displayed at log-in at the hauler station informing the hauler to contact the office.

J. Waste Type Features:

1. The software shall allow the facility to define a list of permitted waste types and an associated rate to be charged per 1000 units of waste unloaded. The software shall allow the facility to define these units. (Gallons, Liters, etc…) The facility shall also be able to set different rates for the same waste type. (Ex. Charging In-county customer vs. out-of-county customer).

2. When accessing the station, the customer shall be prompted at log-in to identify the waste type that shall be unloaded.

K. Status and Alarm Features:

1. The software shall allow the facility to monitor alarms at the Hauler Access Stations. Alarms make the station unusable or may prevent a hauler form unloading. These alarms include :

   a. Printer low on paper
   b. define a list of permitted waste types
   c. Equipment Fault
   d. Storage Tank at High Level
   e. Optional User-Defined alarm (20 available)

L. Reporting, Billing, and Payment Features:

1. The software shall allow the facility to manage each customer on a debit or credit basis. The facility shall choose whether customers shall pay prior to using the Hauler Access Station or after.

2. The software shall debit account balances automatically and auto-deactivate the truck's access privilege should the customer's balance drop below the set minimum. The facility shall be able to set the minimum.

3. The software shall allow the facility to bill on a truck capacity basis, a metered basis (flow-meter or scale), or by manual entry.

4. The software shall allow the facility to enter payments if required. The total balance shall automatically recalculate once a payment is applied. A customer's account that is deactivated shall be automatically reactivated once money is received.

5. The facility shall be able to use the features of the software to substantiate the data recorded from each transaction and accurately calculate the total cost on a per customer basis.

6. The software shall have multiple pre-formatted reports that will, at a minimum, show activity with daily totals, statements, and customer and truck usage. The software shall also allow the facility to generate billing statements that can be exported for accounting use. The reports and billing statements shall be easily exported into an electronic comma separated .CSV file for Manatee County use.

PART 3 – EXECUTION

3.01 LOG-ON SEQUENCE

A. The hauler shall turn the selector switch to the "START" position.

B. The green "SYSTEM READY" pilot light will illuminate informing the hauler that access has been granted. The inlet valve will open.

3.02 LOG-OFF SEQUENCE

A. The hauler shall turn the selector switch to the "DONE" position.

B. The inlet valve shall then close and a receipt will be printed for the hauler.

3.03 ALARM SHUTDOWN

A. The Log-off sequence will automatically be initiated if an alarm is triggered.

B. An alarm ID shall be printed on the receipt and shall be recorded into the system.

3.04 INSTALLATION

A. Hauler Access system shall be installed as indicated on the drawings.

END OF SECTION

SECTION 13990
INTERCOM SYSTEM

PART 1 - GENERAL

1.01 WORK INCLUDED

A. The work included under this section of the specifications consists of furnishing all materials and equipment and performing all labor and services necessary for the complete installation of the Septage Receiving Station intercom system, including all related systems and accessories, as shown on the drawing or hereinafter specified. The system shall be provided with any surge suppression devices as recommended by the system manufacturer.

1.02 SYSTEM DESCRIPTION

A. The intercom system shall be an audio only, hands-free system that shall support up to three subs units, all communicating back to the Master Station in the SEWRF Administration Building.

B. The intercom system components shall be from a single manufacturer to insure single-source responsibility.

1.03 SUBMITTALS

A. General: Furnish all submittals, including the following, as specified in the Specific/General Provisions and Section 16050.

B. Product Data and Information: Provide catalog data for all associated equipment, devices and conductors.

C. Submit manufacturer's verification that conductors to be installed are adequate for communication distance required by the application.

D. Shop Drawings: Furnish shop drawings customized to the project for the intercom system.

PART 2 - PRODUCTS

2.01 MASTER STATION

A. Master Station shall operate off of 6V DC power supply.

B. Master Station shall have a communication power output of 350mW.

C. Master station shall AIPHONE LEM-3 or approved equal with AIPHONE 6V DC power supply SKK-620A or approved equal.

2.02 SUB STATIONS

A. The sub stations shall be vandal and weather resistant and shall be compatible with the Master Station to be provided.

B. The units shall be constructed of 12 gauge stainless steel and shall be surface mounted into a stainless steel, 2-gang junction box.

C. Each unit shall include tamper proof screws and a tool for installation.

D. The sub station units shall have a stainless steel mechanical call buttons.

E. Communication at the master station shall be push-to-talk and communication at the sub station shall be hands free.

F. Power for the sub stations shall be supplied by master station.

G. Sub station speakers shall be 20 ohms, 2 -1/2" diameter, water and puncture resistant, with a 2.5 oz. ceramic magnet.

H. Sub Stations shall be AIPHONE LE-SS or approved equal installed in AIPHONE 2-gang stainless steel junction box (SBX-2G) or approved equal.

2.03 INTERCOM CONDUCTORS

A. The intercom conductors shall be as recommended by the intercom system manufacturer to insure proper system operation over the intended communication distance. Conductors supplied shall be approved by the intercom system manufacturer.

B. Description:

1. 18 gauge, (or as recommended by intercom system manufacturer) with number of conductors as required, 7 strand bare copper wire with .010" polyvinylchloride insulation, overall aluminum mylar shield with a 22 gauge 7 strand tinned copper drain wire.

2. Overall .015" gray polyvinylchloride jacket.

3. Cable shall be made in accordance to UL standard 444, NEC listed Type CMR & UL standard 14, NEC listed type CL3R C(UL).

4. Conductors shall be approved for installation in underground conduit.

5. Assembly : Lay Length: 2.00”.

6. Shield: Aluminum mylar tape-100% coverage.

7. Drain: 22 Awg 7 strand tinned copper wire.

8. Capacitance: 47.07 pf/Ft.

9. Resistance: 6.92 Ω per 1000 feet at 68°F

C. Products

1. AIPHONE intercom conductors or approved equal.

PART 3 - EXECUTION

3.01 INSTALLATION

A. Intercom system shall be installed as indicated on the drawings.

B. Contractor shall verify the wiring diagrams/schematics indicated in the contract documents with the intercom manufacturer prior to ordering materials. The intercom manufacturer shall indicate if any modifications are required to provide a properly functioning intercom system.

END OF SECTION

SECTION 15060
PIPING SYSTEMS—GENERAL

PART 1 GENERAL

1.01 SCOPE OF WORK

A. This Specification describes responsibilities and requirements for Piping Systems including the following:

1. Labor, materials, tools, equipment, and services are to be furnished in accordance with the provisions of the Contract Documents. The materials to be used for the piping systems shown in the Drawings are listed by service in the Piping Schedule, included in Section 15000 Piping Systems – Schedule.

2. Coordination of work with other trades.

3. The furnishing and installation of all supplementary or miscellaneous items, appurtenances, and devices incidental to or necessary for a sound, secure, and complete installation, although such work is not specifically indicated.

4. The furnishing of Drawings and documents for preparation of Record Drawings of piping systems.

1.02 RELATED WORK (NOT USED)

1.03 SUBMITTALS

The Contractor shall submit the following in accordance with Section 01300, Shop Drawings, Submittals and Samples:

A. If the Contractor deviates from the piping layout as shown on the Contract Drawings, then the Contractor shall submit scaled piping drawings showing locations and dimensions to and from fittings, valves, tanks, equipment, structures, and related appurtenances. Provide scaled drawings to a minimum scale of 1- inch equals 10 feet. Elevations shall correspond to reference vertical elevation datum shown or provided for this project.

B. Copies of manufacturer's written instructions regarding material handling, delivery, storage, and installation.

C. Record piping drawings shall meet the requirements of Section 01300, Shop Drawings, Submittals and Samples, and Section 01720, Project Record Documents. During the progress of the work and when the work is finally completed and accepted by the Owner and the Engineer, Record Drawings of installed piping systems in project including pre-existing piping discovered, relocated, or at locations other than as originally shown in the Drawings. The Contractor shall identify complete location, elevations, and description of piping systems. Piping systems and fittings are to be identified from three points on structures and/or stationary appurtenances.

D. Submit documentation for field pressure testing work and test results.

E. Submit welding certificate copies.

F. Submit certified copies of mill test reports for bolts and nuts, including coatings if specified. Provide certifications by independent domestic testing laboratories for materials originating outside of the United States and Canada.

G. Submit manufacturer's data sheets for gaskets to show materials of construction, dimensions, bolting, and installation recommendations.

1.04 WORK SEQUENCE (NOT USED)

1.05 REFERENCE STANDARDS

The publications listed below form a part of this Specification as if incorporated herein except as modified to the extent referenced. Reference standards and recommended practices referred to in this Specification Section shall be the latest revision of any such document in effect at the bid time. The following documents are a part of this Section. Where this Section differs from these documents, the requirements of this Section shall apply.

A. American National Standards Institute:

1. ANSI A21.11, Rubber Gasket Joints for Cast Iron and Ductile Pressure Pipe and Fittings.
2. ANSI B1.1, Unified Inch Screw Threads
3. ANSI B2.1, Pipe Threads.
4. ANSI B16.21, Nonmetallic Gaskets for Pipe Flanges.
5. ANSI B18.2.1, Square and Hex Bolts and Screws, Including Askew Head Bolts, Hex Cap Screws, and Lag Screws.

6. ANSI B18.2.2., Square and Hex Nuts.
7. ANSI B31.1, Power Piping (Pressure Piping).
8. ANSI B31.3, Process Piping

B. American Society for Testing and Materials:

1. ASTM A183, Specification for Carbon Steel Track Bolts and nuts
2. ASTM A 193, Standard Specification for Alloy-Steel; and Stainless Steel Bolting Materials for High Temperature or High Pressure Service and other Special Purpose Applications
3. ASTM A194, Specification for Carbon and Alloy Steel Nuts for Bolts for High-Pressure and High-Temperature Service
4. ASTM A 307, Specification for Carbon Steel Externally Threaded Standard Fasteners.
5. ASTM D1330, Standard Specification for Rubber Sheet Gaskets
6. ASTM F467, Standard Specification for Nonferrous Nuts for General Use

C. American Water Works Association:

1. AWWA C207, Steel Pipe Flanges for Waterworks Service-Sizes 4 inch through 144 inch.

1.06 QUALITY ASSURANCE (NOT USED)

1.07 WARRANTIES

A. Warranties shall be in accordance with General Conditions, Supplementary Conditions, and Specification Section 01780, Warranties and Bonds.

1.08 DELIVERY, STORAGE, AND HANDLING

A. The Contractor shall adhere to the requirements specified in Section 01620 for storage and protection of the items specified in this Section.

B. The Contractor shall take care to protect the pipe from kinks, cuts, end damage, and other defects when transporting all pipe and pipe materials. Binding and tie-down methods shall not damage or deflect the pipe in any way. Pipe damaged during shipment, storage on-site, or during installation shall be rejected.

C. Pipe shall be stored on level ground, preferably turf or sand, free of sharp objects which could damage the pipe. Stacking of any pipe shall be limited

to a height that will not cause excessive deformation of the lower layers of pipe under anticipated temperature conditions. When necessary due to ground conditions, the pipe shall be stored on wooden sleepers, spaced suitably and of such widths to not allow deformation of the pipe at the point of contact with the sleeper or between supports. Pipe shall not be removed from storage until bedding or sub-grade work is complete and ready to receive the pipe.

D. The joined pipe shall be handled in such a manner that the pipe is not damaged. Ropes, fabric, or rubber-protected slings and straps shall be used when handling pipe. Chains, cables, or hooks inserted into the pipe ends shall not be used. Two slings spread apart shall be used for lifting each length of pipe. Pipe, valves, or fittings shall not be dropped. Slings for handling joined pipe shall not be positioned at socket-welded joints. Sections of the pipes with cuts and gouges shall be removed and the ends of the pipe rejoined. The Contractor shall repair all pipe coatings which have been damaged before the pipe is installed.

E. The Contractor shall cover all pipe stored on the site with canvas or other opaque material to protect it from sunlight. Provide air circulation under the covering.

F. The Contractor shall inspect all pipe, fittings, and other accessories delivered to the site and during the work. Any defective or damaged materials found during field inspection or during tests shall be removed from the site and replaced by the Contractor and at the Contractor's expense. Additional time shall not be granted to replace pipe and fittings due to the Contractor's mishandling or improper storage practices.

G. The interior of all pipe, fittings, and other accessories shall be kept free from dirt and foreign matter at all times. Fittings shall be drained and stored in a manner that will protect them from damage by freezing.

H. Gaskets shall be placed in a cool location out of direct sunlight. Gaskets shall not come in contact with petroleum products. Gaskets shall be used on a first-delivered-to-site and first-to-be-installed rotation basis. Mechanical-joint glands, bolts, and washers shall be handled and stored in a manner that will ensure proper use with respect to types and sizes.

1.09 QUALIFICATIONS (NOT USED)

1.10 DEFINITIONS OF BURIED, EXPOSED, AND SUBMERGED PIPING

A. Buried piping is piping buried in the soil beginning at the wall or beneath the slab of a structure. Where a coating is specified, the Contractor shall 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.

C. Submerged piping is considered to be all piping inside the tank (at and below the top of the tank wall)

PART 2 PRODUCTS

2.01 PIPING SYSTEM GENERAL REQUIREMENTS AND SCHEDULE

A. Unless noted otherwise in the Drawings, piping system materials, fittings, and appurtenances are subject to requirements in Division 15 for each of the piping systems and in accordance with the schedule in Section 15000, Piping Systems - Schedule.

2.02 PIPING SCHEDULE

A. A piping schedule (flow stream identification) listing the piping flow stream (process flow) identification and corresponding abbreviations, materials of construction, working pressures, test pressures, and pipe lining is given in Specification Section 15000 Piping Systems – Schedule. Color coding associated with the flow streams is provided in Section 09000 Painting and Protective Coatings. In locations where the piping material referenced in the piping schedule is not required to be used, alternate piping material is indicated in the Contract Drawings.

B. The piping schedule 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. Piping materials shall be furnished and installed as listed in the piping schedule unless specifically designated to use other piping materials at specific locations on the Contract Drawings.

2.03 THREAD FORMING FOR STAINLESS STEEL BOLTS

A. Form threads for stainless steel bolts by rolling, not by cutting or grinding.

2.04 FLANGES, BOLTS, AND NUTS FOR DUCTILE IRON PIPE

A. Bolts and nuts for Class 150 flanges (including AWWA C 207, Class D) located indoors, outdoors above and below ground, and in vaults and structures shall be carbon steel, ASTM A307, Grade B.

B. Bolts and nuts for submerged Class 150 flanges shall be Type 304 stainless steel conforming to ASTM A 193 (Grade B 8) for bolts and ASTM A 194 (Grade 8) for nuts. Fit shall be Classes 2A conforming to ANSI B1.1 when connecting to cast-iron valves having body bolt holes.

2.05 FLANGES, BOLTS, AND NUTS FOR STAINLESS STEEL PIPE

A. Bolts and nuts for flanges shall be Type 304 stainless steel conforming to ASTM A193, Grade B8, for bolts and ASTM A194, Grade 8, for nuts.

2.06 FLANGES, BOLTS, AND NUTS FOR PVC, CPVC AND PVDF PIPE

A. Bolts for piping in sodium hypochlorite service shall be made of titanium, in accordance with ASTM F467, Grade Ti1, Ti2, or Ti7. Nuts shall conform to ASTM F467, same material as the bolts.

B. Bolts and nuts in chemical service other than sodium hypochlorite shall be Type 304 stainless steel conforming to ASTM A193, Grade B8, for bolts and ASTM A194, Grade 8, for nuts.

C. Bolts and nuts for buried and submerged flanges and flanges located outdoors above ground or in vaults and structures shall be Type 304 stainless steel conforming to ASTM A193, Grade B8, for bolts and ASTM A194, Grade 8, for nuts.

D. The Contractor shall provide a flat washer under each nut and under each bolt head. Washers shall be of the same material as the nuts.

2.07 FLANGES, BOLTS, AND NUTS FOR STEEL PIPE

A. Bolts and nuts for Class 150 flanges (including AWWA C 207, Class D) located indoors, outdoors above ground, in vaults, and in structures shall be

carbon steel, ASTM A307, Grade B. Bolts and nuts for buried service shall also be hot-dipped galvanized.

B. Bolts and nuts for submerged Class 150 flanges shall be Type 304 stainless steel conforming to ASTM A193 (Grade B8) for bolts and ASTM A194 (Grade 8) for nuts. Fit shall be Classes 2A per ANSI B1.1 when connecting to cast-iron valves having body bolt holes.

2.08 LUBRICANT FOR STAINLESS STEEL BOLTS AND NUTS

A. Anti-Seize Lubricant shall be chloride free and shall be nongalling NSF approved.

2.09 FLANGE GASKETS FOR STEEL, GALVANIZED STEEL, AND STAINLESS STEEL PIPE AND FITTINGS

A. Flange gaskets shall be in accordance with AWWA C207, except as modified herein. Gaskets shall be ring type. All gasket material shall be suitable for the fluid being conveyed and shall be resistant to free chlorine concentrations up to 10 mg/L. All gasket material shall be rated to meet or exceed the pipe rated operating test pressures and field test pressures, which ever pressure is greater. Gaskets shall be EPDM,, Styrene Butadiene Rubber (SBR), Viton, or alternate approved gasket material as required for piping services and fluids in contact with the gaskets

2.10 FLANGE GASKETS FOR DUCTILE-IRON PIPE AND FITTINGS

A. Gaskets shall be full face, 1/8 inch thick, Styrene Butadiene Rubber (SBR) having a Brinell Hardness of 55 to 65 durometer. Gaskets shall be suitable to meet or exceed pipe operating pressures or field testing pressures, whichever pressure is greater, at a temperature of 150°F. Gaskets shall have "nominal" pipe size inside diameters, not the inside diameters per ANSI B16.21. Provide gaskets suitable for fluids in contact with the gasket and service operating temperatures. Contractors shall verify gaskets are compatible and approved for use by the gasket manufacturer for normal domestic wastewater treatment and transmission piping systems.

2.11 FLANGE GASKETS FOR PVC AND CPVC PIPE

A. Gaskets for flanged joints shall be full faced, 1/8 inch thick, having a Brinell Hardness of 50 to 70 durometer A. Gasket material for other than sodium hypochlorite service shall be EPR. Gasket material for sodium hypochlorite service shall be Viton. Gaskets shall be compatible to exposure to the chemicals conveyed in the process chemical or flow stream.

2.12 FLANGE GASKETS FOR PVDF PIPE

A. Gaskets for flanged joints shall be full faced, 5/64 inch thick (minimum), made of Teflon-bonded EPDM or PVDF-bonded EPDM. The EPDM shall have a Brinell Hardness of 65 to 70 Durometer “A”. Gaskets shall be suitable for a fluid temperature range of -40˚F to +210˚F and compatible to exposure to the chemicals conveyed in the process chemical or flow stream.

2.13 FLANGE GASKETS FOR STAINLESS STEEL PIPE IN CHEMICAL SERVICE

A. Gaskets shall be suitable for a maximum pressure of 300 psi and a maximum temperature of 500°F. Contractor shall verify gaskets are compatible with all chemicals being used. Gaskets for chemical service shall be one of the following materials:

1. Teflon envelope type, full face, 1/8 inch thick, with compressed nonasbestos filler. Provide free-flow design in which the Teflon is machined or milled between leaves to provide a space for the filler.

2. Teflon (PTFE) with inert filler, 1/8-inch thick. Product: Garlock "Gylon 3510" shall be used for potassium hydroxide, sodium hypochlorite, and ammonium hydroxide. Garlock “Gylon 3545” shall be used for sulfuric acid, corrosion inhibitor, and hydrofluosilicic acid.

2.14 POTABLE WATER PIPING SYSTEMS

A. All potable water piping systems including pipe, valves, fittings, weld-solvents, linings, gaskets, lubricants, grout disinfection agents, etc. and surfaces in contact with potable water shall meet all local, State of Florida, and federal regulations and requirements including National Sanitation Foundation (NSF) Standards 61. Contractor shall coordinate color of potable water system piping color with Owner’s color standard and shall provide color as approved by the Owner.

2.15 LOCATOR WIRE (OR DETECTABLE PIPELINE MARKING TAPE)

A. All 1-1/2-inch and larger buried non-metallic piping shall be installed with underground detectable caution tape; 2-inch tape for a maximum of 12-inch depth and 6-inch tape for a maximum of 24-inch depth.

PART 3 EXECUTION

3.01 PREPARATION

A. Field Alignment:

1. The piping shown on the Contract Drawings is generally indicative of the work, with symbols and notations provided for clarity. However, the Contract Drawings are not an exact representation of all conditions involved; therefore, install piping to suit actual field conditions and measurements as approved by the Engineer. No extra compensation will be made for work due to differences between indicated and actual dimensions.

2. The Contractor shall install all adapters, couplings, fittings, flanged connections, closures, and restrained couplings, fittings and joints, etc. shown or not shown on the Drawings and specified or not specified as necessary for a complete installation acceptable to the Engineer.

3. The Contract Drawings do not indicate all adapters, couplings, fittings, spool pieces, bushings, unions, supports, hangers, and other items required to accommodate the installation and connection of pipe, fittings, valves, and equipment of various pipe joints, designs, and sizes. Provide such required items of appropriate designs, materials, coatings, and linings.

4. An extensive network of underground piping, ducts, conduits, direct-buried conductors, and related structures of various sizes, materials, alignments, age, and function exist within the project site. Conclusive information concerning these facilities is not available. Consequently, the design of new piping indicated on the Contract Drawings is approximate. Adjust alignment, fitting, valve, and joint locations as required and as approved by the Engineer to accommodate and protect existing facilities and provide the intended functionality of new piping.

3.02 FIELD LAYOUT AND MODIFICATIONS

A. The Contractor, unless directed otherwise, shall be responsible for setting construction layout stakes and/or offsets required to complete the designated work. The Contractor shall ensure that those stakes and/or offsets are protected and any re-staking required for any reason including work stoppage shall be included in the bid price and no additional compensation to the Contractor will be made.

B. The Engineer has the right to make any modifications the Engineer deems necessary due to field conditions, conflicts with other utilities, structures, facilities, and to protect other properties.

3.03 PIPE PRODUCTS INSPECTION

A. The Contractor shall obtain from the pipe manufacturer a certificate of inspection to the effect that the pipe, fittings, gaskets, glands, bolts, and nuts supplied for this Contract have been inspected at the plant and that they meet the requirements of these specifications. The Contractor shall submit these certificates to the Engineer before installing the pipe materials. The Contractor shall visually inspect all pipe and fittings at delivery and before they are lowered into the trench to be installed. Pipe or fittings that do not conform to these specifications or have been damaged in any manner will be rejected and the Contractor must remove them from the job site immediately. The entire product of any plant may be rejected when, in the opinion of the Engineer, the methods or quality assurance and uniformity of manufacturer fail to secure acceptable and uniform pipe products or where the materials used produce inferior pipe products.

3.04 REMOVAL OF EXISTING PIPE AND FITTINGS

A. Due to certain permit requirements, pipe that is to be removed or replaced from service will have to be physically taken out of the ground. The limits of pipe to be removed shall be specifically called for in the plans or shall be approved in writing by the Engineer. Any other removal not specifically called for shall be considered incidental to construction of other items in the contract and the Contractor will not receive compensation for such work.

B. When removing pipe the Contractor shall excavate a trench wide enough to dislodge the pipe from the surrounding soil and long enough to be able to handle the pipe without causing any damage to nearby utilities, structures, or adjacent property.

C. The removed pipe, fitting, and appurtenances will become the Contractor's property and the Contractor shall be responsible for proper disposal and any required permits thereof.

D. Regarding pipe remaining in the ground subsequent to removal of connected pipe or pipe fittings, the remaining pipes and fittings shall be plugged or capped as approved by the Engineer.

E. Pipe that will be abandoned in place shall be plugged or capped as approved by the Engineer.

3.05 BURIED PIPING AND PIPE FITTINGS

A. Trenching and backfilling for all pipe and fittings shall also be in accordance with Section 02221, Trenches, Bedding, and Backfill for Pipe, of these Specifications.

B. Installation:

1. Inspect all piping for defects and remove all lumps or excess coatings before installation. The inside of the mechanical joint and outside of plain-end pipe shall be cleaned before joining pipe. Caution shall be taken to prevent damage to the pipe during lowering into the trench. No foreign matters shall enter the pipe during installation. The Contractor shall cover the pipe ends during installation to prevent debris from entering the pipe. No debris, tools, clothing, or other material shall be placed in the pipe.

2. After being placed in the trench, the pipe shall be brought to the proper line and grade by compacting the approved backfill material under it, except at the bell end. Joint deflection shall not exceed 75% of the manufacturer's limit.

3. The Contractor shall install temporary water-tight plugs on the pipe ends during the time that the pipe is in the trench but no work is in progress. If there is water in the trench upon beginning work, this plug shall remain in place until the trench has been pumped dry, unless otherwise approved by the Engineer, the Engineer’s Representative, or the Owner’s Representative.

4. Buried carbon steel bolts and nuts shall receive one coat of heavy-bodied bituminous mastic.

5. Coat threaded portions of stainless steel bolts and nuts with lubricant before assembly.

6. Restrained plugs or caps shall be inserted into all buried dead end pipes, tees, or crosses. Provide blind flanges for all flanged exposed piping. Restrained plugs and caps installed for pressure testing shall be fully secured and blocked to withstand the test pressure.

7. Where plugging is required because of contract division or phasing for later connection, the ends of such lines shall be equipped with a suitable cast iron or ductile iron plug/cap or blind flange with or without a blowoff cock, as shown on the Drawings. Installation or removal of such plugging shall be considered incidental to the work and the Contractor shall not be compensated by the Owner for performing this work.

3.06 FLANGED JOINTS FOR EXPOSED PIPE AND FITTINGS

A. When bolting flanged joints, the Contractor shall take care to avoid restraint on the opposite end of the pipe or fitting, which would prevent uniform gasket compression or which would cause unnecessary stress in the flanges. One flange shall be free to move in any direction while the flange bolts are being tightened. Bolts shall be tightened gradually and at a uniform rate to ensure uniform compression of the gasket, in accordance with pipe and fitting manufacturer's recommendations.

B. Coat threaded portions of stainless steel bolts and nuts with lubricant before assembly.

C. Connecting to Pumping Equipment: The Contractor shall take special care when connecting to pumping equipment to ensure that piping stresses are not transmitted to the pump flanges. All connecting pipe shall be permanently supported so that accurate matching of bolt holes and uniform contact over the entire surface of flanges are obtained before any bolts are installed in the flanges. In addition, piping that is connected to pumps and equipment shall be free to move parallel to its longitudinal center line while the bolts are being tightened.

1. Each pump and equipment shall be leveled, aligned, and wedged into a position which will fit the correcting pipe, but shall not be fastened or grouted into a final fixed position until the initial fitting and alignment of all connecting pipe is completed so that the pump and equipment may

be finally adjusted if necessary to properly install and align with the connecting piping. Each pump and equipment base plate or supportive frame shall be grouted to a final position before final bolting of the connecting piping.

2. After final alignment and bolting, the pump and equipment connections shall be tested for applied piping stresses by loosening the flange bolts which, if the piping is properly installed, should result in no observed or measured movement or release of the connecting piping relative to the pump or equipment. If any movement is observed, the piping shall be loosened and re-aligned to the pump and equipment as required and then the flanges bolted back together. The flange bolts then shall be loosened and the process repeated until no movement is observed or measured.

3. All carbon steel bolts and nuts shall be coated with the same coating as the piping system they are employed on.

3.07 ANCHORING AND RESTRAINING

A. The use of thrust blocks in new lines is prohibited and shall only be limited to areas in which a new fitting has been installed in an existing line and field restraining joints are not feasible or when directed by the Engineer.

3.08 FLUSHING, CLEANING, TESTING AND INSPECTION OF PIPING

A. See Section 15144, Pressure Testing of Piping, for the requirements of pipe flushing, cleaning, pressure testing and inspection requirements.

3.09 DISINFECTION

A. See Section 15141, Disinfection of Potable Water Piping and Storage Facilities, for the disinfection requirements.

3.10 SPECIAL REQUIREMENTS AND PIPING SPECIALTIES

A. Welding:

1. Use only certified welders meeting procedures and performance outlined in Section 9 of the ASME and other codes and requirements in accordance with local building and utility requirements. Submit Welder's certificates to the Engineer for review before beginning any

welding on the project. Welder must be certified for all positions (flat, vertical, and overhead).

2. Have all welds conform to highest industrial practice in accordance with ANSI B31.3 and ANSI B31.1 or other codes and requirements in accordance with local building and utility requirements.

3.11 PIPE COLOR CODING

A. The Contractor shall coordinate with the Engineer and the Owner for acceptable pipe colors for exposed piping systems. Where color-coding is achieved by painting exterior surfaces of the piping systems, painting shall be provided in accordance with Section 09000, Painting and Protective Coatings.

END OF SECTION

SECTION 15061
PIPE HANGERS AND SUPPORTS

PART 1 GENERAL

1.01 DESCRIPTION

A. This Section includes requirements for materials and installation of pipe hangers and supports, including accessory items, such as anchor bolts and screws, pipe spiders, neoprene isolation pads, cable trays for hoses, and drip guards.

1.02 SUBMITTALS

A. The Contractor shall submit shop drawings in accordance with Section 01300, Shop Drawings, Submittals and Samples, and the following:

1. Provide line drawings of each piping system to the scale shown in the Drawings, locating each support or hanger. Identify each type of hanger or support by the manufacturer's catalog number or figure.

2. Provide installation drawings and manufacturer's catalog information on each type of hanger and support used. Clearly indicate the actual pipe outside diameter (not just nominal pipe size) that is used for the hangers and supports.

3. Submit layout drawings for the drip guards, showing dimensions and thicknesses. Show design of seam or joint where field connections will be made between sections and pieces of drip guards.

4. Submit a certificate listing the type of resin to be used, describing the manufacturer's brand name or designation, composition, and characteristics.

PART 2 MATERIALS

2.01 DESIGN CRITERIA

A. Not all pipe supports or hangers required are shown in the Drawings. The Contractor shall provide pipe supports for every piping system installed.

Support piping by pipe support where it connects to pumps or other mechanical equipment.

B. The Contractor shall ensure that pipe support and hanger components shall withstand the dead loads imposed by the weight of the pipes, fittings, and valves (all filled with water), plus valve actuators and any insulation, and shall have a minimum safety factor of 5 based on the material's ultimate strength.

2.02 HANGER AND SUPPORT SYSTEMS

A. Pipe hangers and supports shall be as manufactured by Anvil, Unistrut, Cooper B-Line, Aikinstrut, Superstrut, or equal.

B. Pipe hangers and supports shall comply with Manufacturers Standardization Society (MSS) SP-58 "Pipe Hangers and Supports - Materials, Design and Manufacture" for the standard types referenced in the Drawings. The Contractor shall construct special hangers and supports if detailed in the Drawings. Type numbers for standard hangers and supports shall be in accordance with MSS SP-58 as listed below:

Type Number	Description	Manufacturer and Model (or Equal)
1	Adjustable steel clevis	Anvil Fig. 590 or 260, B-Line B3100 or B3102
3	Steel double-bolt pipe clamp	Anvil Fig. 295A or 295H, B-Line B3144 or B3144A
4	Steel pipe clamp (pipes smaller than 3 inches)	Anvil Fig. 212, B-Line B3140
4	Steel pipe clamp (pipes 3 inches and larger)	Anvil Fig. 216, B-Line 3142
5	Pipe hanger	B-Line B6690
6	Adjustable swivel pipe ring	Anvil Superstrut 714, Anvil Fig. 104
7	Adjustable steel band hanger	B-Line B3172
8	Extension pipe or riser clamp	Anvil Fig. 261, B-Line B5573
9	Adjustable band hanger	Anvil Fig. 97
10	Adjustable swivel ring band hanger	Anvil Fig. 70, B-Line B3170 NF
11	Split pipe ring with adjustable turnbuckle	Anvil Fig. 108, B-Line B3173
13	Steel turnbuckle	Anvil Fig. 230, B-Line B3202
14	Steel clevis	Anvil Fig. 299, B-Line B3201
15	Swivel turnbuckle	Anvil Fig. 114, B-Line B3224
16	Malleable iron socket	Anvil Fig. 110R, B-Line B3222
17	Steel weldless eye nut	B-Line B3200

Type Number	Description	Manufacturer and Model (or Equal)
18	Steel or malleable iron concrete insert	Anvil Fig. 281, Superstrut 452
19	Top beam C-clamp	Anvil Fig. 92, B-Line B3033
20	Side I-beam or channel clamp	Anvil Fig. 14 or 217
21	Center I-beam clamp	Anvil Figure 134
22	Welded attachment type	Anvil Fig. 66 B-Line B3083
23	C-clamp	Anvil Fig. 86, B-Line B3036L
24	U-bolt	Anvil Fig. 137, B-Line B3188
26	Clip	Anvil Fig. 262, B-Line B3180
28	Steel I-beam clamp with eye nut	Anvil Fig. 228
29	Steel wide flange	Anvil Fig. 228 clamp with eye nut
30	Malleable iron beam clamp with extension piece	Superstrut CM-754, B-Line B3054
31	Light welded steel bracket	Anvil Fig. 194, B-Line B3063
32	Medium welded steel bracket	Anvil Fig. 195, B-Line B3066
33	Heavy welded steel bracket	Anvil Fig. 199, B-Line B3067
34	Side beam bracket	Anvil Fig. 202, B-Line B3062
36	Pipe saddle support	Anvil Fig. 258, B-Line B3095
37	Pipe stanchion saddle	Anvil Fig. 259, B-Line B3090
38	Adjustable pipe saddle support	Anvil Fig. 264, B-Line B3093/B3089
39	Steel pipe covering	Anvil Fig. 160, 161, 162, 163, 164, or 165; Superstrut A 789; B-Line B3160/B3165
40	Insulation protection shield	Anvil Fig. 167, B-Line B3151
41	Single pipe roll	Anvil Fig. 171, B-Line B3114
43	Adjustable roller hanger with swivel	Anvil Fig. 181, B-Line B3110
44	Pipe roll, complete	Anvil Fig. 271, B-Line B3117SL

C. Pipe hangers and supports shall be hot-dipped galvanized according to ASTM A 153 carbon steel (ASTM A 36, A 575, or A 576). Bases, rollers, and anchors shall be steel as described above or may be cast iron (ASTM A 48). Pipe clamps shall be steel as described above or may be malleable iron (ASTM A 47).

2.03 OFFSET PIPE CLAMP

A. Anvil Figure 103, Cooper B-Line B3148, or equal. Material shall be Type 316 stainless steel unless otherwise noted.

2.04 MISCELLANEOUS PIPE SUPPORTS AND HANGERS

A. Pipe Anchor Chair: Anvil Figure 198 or equal.

B. One Hole Clamp: Anvil Figure 126 or equal.

C. Roller Chair: Anvil Figure 175 or equal.

2.05 STEEL CHANNEL FRAMING SYSTEM

A. Steel channel frames shall be 1-5/8 inches wide by 1-5/8 or 3-1/4 inches high by 12-gauge metal thickness, unless otherwise shown in the Drawings. Material shall conform to ASTM A 36, A 570 (Grade 33 minimum), or A 653 unless stainless steel is indicated in the Drawings. Stainless steel shall be Type 304. One side of the channel shall have a continuous open slot with inturned clamping ridges. Maximum allowable stress under any combination of applied uniformly distributed loads and concentrated loads shall not exceed those recommended in the AISC or AISI. Deflection shall not exceed 1/240 of span. The Contractor shall use multiple back-to-back channels to achieve these criteria if single channels are not sufficient. Products: Unistrut P1000 or P5000 Series, B-Line B11 or B22 Series, or equal.

B. Steel channels shall be hot-dipped galvanized according to ASTM A 153.

C. Nuts shall be machined and case hardened. The Contractor shall provide rectangular nuts with the ends shaped to permit a quarter turn crosswise in the framing channel. Provide two serrated grooves in the nut to engage the inturned edges of the channel.

D. Pipe clamps (including attachments crews and nuts) shall be Unistrut P1100 or P2000 Series, B-Line B2000 Series, or equal. Material shall be Type 304 stainless steel.

E. Hanger rods for trapezes shall be carbon steel (ASTM A 36, A 575, or A 576) unless stainless steel is indicated in the Drawings. Stainless steel hanger rod material shall comply with ASTM A 276, Type 304.

F. Accessory fittings and brackets shall be the same material as the channel or trapeze. Provide coating on carbon steel fittings and brackets as specified for the channels and frames.

1. Flat Plate Fittings: Unistrut P1065, P1066, P1925; Superstrut AB-206, AB-207; or equal.

2. Post Bases: Unistrut P2072A, Superstrut AP-232, or equal.

3. 90-Degree Brackets: Unistrut P1326, P1346; Superstrut AB-203; or equal.

4. Rounded-End Flat Plate Fittings: Unistrut P2325, Superstrut X-240, or equal.

G. Parallel pipe clamps shall be Unistrut P 1563 through P 1573, Superstrut AB-719, or equal. Material shall be Type 304 stainless steel.

2.06 FIBERGLASS-REINFORCED PLASTIC (FRP) CHANNEL FRAMING SYSTEM

A. FRP pipe hangers and supports shall be Aickinstrut, Inc., or equal.

B. Material properties shall be as follows:

Longitudinal Direction	
Ultimate Tensile (psi)	37,500 minimum
Ultimate Compressive (psi)	35,000 minimum
Ultimate Flexural (psi)	37,500 minimum
Tensile Modulus (psi) x 10**6	3.00 minimum
Flexural Modulus (psi) x 10**6	2.00 minimum
Ultimate Shear Strength (psi)	6,000 minimum
Ultimate Bearing Stress (psi)	35,000 minimum
Izod Impact (ASTM D 256) ft-lb/inch notch	30 minimum
Transverse Direction	
Ultimate Tensile (psi)	10,000 minimum
Ultimate Compressive (psi)	20,000 minimum
Ultimate Flexural (psi)	14,000 minimum
Tensile Modulus (psi) x 10**6	1.0 minimum
Compressive Modulus (psi) x 10**6	1.4 minimum
Flexural Modulus (psi) x 10**6	1.0 minimum
Ultimate Shear Strength (psi)	5,500 minimum
Ultimate Bearing Stress (psi)	35,000 minimum
Izod Impact, ft-lb notch	5 minimum
Hardness	
Barcol Test	50 minimum

C. Glass fiber reinforced composites and plastic products shall have a flame spread rating of 25 or less when tested in accordance with ASTM E 84.

D. Channel framing shall be 1-5/8 inches deep by 1-5/8 inches wide and shall be made using vinylester resin equal to Ashland Derakane 411, Ashland Hetron 92 2, or Reichhold Dion 98 00. It shall have a nexus polyester surfacing veil over 100% of the surface which, along with a filler system, will protect against degradation from ultraviolet light. Channel shall be

supplied with integral notches 1 inch on center. Notches shall be located on the interior flange to prevent slippage of pipe clamps and fittings after installation. In place of notched channel, unnotched channel may be used if the vertical channel sections supporting the horizontal piping are provided with stop lock hardware at each pipe clamp to prevent slippage. Channel framing shall be Aickinstrut G.R.P. Type V 2000 series or equal.

E. Channel framing connections shall be made with vinylester glass fiber composite nuts, bolts, all threaded rods, channel fittings, bases, and hanger assemblies. Nut, bolts, and rods shall be Aickinstrut 4200 series, Strut Tech PVCG, or equal. Channel fittings shall be Aickinstrut 2800 style or equal.

F. Load-bearing pipe clamps and nonload-bearing pipe straps shall be nonmetallic and nonconductive and shall be made by the injection molding process using polyurethane base resin. Pipe clamps and straps shall be Aickinstrut 3100 series or equal.

G. Clevis hangers shall be made with vinylester glass fiber and be Aickinstrut 1500 series or equal.

H. Hanger rods for trapezes shall be carbon steel (ASTM A 36, A 575, or A 576) unless stainless steel or FRP is indicated in the Drawings. Stainless steel hanger rod material shall comply with ASTM A 276, Type 304. FRP hanger rod shall be by Aickinstrut, StrutTech, or equal.

2.07 PIPE SPIDERS

A. Cooper B-Line B3281 to 3286, Superstrut S-794 or equal.

2.08 WAFFLE ISOLATION PADS

A. Mason Type "W"; Machinery Installation Systems "Unisorb" Type S, SB, F, or FB; or equal. Provide minimum 1/4-inch thickness.

2.09 NEOPRENE ISOLATING SLEEVES FOR METAL PIPE 6 INCHES AND SMALLER

A. Unistrut P2600, B-Line "Vibrocushion," or equal.

2.10 ANCHOR BOLTS AND SCREWS

A. Anchor bolts and screws for attaching pipe supports and hangers to walls, floors, ceilings, and roof beams shall be Type 316 stainless steel, ASTM A 276 or F 593. Nuts shall be Type 316 stainless steel, ASTM A 194, Grade 8M, or ASTM F 594, Type 316 stainless steel.

PART 3 EXECUTION

3.01 PIPE HANGER AND WALL SUPPORT SPACING

A. The Contractor shall install pipe hangers and wall supports on horizontal and vertical runs at the spacings shown or detailed in the Drawings. Provide hanger rods (for horizontal runs) and wall supports of the sizes shown or detailed in the Drawings. If no spacing or rod sizes are given in the Drawings or in the Specifications for a particular piping system, use the following:

1. Pipe Hanger and Wall Support Spacing for Steel and Ductile-Iron Pipe:

Pipe Size (inches)	Maximum Support or Hanger Spacing (feet)	Minimum Rod Size (inches)
3/8 and smaller	4	3/8
1/2 through 1	6	3/8
1-1/4 through 2	8	3/8
2-1/2 and 3	10	1/2
3-1/2 and 4	10	5/8
6	12	3/4
8	12	7/8
10 and 12	14	7/8
14 and 16	16	1
18	15	1
20 through 24	9	1
30	6	1

B. Pipe Hanger or Wall Support Spacing for PVC Pipe:

Pipe Size (inches)	Maximum Support or Hanger Spacing (feet)	Minimum Rod Size (inches)
3/4	4	3/8
1	4	3/8
1-1/2	5	3/8
2	5	3/8
2-1/2	5	1/2
3	6	1/2

C. Pipe Hanger or Wall Support Spacing for PVDF Piping:

Pipe Size (inches)	Maximum Hanger or Support Spacing (feet)	Minimum Rod Size (inches)
3-1/4	2	3/8
1	2	3/8
1-1/2	3	3/8
2	3	3/8
3	6	1/2

D. For piping services not described, the Contractor shall provide hangers and supports according to MSS SP-58 and SP-69.

E. The Contractor shall provide bracing for piping 8 inches and smaller that is installed on hangers or trapezes according to MSS SP-127, except provide lateral bracing at maximum 10-foot center-to-center spacings. Provide sway bracing for hangers for piping larger than 8 inches as detailed in the Drawings.

3.02 PIPE SUPPORT SPACING FOR SUPPORTS ON TOP OF SLABS OR GRADE

A. The Contractor shall install pipe supports on horizontal runs at the spacing shown or detailed in the Drawings. Provide supports of the type shown or detailed in the Drawings. If no spacings are given in the Drawings or in the Specifications for a particular piping system, use the following:

1. Pipe Support Spacing for Steel and Ductile-Iron Pipe (Section 15070, Ductile Iron Pipe and Fittings):

Pipe Size (inches)	Maximum Support Spacing (feet)
3/8 and smaller	4
1/2 through 1	6
1-1/4 through 2	8
2-1/2 and 3	10
3-1/2 and 4	10
6	12
8	12
10 and 12	14
14 and 16	16
18	16
20 through 24	18
30	18

B. Pipe support spacing for other pipe materials shall be the same as described above in paragraph titled "Pipe Hanger and Wall Support Spacing."

3.03 INSTALLING PIPE HANGERS AND SUPPORTS

The Contractor shall do the following:

A. Provide separate hangers or supports at each valve. Provide one hanger or support around each end of the valve body or on the adjacent connecting pipe within one pipe diameter of the valve end. Provide additional hangers or supports to relieve eccentric loadings imposed by offset valve actuators.

B. Provide separate hangers or supports at each pipe elbow, tee, or fitting. Provide separate hangers or supports on both sides of each nonrigid joint or flexible pipe coupling.

C. Adjust pipe hangers according to MSS SP-89, paragraph 10.6.

D. Install leveling bolts beneath support baseplates. Provide 3/4-inch-thick grout pad beneath each base.

E. Install piping without springing, forcing, or stressing the pipe or any connecting valves, pumps, and other equipment to which the pipe is connected.

3.04 INSTALLING STEEL AND FRP CHANNEL FRAMES

A. The Contractor shall use 1-5/8-inch-high channel frames, unless 3-1/4 inch is needed, to provide clearance from walls. Use multiple back-to-back channels if additional clearance is needed.

3.05 INSTALLING NEOPRENE ISOLATING SLEEVES

A. The Contractor shall install a sleeve around each metal pipe 6 inches and smaller at the point of bearing or contact with the pipe hanger or support.

3.06 PAINTING AND COATING

The Contractor shall do the following regarding painting and coating:

A. Grind the welds of fabricated steel pipe supports smooth, prepare surface by sandblasting, and apply coating system.

B. Paint exposed metallic pipe hangers and supports to match the color of the adjacent wall using System No. 2 per Section 09000, Painting and Protective Coatings. If the adjacent wall is not painted, paint the hangers and supports to match color code of the largest pipe on the support.

C. Coat submerged pipe hangers and supports per Section 09000, Painting and Protective Coatings, System No. 1.

D. Coat FRP pipe hangers and supports exposed to direct sunlight with System No. 10 in accordance with Section 09000, Painting and Protective Coatings. FRP pipe hangers and supports that are hidden from direct sunlight need not be coated.

END OF SECTION

SECTION 15063
WALL PIPES, SEEP RINGS, AND PENETRATIONS

PART 1 GENERAL

1.01 SCOPE OF WORK

A. This Section describes requirements for materials, installation, and testing of steel, cast-iron, and ductile-iron wall pipes and sleeves (including wall collars and seepage rings) and penetrations.

1.02 SUBMITTALS

The Contractor shall submit the following:

A. Submit shop drawings in accordance with Section 01300, Shop Drawings, Submittals and Samples.

B. Submit detailed drawings for fabricated steel or cast-iron wall and floor pipes and sleeves, wall flanges, seep rings, and sealing materials. Show dimensions and wall thicknesses.

C. Show flange sizes and the appropriate ANSI or AWWA flange dimensional standard where flanged end wall pipes or penetrations are used.

D. Show grooved-end dimensions and AWWA grooved-end dimensional standard where grooved-end wall pipes or penetrations are used.

E. List coating systems to be applied, manufacturer, and dry thickness of coatings. Call out coatings where coatings are to be applied.

F. List materials of construction, with ASTM material reference and grade.

G. Submit manufacturer's instructions for installing rubber annular hydrostatic sealing devices:

1. Submit six copies of the results of the leakage test for cast-iron sleeves having shrink-fit steel collars or collar halves bottomed in a groove and steel sleeves having welded steel collars.

PART 2 MATERIALS

2.01 GENERAL

A. Use cast-iron, ductile-iron, or fabricated steel wall sleeves when containing rubber annular hydrostatic sealing devices through which piping passes:

1. Use only cast-iron or ductile-iron wall pipes when connecting to cast-iron and ductile-iron pipe. Use only fabricated steel or stainless steel wall pipes when connecting to steel or stainless steel pipe, respectively.

2. Cast-iron flanges shall conform to ANSI B16.1, Class 125 or 250, to match the flange on the connecting pipe.

3. Class 150 steel flanges shall conform to AWWA C207, Class D. Class 300 steel flanges 48 inches and smaller shall conform to AWWA C207, Class F. Class 300 flanges larger than 48 inches shall conform to the dimensions of ANSI B16.1 Class 250 flanges. Flanges shall be flat face. Flanges shall match the flange on the connecting pipe.

4. See Section 15060, Piping Systems—General, for flange bolts and gaskets.

2.02 CAST-IRON OR DUCTILE-IRON WALL PIPES

A. Provide cast- or ductile-iron wall pipes with thrust collars and ends as shown in the Drawings for connection to adjacent cast-iron and ductile-iron pipe passing through concrete water and wastewater holding tank and basin walls, elevated slabs, and floor slabs. Provide wall pipes passing through concrete walls, elevated concrete slabs and ceilings of other structures as shown in the Drawings. Locate thrust collars so that the collar is at the center of the wall or floor slab, unless otherwise shown in the Drawings.

B. Wall pipes and sleeves shall be of the following types:

1. Cast ductile iron wall pipe with integrally cast thrust collar.

2. Fabricated ductile iron wall pipe with thrust collar attached by continuous fillet weld on both sides of collar.

C. Minimum wall thickness for pipes and sleeves having integrally cast seep rings shall be as shown in the following table:

Pipe or Sleeve Size (inches)	Minimum Wall Thickness (inches)
3	0.48
4	0.52
6	0.55
8	0.60
10	0.68
12	0.75
14	0.66
16	0.70
18	0.75
20	0.80
24	0.89

1. Minimum wall thickness of pipes or sleeves having shrink-fit collars shall be special Class 52. Cut shrink-fit collars from a 1/4-inch-thick steel ring. Attach the collar to a cast-iron or ductile-iron pipe or sleeve by heating the steel collar and allowing it to shrink over the pipe at the necessary location. Provide an epoxy bond (Keysite 740 or 742 or Scotchkote 302) between the pipe and collar. Sandblast the area of the pipe to be epoxy coated in accordance with SSPC SP-10.

2. Wall pipes or sleeves having steel collar halves bottomed in a groove shall be ductile iron Special Class 54 minimum unless otherwise shown. Wall flanges shall consist of 1/4-inch-thick steel seep ring halves for pipes through 24 inches and 3/8-inch-thick halves for pipe 30 inches and larger, bottomed in a groove provided on the pipe. The pipe groove shall be machine cut to a depth of 1/16- to 5/64-inch to provide a press fit for the seep ring. Seep ring halves shall be welded together after being fit into the groove but shall not be welded to pipe. Seep rings shall be sealed completely around the pipe with silicon sealant manufactured by Dow-Corning No. 790, General Electric Silpruf, or equal.

3. The material used in cast- or ductile-iron wall flanges, wall sleeves, and wall penetrations shall conform to ASTM A 395, A 436, A 536, A 48 (Class 35), or A 126 (Class B).

4. Pressure test at least one of each size of cast-iron pipes or sleeves having shrink-fit steel collars or collar halves installed in a groove in the pipe at the place of fabrication to demonstrate watertightness of the seal between the collar and the sleeve. The test shall be at a pressure of 20 psig for four hours' duration and shall show zero leakage.

D. Fabricated Steel Wall Pipes and Sleeves

1. Provide fabricated steel wall pipes and sleeves with ends as shown in the drawings for connection to adjacent steel pipes or for containing pipes where they pass through concrete walls. Provide seepage ring or wall flange on wall pipes and sleeves passing through concrete walls and slabs that are to be watertight. Wall thickness shall be the same as the pipe wall thickness when connecting to steel pipe. Minimum wall thickness for sleeves containing pipes shall be standard weight in accordance with ANSI B36.10 for sleeves 72 inches and smaller and 1/2 inch for sleeves greater than 72 inches through 96 inches.

2. Wall flanges shall be in the form of a steel wall collar welded to the steel sleeve or penetration. Cut welded wall collars from a 1/4-inch steel ring. Attach the collar to a steel wall pipe or sleeve with full circle, 3/16-inch fillet welds. Welding procedures shall be in accordance with ANSI B31.3, Chapter V.

3. Steel pipe used in fabricating wall sleeves containing pipes shall comply with ASTM 53 (Type E or S), Grade B; ASTM A 135, Grade B; ASTM A 139, Grade B; or API 5L or 5LX. Wall pipes connecting to steel pipe shall be of the same material as the connecting pipe. Wall collar material shall comply with ASTM A 36, A 105, A 181, or A 182.

4. Stainless steel pipe used in fabricating wall pipes shall be of the same material as the connecting pipe. Wall collar material shall comply with ASTM A 240.

5. Pressure test at least one of each size of fabricated steel wall sleeve or penetration and collar assemblies at the place of fabrication to demonstrate watertightness of the seal between the collar and the sleeve. The test shall be at a pressure of 20 psig for four hours' duration and shall show zero leakage.

E. Rubber Annular Hydrostatic Sealing Devices

1. Rubber annular hydrostatic sealing devices shall be of the modular mechanical type, using interlocking synthetic rubber links shaped to continuously fill the annular space between the pipe sleeve and the passing pipe. Assemble links to form a continuous rubber belt around the pipe, with a pressure plate under each bolthead and nut.
2. Materials of construction shall be as follows:

Compound	Material
Pressure plate	Composite glass reinforced nylon
Bolts and nuts for links	Type 303 or 316 stainless steel
Sealing element	EPDM rubber

3. The size of the wall sleeve needed to accommodate the passing pipe shall be as recommended by the rubber annular seal manufacturer.

4. Provide centering blocks in 25% of the sealing elements on pipelines larger than 12 inches in diameter.

5. The rubber annular hydrostatic sealing devices shall be Link Seal as manufactured by Thunderline Corporation; Innerlynx as manufactured by Advance Products & Systems, Inc.; or equal.

F. Bolts, Nuts, and Gaskets for Flanged-End Wall Pipes

1. See Section 15060, Piping Systems—General.

G. Polyethylene Foam Filler for Pipe Penetrations: Packing foam shall be an extruded closed-cell polyethylene foam rod, such as Minicel backer rod, manufactured by Industrial Systems Department, Plastic Products Group of Hercules, Inc., Middletown, Delaware; Ethafoam, as manufactured by Dow Chemical Company, Midland, Michigan; or equal. The rod shall be 1/2 inch larger in diameter than the annular space.

H. Polyurethane Sealant for Pipe Penetrations: Sealant shall be multipart, polyurethane sealant, to cure at ambient temperature, for continuous immersion in water. Install as recommended by the manufacturer. Products: SIKA Sikaflex 2C or equal.

I. Painting and Coating

1. Exterior surfaces of ductile iron and cast iron wall pipes encased in concrete shall be coated with manufacturer's standard asphaltic coating system and the interior lining shall match the lining of adjoining pipe. Exterior surfaces of wall pipe not in contact with concrete shall be coated as specified in Section 09000 Painting and Protective Coatings.

PART 3 EXECUTION

3.01 LOCATION OF PIPES AND SLEEVES

A. Provide a wall or floor pipe where shown in the Drawings and wherever piping passes through walls or floors of tanks or channels in which the water surface is above the pipe penetration.

B. Provide a floor sleeve where shown in the Drawings and wherever plastic pipe, steel, or stainless steel pipe 3 inches and smaller or stainless steel or copper tubing passes through a floor or slab. Provide a rubber annular sealing device in the annular space between the sleeve and the passing pipe or tubing.

C. Provide wall sleeves where shown in the Drawings and wherever plastic, steel or stainless steel pipe 3 inches and smaller, or stainless steel or copper tubing passes through a wall. Provide a single rubber annular seal when the wall is 8 inches thick or less. Provide two rubber annular seals (one at each end of the sleeve) when the wall is more than 8 inches thick. Pack the annular space with polyethylene foam filler and fill the ends of the penetration with 2 inches of elastomeric sealant on both sides of the structure.

D. Where wall sleeves are installed in which water or soil is on one or both sides of the channel or wall, provide two rubber annular seals (one at each end of the sleeve).

E. Where pipes pass through walls or slabs and no sleeves or wall or floor pipe with seep ring is provided, pack the annular space with polyethylene foam filler and fill the ends of the penetration with 2 inches of elastomeric sealant on both sides of the structure.

END OF SECTION

SECTION 15110
MANUAL, CHECK, AND PROCESS VALVES

PART 1 GENERAL

1.01 SCOPE OF WORK

A. The Contractor shall furnish all labor, materials, equipment, and incidentals required and install complete and ready for operation all valves as shown in the Drawings and as specified in this Section. All valves shall be complete with all necessary manual actuators, valve boxes, extension stems, and floor stands, which are required for proper valve operation and completion of the work.

1. All valves shall be of the sizes shown in the Drawings. All equipment of the same type shall be from one manufacturer, unless authorized in writing by the Engineer.

2. The valves shall include, but not be limited to, the following:

a. Air valves
b. Ball valves
c. Butterfly valves
d. Check valves
e. Diaphragm valves
f. Gate valves
g. Globe and angle valves
h. Pinch valves
i. Plug valves
j. Solenoid valves
k. Self-contained pressure regulating valves
l. Needle valves

1.02 RELATED WORK

A. Section 01300: Shop Drawings, Submittals and Samples.
B. Section 01620: Delivery, Storage, Protection.
C. Section 09000: Painting and Protective Coatings.
D. Section 15060: Piping Systems—General.
E. Section 15070: Ductile Iron Pipe and Fittings.
E. Section 15125: Piping Appurtenances

1.03 SUBMITTALS

The Contractor shall submit the following in accordance with the requirements of Section 01300, Shop Drawings, Submittals and Samples:

A. Product technical submittal data shall contain the following information and data:

1. Acknowledgment that products submitted meet requirements of standards referenced.
2. Manufacturer's installation instructions.
3. Manufacturer's operation and maintenance manuals.
4. Data of valves, actuators, and accessories:

a. Pressure and temperature rating.
b. Materials of construction, with ASTM reference and grade.
c. Linings and coatings.
d. Dimensions and weight.
e. Flow coefficient.
f. Actuators and accessories details.
g. Manufacturer's product brochure, cut-sheets, and parts diagrams.

B. Dimensions and orientation of valve actuators as installed on the valves. Show location of internal stops for gear actuators. State differential pressure and fluid velocity used to size actuators. For worm-gear actuators, state the radius of the gear sector in contact with the worm and state the handwheel diameter.

C. The following test reports: Performance Tests; Leakage Tests; Hydrostatic Tests; and Proof-of-Design Tests as applicable or required.

1.04 WORK SEQUENCE (NOT USED)

1.05 REFERENCE STANDARDS (NOT USED)

1.06 QUALITY ASSURANCE (NOT USED)

1.07 WARRANTIES (NOT USED)

1.08 DELIVERY, STORAGE, AND HANDLING

A. The Contractor shall adhere to the requirements specified in Section 01620, Delivery, Storage, and Protection, for storage and protection of the items specified in this Section.

B. All valves, unless otherwise directed, shall be loaded and unloaded by lifting, and under no circumstances shall valves be dropped, skidded, or rolled. Valves shall not be stacked or placed under pipe, fittings, or other valves in such a manner that damage could result.

C. Slings, hooks, or tongs used for lifting shall be padded in such a manner as to prevent damage to exterior surface or interior linings and valve components. If any part of the coating, lining, or components is damaged, the repairs or replacement shall be made by the Contractor at his expense and in a manner satisfactory to the Engineer before attempting installation of such valves.

D. Only new valves will be allowed for installation and shall be stored in a manner to prevent damage and be kept free of dirt, mud, or other debris.

1.09 QUALIFICATIONS

A. All of the valves shall be products of well-established firms which are fully experienced, reputable, have been selling this product for a minimum of 10 years, and are qualified in the manufacture of the particular product furnished. The valves shall be designed, constructed, and installed in accordance with the requirements and procedures of applicable AWWA standards and shall comply with these Specifications as applicable.

1.10 MAINTENANCE (NOT USED)

1.11 OPERATIONS AND MAINTENANCE (O&M) MANUALS (NOT USED)

1.12 VALVE CLASSIFICATIONS

A. Air Valves (V100 series):

1. V140: Air Valves for Sewage Services, Air Release.
2. V141: Air Valves for Sewage Services, Air and Vacuum.

B. Ball Valves (V200 series):

1. V200: Threaded Bronze Ball Valves, 3 Inches and Smaller.
2. V210: Double Union PVC Ball Valves, 3 Inches and Smaller, for Water and Light Chemical Service.
3. V212: Double Union PVC Ball Valves, 3 Inches and Smaller, with Vented Hole for Chemical Service.
4. V220: Regular Port Threaded Stainless Steel Ball Valves, 2 Inches and Smaller

C. Butterfly Valves (V300 series):

1. V300: Flanged, Rubber-Seated Butterfly Valves, 4 Inches through 72 inches, for Exposed Service.
2. V302: Mechanical-Jointed, Rubber-Seated Butterfly Valves, 4 Inches through 72 Inches, for Buried Service.
3. V310: Flanged, Rubber-Seated Butterfly Valves, 4 Inches through 72 Inches, Class 25A.
4. V320: Flanged, Rubber-Seated Butterfly Valves 4 Inches through 72 Inches, Class 25B (Air Service)

D. Check Valves (V400 series):

1. V400: Brass Swing-type Check Valves, 3 Inches and Smaller.
2. V430: Ductile-Iron Swing-flex Check Valves, 2 Inches through 36 Inches.
3. V468: Cast-iron Wafer Double Door Check Valves, Class 150 (Air Service)

E. Diaphragm Valves (V500 series):

1. V525: PVC Diaphragm Valves, 1/2 Inch through 4 Inches, for Sodium Hypochlorite Service.

F. Gate Valves (V600 series):

1. V630: Cast-Iron Gate Valves, 4 Inches through 48 Inches.
2. V685: Ductile-Iron Resilient Wedge Gate, 24 Inches through 36 Inches, for Exposed and Buried Service (AWWA C515).
3. V695: Stainless Steel Knife Gate Valves 2 Inches through 24 Inches.

G. Globe and Angle Valves (V700 series):

1. V700: Bronze Globe Valve, 3 Inches and Smaller:

2. V710: Bronze Angle Hose Valves, 1 Inch through 3 Inches.
3. V720: Bronze Hose Bibbs, 1/2 Inch through 1 Inch.

H. Pinch Valves (V800 series):

1. V810: Pinch Valves, 1 Inch through 8 Inches with Extension Stems.

I. Plug Valves (V900 series):

1. V902: Eccentric Plug Valves, 4 Inches through 12 Inches.
2. V906: Eccentric Plug Valves, 14 Inches through 48 Inches.
3. V910: Cast-Iron Non-lubricated Eccentric Plug Valves, 3 Inches and Smaller.
4. V920: Eccentric Plug Valve, 4 Inches through 48 Inches.
5. V995: Non-lubricated Teflon-Lined Plug Valves, 1/2 Inch through 8 Inches, Class 150.

J. Solenoid Valves (V1000 series):

1. V1050: Solenoid Valves 2 Inches and Smaller.

K. Self-Contained Pressure Regulating Valves (V1100 series):

1. V1195: Back Pressure Valve 2 Inches and Smaller.
2. V1197: Pressure Regulating Valve 2 Inches and Smaller.

L. Needle Valves (V1200 series)

1. V1200: Stainless Steel Needle Valve 1-Inch and Smaller.

PART 2 PRODUCTS

2.01 GENERAL

A. Valves are identified in the Drawings by size and V number. For example, a callout of 36V300 refers to a 36-in-diameter V300 valve. A V300 valve is a flanged, rubber-seated butterfly valve that is 4 inches through 72 inches for exposed service.

B. All valves shall be complete with all necessary geared actuators, chain wheels and chains, hand wheels, levers, valve bonnets, valve boxes, extension stems, operating nuts, and T-handle wrenches, which are

required for proper valve operating and completing of the work included under this Section. Renewable parts including discs, packing, and seats shall be of types specified in this Section and acceptable by valve manufacturer for the intended service. All units shall have the name of the manufacturer and the size of the valve cast on the body or bonnet or shown on a permanently attached stainless steel plate in raised embossed letters. All isolation valves shall be suitable for the intended service with bubble-tight shutoff to flow in either direction.

C. Bronze or brass components in contact with water shall comply with the following requirements:

Constituent	Content
Zinc	7% maximum
Aluminum	2% maximum
Lead	8% maximum
Copper + Nickel + Silicon	83% minimum

D. Valves and valve operators shall be factory prepared and primed and field finish coated with color to match adjacent piping and shall be in accordance with Section 09000, Painting and Protective Coatings.

2.02 VALVE ACTUATORS

A. The valve actuator shall be an integral part of a valve. The valve actuator shall be provided, installed, and adjusted by the valve manufacturer. Actuator mounting arrangements shall facilitate operation and maintenance and shall be determined by the valve manufacturer unless indicated otherwise on the Drawings or directed by the Engineer.

B. All valves shall open counter clockwise as viewed from the top. Unless otherwise required by the Owner, the direction of rotation of the wheel or wrench nut to open each valve shall be to the left (counterclockwise). Each valve body or actuator shall have the word "Open" cast on it and an arrow indicating the direction to open.

C. Actuators shall clearly indicate valve position and an adjustable stop shall be provided to set closing torque. All exposed nuts, bolts, and washers shall be AISI Type 304 stainless steel. Unless noted otherwise, valves shall be equipped with the following manual actuators:

1. Exposed valves 6 inches and smaller: removable lever or handwheel actuators.

2. Exposed valves 8 inches and larger: geared actuators with handwheels.

3. Buried or Submerged Valves 6 inches and smaller: 2-inch-square operating nuts (with valve bonnets, valve boxes, and extension stems as required) for operation by a T-handle wrench.

4. Buried or Submerged Valves 8 inches and larger: Geared actuators with
2-inch-square operating nuts (with valve bonnets, valve boxes, and extension stems as required) for operation by a T-handle wrench.

D. Levers or handwheels shall be provided to actuate the valves where the valves are located within 6.5 feet above finished grade or the operating floor. Handwheels shall be constructed of ductile iron. Levers and handwheels shall be coated in accordance with Section 09000, Painting and Protective Coatings. Handwheel diameters for traveling nut actuators shall not exceed 8 inches for valves 12 inches and smaller and shall not exceed 12 inches for valves 20 inches and smaller.

E. Chainwheel and guide actuators shall be provided for all exposed valves installed with their centerlines more than 6 feet and 9 inches above finished grade. Chainwheels shall be cast iron with stainless steel stem, clip, and pins. The actuating chain shall be AISI Type 304 SS. Stainless steel chain baskets shall also be provided with these units. Chainwheels shall be coated in accordance with Section 09000, Painting and Protective Coatings.

Chainwheels and guides shall be Clow Figure F-5680, DeZurik Series W or LWG, Stockham, or equal.

F. Gear actuators for valves 8 inches through 20 inches shall be of the worm-and-gear or of the traveling-nut type. Gear actuators for valves 24 inches and larger shall be of the worm-and-gear type. Gear actuators for motorized valves shall be of the worm-and-gear type, regardless of size.

1. Gear actuators should be designed assuming that the differential pressure across the valves is equal to the test pressure of the connecting piping and assuming a line fluid temperature range of 33°F to 125°F unless otherwise required in the detailed valve specifications.

2. Gear actuators shall be enclosed and oil lubricated with seals provided on shafts to prevent entry of dirt and water into the actuator. Gear actuators for valves located aboveground or in vaults and structures shall have handwheels. The actuators for valves in exposed service shall contain a dial indicating the position of the valve disc or plug.

3. Traveling nut and worm-and-gear actuators shall be of the totally enclosed design and proportioned to permit operation of the valve under full differential pressure rating of the valve with a maximum pull of 80 pounds on the handwheel or crank. Stop-limiting devices shall be provided in the actuators in the open and closed positions. Actuators shall be of the self-locking type to prevent the disc or plug from creeping. Design actuator components between the input and the stop-limiting devices to withstand without damage a pull of 200 pounds for handwheel or chainwheel actuators and an input torque of 300 foot-pounds for operating nuts when operating against the stops.

4. Self-locking worm gear shall be a one-piece design of gear bronze material (ASTM B427; or ASTM B584, Alloy C86200) that is accurately machine cut. Actuators for eccentric and lubricated plug valves may use ductile-iron gears provided the gearing is totally enclosed with spring-loaded rubber lip seals on the shafts. The worm shall be hardened alloy steel (ASTM A322, Grade G41500 or G41400; or ASTM A148, Grade 105-85) with thread ground and polished. Support worm-gear shafts at each end by ball or tapered roller bearings. The reduction gearing shall run in a proper lubricant. The handwheel diameter shall be no more than twice the radius of the gear sector in contact with the worm. Worm-gear actuators shall be Limitorque Model HBC, EIM Series W, or equal.

G. For buried or submerged service, provide watertight shaft seals and watertight valve and actuator cover gaskets. Provide totally enclosed actuators designed for buried or submerged service.

H. All buried valves shall have non-rising stems. All buried valves located 3 feet below grade or deeper as measured at the valve centerline shall be furnished with an operator stem extension to extend the operating nut within 6 inches from the top of the valve box cover.

2.03 VALVE END CONNECTIONS

A. Provide valve end connections conforming to connected piping and as shown in the Drawings. Generally, all buried valves shall be mechanical joint type end connectors. Exposed valves shall be screwed-end, socket-weld end, or flanged to conform to adjacent exposed connected piping system.

B. Comply with the following standards:

1. Threaded: ANSI B1.20.1
2. Flanged: ANSI B16.1 Class 125 unless otherwise noted or AWWA C207.
3. Mechanical (gland) Type: AWWA C111.
4. Soldered: ANSI B16.18.

C. Nuts, Bolts, and Washers: Wetted or internal to be bronze or stainless steel. Exposed to be zinc or cadmium-plated.

D. Epoxy Interior Coating: Provide epoxy coating for all interiors of ferrous valve body surfaces in accordance with AWWA C550. Coatings shall be NSF-approved for valves in all potable water piping services. Coatings shall not be required for stainless steel valve interiors.

2.04 VALVE BOXES

A. All buried valves, 2-inch size and larger, shall be equipped with a standard cast iron roadway valve box. Valve boxes shall be of the slip or sliding type with a round lid marked "Water" for potable water valves or “Sewer” for wastewater and a square lid marked “Reclaimed Water” for reclaimed water valves. The box shall be designed to prevent transfer of the surface loads directly to the valve or piping. Valve boxes must have a minimum adjustable range of 12 inches and a minimum inner diameter of 6 inches. All valve boxes and lids shall be produced from grey cast iron conforming to the latest revision of specification for grey iron castings, ASTM designation A48, Class 20A-25A. All castings shall be true and free of holes and shall be cleaned according to good foundry practice, chipped and ground as needed to remove fins and rough places on castings. Valve boxes have to be rated to sustain FDOT H-20 loadings and have a minimum depth of 8 inches. The valve box lid shall fit flush in the top of the box without forcing and shall not rock, tip, or rattle.

B. Provide debris cap as required in the Drawings.

C. Coat buried cast-iron pieces as specified in Section 09000, System No. 3 or with fusion-bonded epoxy.

D. Valve boxes shall be as manufactured by Tyler Pipe, Geneco, Star Pipe Products, or equal.

2.05 EXTENSION STEMS

A. Where the depth of the valve is such that its centerline is more than 4 feet below grade, provide operating extension stems to bring the operating nut to a point 6 inches below the surface of the ground and/or box cover. Where the valve is submerged, provide operating extension stems to bring the operating nut to 6 inches above the water surface. Extension stems shall be Type 316 stainless steel, solid core, and shall be complete with 2-inch-square operating nut. The connections of the extension stems to the operating nuts and to the valves shall withstand without damage a pull of 300 foot-pounds.

B. Extension stem diameters shall be as tabulated below:

Valve Size (inches)	Minimum Extension Stem Diameter (inches)
2	¾
3, 4	7/8
6	1
8	1-1/8
10, 12	1-1/4
14	1-3/8
16, 18	1-1/2
20, 24, 30, 36	1-3/4
42, 48, 54	2

C. Provide buried valves or valves located inside manholes or vaults with valve boxes cast in the manhole or vault roof with a valve position indicator designed to fit standard 5-1/4-inch valve boxes. The indicators shall show valve position and the direction and number of turns required to fully open (or close). All internal gearing shall be sealed. Ship each unit ready for field installation complete with valve box cast-iron adapter, cap screws, guide bushing, position indicator, flexible washer, centering plate, and 2-inch AWWA nut. Valve box and indicator shall be provided by the valve manufacturer. Indicators shall be Westran Position Indicator, Pratt Diviner, or equal.

2.06 FLOOR STANDS

A. When required by the installations, provide floor stands for the operation of valves. Floor stands shall be of the non-rising stem, indicating type, complete with steel extension stems, couplings, hand wheels, stem guide brackets, and special yoke attachments as required by the valves and recommended and supplied by the stand manufacturer. Floor stands shall be cast-iron base type: Clow, Figure F-5515; Bingham and Taylor; Stockham; or equal. Handwheels shall turn counterclockwise to open the valves.

B. Provide Type 316 stainless steel anchor bolts.

C. Provide Type 316 stainless steel extension stems for valves in exposed and submerged services.

D. Provide adjustable stem guide brackets for extension stems. The bracket shall allow valve stems to be set over a range of 2 to 36 inches from walls. Provide bushings drilled to accept up to 2-inch-diameter stems. Base, arm, and clamp shall be Type 316 stainless steel. Bushing shall be bronze (ASTM B584, Alloy C86400 or C83600). Bolts, nuts, screws, and washers (including wall anchor bolts) shall be Type 316 stainless steel. Provide slots in the bracket to accept 3/4-inch bolts for mounting the bracket to the wall. Products: Trumbull Industries, Inc., Adjustable Stem Guide or equal.

2.07 BOLTS, NUTS, AND GASKETS FOR FLANGED VALVES

A. Bolts, nuts, and gaskets for flanged valves shall be as described in Section 15060, Piping Systems—General.

2.08 PAINTING AND COATING

A. Coat valves, valve operators, and handwheels located aboveground or in vaults and structures the same color and paint system as the adjacent piping. If the adjacent piping is not coated, then coat valves as specified in Section 09000, System No. 2. Apply the specified prime and finish coat at the place of manufacture.

B. Coat buried metal valves, operators, extension stems, tubes, bonnets, torque tubes at the place of manufacture as specified in Section 09000, System No. 3.

C. Coat submerged metal valves, operators, stem guides, extension stems, torque tubes, and bonnets at the place of manufacture as specified in Section 09000, System No. 1.

D. Line the interior metal parts of metal valves 4 inches and larger, excluding seating areas and bronze and stainless steel pieces, as specified in Section 09000, System No. 1. Apply lining at the place of manufacture.

1. Test the valve interior linings and exterior coatings at the factory with a low-voltage (22.5 to 80 volts, with approximately 80,000-ohm resistance) holiday detector, using a sponge saturated with a 0.5% sodium chloride solution. The lining shall be holiday free.

2. Measure the thickness of the valve interior linings as specified in Section 09000. Repair areas having insufficient film thickness as specified in Section 09000.

E. Coat floor stands as specified in Section 09000, System No. 2.

2.09 AIR VALVES (V100 SERIES)

A. General

1. All valves shall meet or exceed all applicable provisions of the latest revision of AWWA C512, Standard for Air-Release, Air/Vacuum, and Combination Air Valves for Waterworks Service. All valves for drinking water services shall comply with ANSI/NSF Standard 61, Drinking Water Systems Components – Health Effects. Design pressure is 150 psig. Valves shall be operable for water temperatures of above freezing to 125°F.

2. All valves shall consist of a float or a float assembly. Valves shall be identified properly in plates attached permanently on the valve body. The body and cover shall be cast iron ASTM A126, Class B; or ASTM A48, Class 35. Valves 3 inches and smaller shall have threaded ends. Valves 4 inches and larger shall have flanged ends. Threaded ends shall comply with ANSI B1.20.1. Flanges shall comply with ANSI B16.1, Class 125. All flanges shall be flat faced.

3. The float shall be Type 304 or Type 316 Stainless Steel. For valves with inlet sizes less than 4 inches, the float shall be capable of withstanding a collapse pressure of 1,000 psig. For inlet sizes 4 inches and larger, the float shall be capable of withstanding

collapse pressures of 750 psig. Trim shall be Type 304 or Type 316 Stainless Steel. The valve seat shall be of EPDM or other rubber materials that are applicable to wastewater and sludge. The valve seat shall be easily removed and replaced in the field.

4. Drain/test ports on all valves with inlet size 1 in. or larger shall have two ½-in. NPT minimum plugged ports, one near the bottom of the valve body and the other near the top of the valve. The plug shall be of bronze, ASTM B584, Alloy C83600.

B. V140—Air Valves for sewage services, air release.

1. V140 air valves for sewage service shall have elongated cylindrical chambers. All valves shall provide the following: 1/2-inch clearance around the float in the chamber; minimum size 2" ~~1/2 inch~~ isolation valve and quick-disconnect couplings at the valve venting for back-flushing; blowoff port and valve at the bottom of the chamber; and inlet valve at the valve inlet. A back-flushing assemble shall be provided for all valves. The back-flushing assemble shall consist of an inlet shutoff valve, a flush valve, a clear water inlet valve, rubber supply hose, and quick-disconnect couplings. V140 valves shall be air-release valves. Valves shall be APCO 450, Val-Matic Model 49ABW, or equal.

C. V141—Air Valves for sewage services, air and vacuum.

1. V141 air valves for sewage service shall have elongated cylindrical chambers. All valves shall provide the following: 1/2-inch clearance around the float in the chamber; minimum size 2" ~~1/2 inch~~ isolation valve and quick-disconnect couplings at the valve venting for back-flushing; blow off port and valve at the bottom of the chamber; and inlet valve at the valve inlet. A back-flushing assemble shall be provided for all valves. The back-flushing assemble shall consist of an inlet shutoff valve, a flush valve, a clear water inlet valve, rubber supply hose, and quick-disconnect couplings. V141 valves shall be of air/vacuum valves. Valves shall be APCO 401, Val-Matic Model 301ABW, or equal.

2.10 BALL VALVES (V200 SERIES)

A. V200—Threaded Bronze Ball Valves 3 Inches and Smaller:

1. Ball valves 3 inches and smaller for air, water, or diesel service shall have bronze (ASTM B62 or ASTM B584, Alloy C83600 or C84400) body and plug ball retainer. Ball and stem shall be brass, bronze or Type 316 stainless steel. Provide chrome-plated ball, if ball is brass or bronze. Valves shall have screwed ends (ANSI B1.20.1), non-blowout stems, reinforced PTFE seats, and have plastic-coated lever operators. Valves shall have a pressure rating of at least 600 psi WOG at a temperature of 150°F. Valves shall be Stockham T-285 Series, Apollo 70-100 Series, or equal.

B. V210—Double Union PVC Ball Valves 3 Inches and Smaller for water and Light Chemical Service:

1. Unless noted otherwise, ball valves installed in PVC piping systems 3-inch size and smaller shall be constructed from polyvinyl chloride (PVC) ASTM D1784, rated to 150 psi minimum from 30º to 120ºF, double union design with two-way blocking capability, socket end connection except where threaded or flanged-end valves are specifically shown in drawings, double EPDM O-ring seals and EPDM backing cushions, PTFE seals, ABS handle, NSF-61 certified. Provide stem extensions when valves are installed in insulated piping. Stem extensions shall be of sufficient length to bring the bottom of the operating handle above the outside of the insulation. Valves shall be as manufactured by Asahi/America Inc., Quarter-Bloc Ball Valve Series, or approved equal.

C. V212—Double Union PVC Ball Valves 3 Inches and Smaller with Vented Ball for Chemical Service:

1. Vented PVC ball valves 3 inches and smaller for chemical service shall be rated at a pressure of 230 psi at a temperature of 70˚F and 150 psi at a temperature of 105°F. Provide a machined vent hole, de-burred, in the ball to allow gases to vent. Body, ball, and stem shall be PVC conforming to ASTM D1784, Cell Classification 12454-A. Stems shall have double O-rings and be of blowout proof design. Seats shall be PTFE and shall have an elastomeric backing cushion of the same material as the valve seals. O-ring seals shall be FKM. Valve ends shall be of the double-union design. Ends shall be socket welded except where threaded or flanged-end valves are specifically shown in the Drawings. Valves shall have handles for manual operation. Valves shall be Asahi/America Type 21, or approved equal.

D. V220—Regular Port Threaded Stainless Steel Ball Valves 2 Inches and Smaller:

1. Stainless steel ball valves 2 inches and smaller for water service shall be rated at a minimum pressure of 1,500 psi WOG at a temperature of 100°F. Valve body, ball, and stem shall be Type 316 stainless steel, ASTM A276 or A 351. Seat and seals shall be reinforced PTFE. Valves shall have plastic-coated lever actuators. Valves shall have screwed ends (ANSI B1.20.1) and nonblowout stems. Valves shall be Flowserve Marpac B780 Series, Apollo 76-100 Series, or approved equal.

2.11 BUTTERFLY VALVES (V300 SERIES)

A. General Description

1. Butterfly valves shall meet or exceed the latest revision of AWWA C504, Standard for Rubber-Seated Butterfly Valves, Class 150B, unless otherwise specified in this Section. Each valve shall operate in fully opened and in intermediate positions as the valve opens and closes without noticeable flutter or vibration of the disk and shall be free of backlash and loose connections in the operating mechanism, linkage, and shaft connections. Valves shall be identified properly by size, type, serial number, and manufacturer in stainless steel plates attached permanently on the valve body or bonnet.

2. The valve body shall be ductile iron according to ASTM A536 Grade 65-45-12. The valve disc shall be ductile iron in accordance with ASTM A536 (65-45-12). The disc seating edge shall be solid Type 316 stainless steel. The disc shall be securely attached to the valve shaft using 304 stainless steel taper pins. The valve disc shall be designed without using external reinforcing ribs. The valve disc shall provide an uninterrupted 360° seating edge. The valve seat shall be of EPDM or FKM materials. The valve seat shall be designed to provide a tight shutoff in both directions at the specified design differential pressure, with a pressure of 0 psig on the face of the disc opposite the pressurized side. The valve seat shall be molded in and bonded to the valve body for 3- to 24-inch valves. For valves 30 inches and larger, the seat shall be field replaceable without disassembly of the disc and shaft and shall be retained within a dovetail groove in the valve body and locked in place by an epoxy compound edge. The valve shaft shall be of Type 304

stainless steel. The valve shaft may be a one-piece unit extending completely through the disc or of the stub shaft type consisting of two separate shafts inserted into the valve disc hubs. Stub shafts shall extend into the disc hubs for a distance of at least 1.5 shaft diameters. The valve shaft shall have a diameter equal to or greater than that shown for Class 150B in Table 3 of AWWA C504. Connection between the shaft and disc shall be dowel or taper pins, which are mechanically secured. Alignment marks on the valve shaft and on the valve body shall be provided to indicate the fully closed and fully open positions. Valve shaft bearings shall be Teflon lined with a non-metallic fiberglass composite backing and shall be permanently lubricated. The bearings shall be sleeve-type bearings contained in the hubs of the valve body. Design bearings in accordance with AWWA C504, Section 4.5.6. Thrust bearings shall be provided “as required” to hold the valve disc in the center of the valve seat. The valve shaft seal shall be self-compensating V-type packing with a minimum of four sealing rings. One-piece molded shaft seals and o-ring shaft seals are not acceptable. The shaft seal shall be of a design allowing replacement of seals without removing the valve shaft. Packing shall be made of resilient, nonmetallic material and shall not contain asbestos. Metallic components (e.g., dowels, pins, etc.) shall be 300 series stainless steel, ductile iron, or other materials approved by the Engineer. Brass, bronze, and copper alloy materials are not acceptable. Non-metallic components shall be EPDM, FKM, PTFE, or other materials approved by the Engineer.

3. Valves shall be as manufactured by DeZurik, Pratt, or an approved equal.

B. V300—Flanged, Rubber-Seated Butterfly Valves 4 Inches through 72 Inches:

1. V300 valve bodies shall have flanged ends. Flanged-end valves shall be of the short-body design with 125-lb flanged ends faced and drilled in accordance with ANSI B16.1 standard for cast-iron flanges. Seat material shall be EPDM.

C. V302—Mechanical-jointed, Rubber-seated Butterfly Valves 4 Inches through 72 Inches:

1. V302 valve bodies shall have mechanical-jointed ends. The mechanical-joint end valves shall meet the requirements of AWWA C111/ANSI A21.11 standard.

D. V320—Flanged, Rubber-Seated Butterfly Valves 4 Inches through 72 Inches, Class 25B (Air Service)

1. Valves shall conform to AWWA C 504, Class 25B. Ends shall be flanged. Internal Air temperature rating shall be 300°F. The minimum working differential pressure across the valve disc shall be 25 psi. The valves shall provide air-tight bi-directional shut-off at the rated pressure. Valve seats shall be recess mounted and securely fastened to the valve body. For 20-inch and smaller valves, seats shall be simultaneously molded in and bonded to the body. Seats shall withstand a pull of 75 pounds under test procedure ASTM D 429, Method B. For 24-inch and larger valves, seats shall be retained in the valve body by mechanical means. Valves employing complete rubber liners are not acceptable. Valves shall be capable of being held in open or partially open position for manual operation or for automatic operation. When the disc is so held, there shall be no chatter or vibration of the disc or operating mechanism. Valve packing shall be replaceable without dismantling the valve.

2. The valve body shall be cast-iron. The shaft shall be Type 316 stainless steel. The valve disc shall be cast-iron or ductile iron. The disc seats shall be Ethylene Propylene (EPT). The seating edge on disc shall be Type 316 stainless steel. The shaft bearings shall be self-lubricating sleeve type, fiberglass with Teflon lining or fluorosint for valves smaller than 24-inch. The shaft seals shall be self-adjusting V-type chevron, EPT. Tapered pins for attachment of shaft to disc shall be Type 316 stainless steel. All internal and external bolting and other hardware including pins, set screws, studs, bolts, nuts and washers shall be Type 316 stainless steel.

3. Valves shall be provided with gear actuators conforming to AWWAC504. Gear actuators shall be sized for a minimum differential pressure of 25 psi.

4. Valves shall be as manufactured by DeZurik, Henry Pratt, or an approved equal.

2.12 CHECK VALVES (V400 SERIES)

A. V400: Brass Swing-type Check Valves, 3 Inches and Smaller

1. The valve body and cover shall be constructed of ASTM B584 brass Alloy C85700 or Alloy C83600. The bonnet shall be ASTM B584 bronze Alloy C85700. Plug shall be ASTM B16 bronze Alloy C36000. Pin shall be ASTM B16 brass Alloy C37700. Disc shall be ASTM B124 brass Alloy C37700. The valve shall be designed for a minimum working pressure of 200 psi, and have threaded ends. The check valve shall be Nibco Swing-type brass check valve Type TI-3, or approved equal.

B. V430—Ductile-Iron Swing-Flex Check Valves 2 Inches through 36-inches:

1. The valve body and cover shall be constructed of ASTM A536 Grade 65-45-12 ductile iron. The disc shall be precision-molded Buna-N, ASTM D2000-BG. A screw-type backflow actuator shall be provided to allow opening of the valve during no-flow conditions. Buna-N seals shall be used to seal the stainless steel stem in a bronze bushing. The backflow device shall be of the rising-stem type to indicate position. A stainless steel T-handle shall be provided for ease of operation. The valve shall be designed for a minimum working pressure of 150 psi. The manufacturer's name, initials, or trademark and also the size of the valve, working pressure, and direction of flow shall be directly cast on the body. Swing check valves shall exceed the minimum requirements of AWWA C508 with a heavy-duty body of ductile iron with integral flanges, faced and drilled in accordance with ASME B16.1 Class 125. Bolts, nuts, washers, etc., shall be Type 316 stainless steel. The valve body shall be the full waterway type. The valve interior shall be painted with epoxy coating by the valve manufacturer in accordance with AWWA C550. The check valve shall be Apco 100,Val-Matic Swing-Flex check valve, or approved equal.

C. V468—Cast-iron Wafer Double Door Check Valves, Class 150 (Air Service):

1. Valves shall conform to API STD 594, API STD 598, and ASME/ANSI B16.34. Valves shall have a pressure rating of 150 psi. Internal temperature rating shall be 300°F minimum. Cracking pressure shall be 8.0 psi. Valves shall operate without hammer or shock. Valves shall be equipped with double doors, and low torque

springs. Each of the dual plate shall be provided with its own springs to provide independent closing action. Valve seats shall be completely out of the flow stream and protected from wear. Each valve shall incorporate a hinge pin and a stop pin of sufficient strength to contain the valve plates within the valve body and to serve as a stop for plates in open position.

2. Valve bodies shall be cast-iron conforming to ASTM A126. Discs shall be aluminum alloy or Type 316 stainless steel. Hinge and stop shafts shall be Type 316 stainless steel. Springs shall be Type 316 stainless steel. Seat material shall be synthetic rubber suitable for air service and for rated temperature. All internal and external bolting and other hardware including pins, set screws, studs, bolts, nuts and washers shall be Type 316 stainless steel.

3. Valves shall be manufactured by Crane Valve Co. or equal.

2.13 DIAPHRAGM VALVES (V500 SERIES)

A. V525—PVC Diaphragm Valves 1/2 Inch through 4 Inches in Sodium Hypochlorite Service:

1. Diaphragm valves 1/2 inch through 4 inches shall be of the weir type with PVC bodies and PVC bonnets and molded flanged or true union ends. PVC shall comply with ASTM D1784, cell classification 12454-A. The valve shall have a position indicator, travel stop, and bonnet O-ring sealing arrangement. Provide a manual polypropylene handwheel actuator with a rising indicator stem. Valves ½ inch through 2 inches shall be weir type with square body bonnet sealing design. Valves 2-1/2 inches through 4 inches shall be round bonnet body sealing design with threaded stud diaphragm connection. Valve diaphragms shall be PTFE coated. PTFE diaphragms shall accept the installation of a PVDF gas barrier between the layers of EPDM and PTFE. PVDF shall comply with ASTM D3222 Cell Classification VII. Provide EPDM elastomer backing for diaphragms. O-rings and flange gaskets shall be Viton FKM. Body-bonnet bolting and hardware shall be Hastelloy C (ASTM F468, Grade N10276) or Type 304 stainless steel and non-wetted. Minimum pressure rating shall be 150 psi at a temperature of 70°F and 135 psi at a temperature of 110°F. Ends for valves ½ inch through 2 inches shall be true union. Ends for valves 2-1/2 inches through 4 inches shall be flanged, Class 125, ANSI B16.1. Products: Asahi/America Type14 or approved equal.

2.14 GATE VALVES (V600 SERIES)

A. V630—Iron Body Gate Valves 4 Inches through 48 Inches:

1. Valves shall conform to AWWA C500 and the following. Valves shall be cast-iron or ductile iron bodied, bolted bonnet, nonrising stem, solid bronze internal working parts, parallel faced, bottom wedging double-discs, and O-ring seals. Discs for valves 12 inches and smaller shall be solid bronze; discs for valves larger than 12 inches shall either be solid bronze or shall be cast iron or ductile iron with bronze facings. Bronze for internal working parts, including stems, shall not contain more than 2% aluminum nor more than 7% zinc. Bronze shall conform to ASTM B62 (85-5-5-5) or ASTM B584 (Alloy C83600), except that stem bronze shall have a minimum tensile strength of 60,000 psi, a minimum yield strength of 30,000 psi, and a minimum of 10% elongation in 2 inches (ASTM B584, Alloy C87600). Body bolts shall be Type 316 stainless steel, ASTM A276. End connections for exposed valves shall be flanged. End connections for buried valves shall be mechanical joint type to match the connecting pipe material. Valves shall be Clow AWWA gate valves, Mueller, or approved equal.

B. V685—Iron Body Resilient Wedge Gate Valves 24 Inches through 36 Inches (AWWA C515):

1. Valves shall be cast iron or ductile iron body valves and comply with AWWA C515. Valves shall be of the bolted-bonnet type with nonrising stems. The valve gate shall be of ductile iron with a resilient wedge. Valve stems shall be Type 304 or Type 316 stainless steel or cast, forged, or rolled bronze. Stem nuts shall be made of solid bronze. Bronze shall conform to ASTM B62 or ASTM B584. Body bolts shall be TYPE 316 stainless steel. End connections for exposed valves shall be flanged. End connections for buried valves shall be mechanical joint type. Provide reduction thrust bearings above the stem collar. Stuffing boxes shall be O-ring seal type with two rings located in the stem above the thrust collar. Each valve shall have a smooth unobstructed waterway free from any sediment pockets. Valves shall be lined and coated at the place of manufacture with either fusion-bonded epoxy or heat-cured liquid epoxy. Minimum epoxy thickness shall be 8 mil.

2. Manufacturers: Clow, AVK, American Flow Control, Kennedy, or approved equal.

C. V695—Stainless Steel Knife Gate Valves 2 Inches through 24 Inches:

1. Knife gate valves shall be of the solid one-piece cast body design. Minimum working pressure shall be 150 psi. Provide bevel gear actuators for valves 14 inches and larger. Materials of construction shall be as follows:

Component	Material	Specification
Body	Stainless steel	ASTM A743, Grade CF8M
Yoke, superstructure, fasteners, and packing gland	Stainless steel	AISI Type 304 or Type 316 stainless steel
Gate	Stainless steel	ASTM A240, Type 316
Stem	Stainless steel	ASTM A582, Grade S20300
Handwheel	Cast iron	ASTM A126, Class B
Packing	Flax or acrylic PTFE	--

2. Flange holes in the body shall be Class 125, ANSI B16.1. Valve leakage shall be in accordance with MSS SP-81. Valves shall have a resilient seat (neoprene or nitrile) for drip-tight shutoff. Valves shall be DeZurik, ITT (Fabri-Valve), Red Valve.

2.15 GLOBE AND ANGLE VALVES (V700 SERIES)

A. Type 700—Bronze Globe Valves 3 Inches and Smaller:

1. Globe valves 3 inches and smaller shall be all-bronze construction with screwed-end connections, union bonnet, integral seat, rising stem with replaceable seat and disc. Valves shall be Class 150 rated for 150 psi SWP/300 psi WOG and shall be as manufactured by NIBCO, Figure T-235-Y; Stockham, Figure B-22T; or approved equal.

B. V710—Bronze Angle Hose Valves 1 Inch through 3 Inches:

1. Angle-type hose valves 1 inch through 3 inches shall be brass or bronze (ASTM B62 or ASTM B584, Alloy C83600) body with rising or non-rising stem, composition disc, and bronze or malleable iron hand wheel. The stem shall be bronze, ASTM B62, ASTM B584

(Alloy C83600), or ASTM B198 (Alloy C87600). Valves shall have a cold-water service pressure rating of at least 150 psi. Provide cap and chain with valve. Threads on the valve outlet shall be American National Standard fire hose coupling screw thread. Valves shall be as manufactured by Nibco, Powell Figure 151 with nipple adapter, Crane 17TF with hose nipple adapter, or approved equal.

C. V720—Bronze Hose Bibs ½ Inch through 1 Inch:

1. Hose bibs 1/2 inch, 3/4 inch, and 1 inch shall be all bronze (ASTM B62 or ASTM B584, Alloy C83600) with rising or non-rising stem, composition disc, bronze or malleable iron hand wheel, and bronze stem (ASTM B99, Alloy C65100; ASTM B371, Alloy C69400; or ASTM B584, Alloy C87600). Packing shall be Teflon or graphite. Valves shall have a pressure rating of at least 125 psi for cold-water service. Threads on valve outlets shall be American National Standard fire hose coupling screw thread (ANSI B1.20.7). Provide atmospheric vacuum breaker conforming to ASSE Standard 1011 and IAPMO code. Valves shall be as manufactured by Nibco, or approved equal.

2.16 PINCH (V800 SERIES)

A. V810—Pinch Valves 1 Inch through 8 Inches with Extension Stems:

1. Pinch valves 1 inch through 8 inches shall have cast-iron (ASTM A48, Class 30) bodies with totally enclosed actuators. Sleeves shall be neoprene, Buna-N, or Hypalon. Ends shall be flanged, ANSI B16.1, Class 125. Valves shall have 2-inch-square AWWA operating nuts with extension stem actuators. Valves shall have upper and lower pinch bars. Valves installed on the end of a pipe shall be provided with a Type 304 stainless steel retaining ring to hold the sleeve end in place. Valves shall be Red Valve Series 75, or equal.

2.17 PLUG (V900 SERIES)

A. Plug and Seating Design for Eccentric Plug Valves: Eccentric plug valves shall comply with MSS SP-108 and the following. Provide a rectangular ~~or circular~~ plug design, with an associated rectangular or round seat. Provide bidirectional seating design. The valve shall seat with the rated pressure both upstream and downstream of the closed plug. Provide geared actuators sized for bidirectional operation.

B. For eccentric plug valves, the metallic portion of the plug shall be one-piece design and shall be without external reinforcing ribs which result in a space between the rib and the main body of the plug through which water can pass. Valves shall be re-packable without any disassembly of valve or actuator. The valve shall be capable of being repacked while under the design pressure in the open position. Nowhere in the valve or actuators shall the valve shaft be exposed to iron on iron contact. Sleeve bearings shall be stainless steel in valve sizes 20 inches and smaller and bronze or stainless steel in valve sizes 24 inches and larger. Provide enclosed worm-gear actuators for valves 6 inches and larger.

C. Rubber compounds shall have less than 2% volume increase when tested in accordance with ASTM D471 after being immersed in distilled water at a temperature of 73.4°F ±2°F for 70 hours.

D. V902—Eccentric Plug Valves 4 Inches through 12 Inches:

Eccentric plug valves 4 inches through 12 inches shall be non-lubricated type. Minimum pressure rating shall be 175 psi. Bodies shall be cast iron in accordance with ASTM A126, Class B. Ends shall be flanged, Class 125 in accordance with ANSI B16.1. Plugs shall be stainless steel or cast iron (ASTM A126, Class B), or ductile iron (ASTM A536, Grade 65-45-12) with Buna-N. Valve body seats shall be Type 304 or Type 316 stainless steel or have a raised welded-in overlay at least 1/8-inch thick of not less than 90% nickel. Body cap screws and bolts and nuts shall be Type 316 stainless steel. Packing shall be butadiene-filled Teflon. Valves shall be DeZurik “PEC”, Clow F-5412, Val-Matic “Cam-Centric”.

E. V906—Eccentric Plug Valves 14 Inches through 48 Inches:

1. Eccentric plug valves 14 inches and larger shall be non-lubricated type. Minimum pressure rating shall be 150 psi. Bodies shall be cast iron in accordance with ASTM A126, Class B. Ends shall be flanged, Class 125 per ANSI B16.1. Plugs shall be cast iron (ASTM A126, Class B), or ductile iron (ASTM A536, Grade 65-45-12) with Buna-N facing. Valve body seats shall be Type 304 or Type 316 stainless steel or have a raised welded-in overlay at least 1/8-inch thick of not less than 90% nickel. Plug shall be of the one-piece design. Body cap screws and bolts and nuts shall be Type 316 stainless steel. Packing shall be butadiene-filled PTFE Valves shall be DeZurik “PEC”, Clow F-5412, Val-Matic “Cam-Centric”.

F. V910—Cast-Iron Non-Lubricated Eccentric Plug Valve 3 Inches and Smaller:

1. Plug valves 3 inches and smaller shall be non-lubricated eccentric type, cast-iron body, screwed end connection, resilient plug, stainless steel bearing, and O-ring seals, as manufactured by Dezurik Water Controls, or an approved equal.

G. V920—Cast-Iron Non-Lubricated Eccentric Plug Valve 4 Inches and Larger:

1. Plug valves 4 inches and larger shall be of the non-lubricated eccentric type with resilient faced plugs and shall be furnished with mechanical-joint end connections to match connecting piping and as shown in the Drawings. Mechanical joint ends shall conform to AWWA Standard C 111. Valve bodies shall be of ASTM A126 Class B cast iron. Valves shall be furnished with a welded overlay seat of not less than 90% pure nickel. Seat area shall be raised, with raised surface completely covered with weld to ensure that the plug face contacts only nickel. Screwed-in seats shall not be acceptable. The plug shall have a cylindrical seating surface eccentrically offset from the center of the plug shaft. The interference between the plug face and body seat, with the plug in the closed position, shall be externally adjustable in the field with the valve in the line under pressure. Plugs shall be resilient faced with Hycar (Acrylonitrile-Butadiene) or Buna N, formulated and constructed to be suitable for use with wastewater. Minimum port areas shall be 80% of full pipe flow area. Valves shall have sleeve-type metal bearings and shall be of sintered, oil-impregnated, permanently lubricated Type 316 ASTM. Nonmetallic bearings shall not be acceptable. Valve shaft seals shall be of the multiple V-ring type or U-cup type and shall be externally adjustable and replaceable without removing the bonnet or actuator from the valve under pressure. Valves using O-ring seals or non-adjustable packing shall not be acceptable. All exposed nuts, bolts, springs, washers, and other fasteners shall be 300-series stainless steel. Valve working pressure ratings shall be a minimum of 150 psi. Each valve shall be given a hydrostatic and seat test with certified copies of proof-of-design test reports as outlined in AWWA C 504, Section 5.5. Plug valves shall be DeZurik PEC Series; Henry Pratt Company Ballcentric Series; or approved equal.

H. V995—Non-lubricated Teflon-Lined Plug Valves, 1/2 Inch Through 8 Inches, Class 150:

1. Provide a non-lubricated plug valve design consisting of a one-piece cast ductile iron body with a one-piece solid PTFE liner, a cast ductile iron tapered plug encapsulated in molded PFA, with a PFA diaphragm between the thrust collar and the top of the plug. Provide a system of raised ribs, grooves, and recesses to lock the liner into the body. Valve ends shall be flanged, ANSI B16.5, Class 150. Valves shall have a minimum pressure rating of 200 psi at a temperature of 100°F. Valves 6 inches and larger shall have enclosed worm-gear actuators with hand wheels. Valves shall be Durco T-41 or approved equal.

2.18 SOLENOID VALVES (V1000 SERIES)

A. V1050—Solenoid Valves 2 Inches and Smaller:

1. Solenoid valves 2 inches and smaller shall be constructed with a brass body and Viton seals with screwed-end connections. Solenoid valve shall be 120 VAC NEMA 4/4X, 2 way normally closed (energize to open/de-energize to close). Valve must be rated for diesel fuel service, rated for 150 PSI maximum operating pressure differential and shall require a 5 psi minimum operating pressure differential. Valve Cv rating shall be 43.00. Valve coil shall be of a one piece molded design, and shall be as manufactured by ASCO Valve, Inc, or approved equal.

2.19 SELF-CONTAINED PRESSURE REGULATING VALVES (V1100 SERIES)

A. V1195—Back Pressure Valves 2 Inches and Smaller (for diesel fuel system use):

1. Back pressure valves 2 inches and smaller shall be of iron body construction with threaded-end connections, brass body seat, 303 stainless steel seat ring and disc, Buna-N diaphragm, and Buna-N o-ring. Valve shall be acceptable for diesel fuel service. Contractor to verify compatibility of valve material with associated piping material. Valves shall be rated for 250 psi, 200 degrees F, and shall be as manufactured by Cash-Acme, Type FR-10, or approved equal.

B. V1197—Pressure Regulating Valves 2 Inches and Smaller (for general non-potable water systems use, sample lines, and plant service water use):

1. Pressure regulating valves 2 inches and smaller shall be of cast-iron body and spring case construction with brass orifice, neoprene surfaces and diaphragm, Type 416 stainless steel valve stem, and brass plug guide. Valves shall be same size as connected upstream piping. Valves shall have threaded-end connections, and shall be sized to have no more than 10-percent offset at maximum flow. Valves shall be Fisher Controls Company Series 95 Pressure Regulators, or approved equal.

2. All Pressure regulating valves shall be furnished and installed with an upstream located wye-pattern strainer of same size as pressure regulating valve. Strainers shall be as specified in Section 15125, Piping Appurtenances.

L. NEEDLE VALVES (V1200 SERIES)

A. V1200—Needle Valves 1 Inch and Smaller (for general use):

1. Needle valves shall be Type 316 stainless steel body and component construction, PTFE packing, stainless steel handle and lock-nut, non-rotating stainless steel needle, as manufactured by Swagelok, GU Series; or approved equal.

PART 3 EXECUTION

3.01 JOINTS

A. Bolt holes of flanged valves shall straddle the horizontal and vertical centerlines of the pipe run to which the valves are attached. Clean flanges by wire brushing before installing flanged valves. Clean flange bolts and nuts by wire brushing, lubricate threads with oil and graphite, and tighten nuts uniformly and progressively. If flanges leak under pressure testing, loosen or remove the nuts and bolts, reseat or replace the gasket, reinstall or retighten the bolts and nuts, and retest the joints. Joints shall be watertight.

B. Clean threaded joints by wire brushing or swabbing. Apply Teflon joint compound or Teflon tape to pipe threads before installing threaded valves. Joints shall be watertight.

C. Install lug-type valves with separate hex head machine bolts at each bolt hole and each flange (two bolts per valve bolt hole).

D. Install grooved-end couplings for valves in accordance with Section 15060, Piping Systems—General.

3.02 INSTALLING EXPOSED VALVES

A. Unless otherwise indicated in the drawings, install valves in horizontal runs of pipe having centerline elevations 4 feet 6 inches or less above the floor with their operating stems vertical. Install valves in horizontal runs of pipe having centerline elevations between 4 feet 6 inches and 6 feet 9 inches above the floor with their operating stems horizontal.

B. Install valves on vertical runs of pipe that are next to walls with their stems horizontal, away from the wall. Valves on vertical runs of pipe that are not located next to walls shall be installed with their stems horizontal, oriented to facilitate valve operation.

3.03 INSTALLING BURIED VALVES

A. Connect the valve, coat the flanges, apply tape wrapping or polyethylene encasement as required on the Drawings, and place and compact the backfill to the height of the valve stem.

B. Place block pads under the extension pipe to maintain the valve box vertical during backfilling and repaving and to prevent the extension pipe from contacting the valve bonnet.

C. Mount the upper slip pipe of the extension in mid-position and secure with backfill around the extension pipe. Pour the concrete ring allowing a depression so the valve box cap will be flush with the pavement surface.

D. In streets without concrete curbs and in open areas, install the valve box as for a paved area with concrete curb except include a marker post. Cut the marker post from 4-inch-by-4-inch dense structural grade Douglas fir No. 2 or Southern Pine No. 2 surfaced on four sides to a length of 5 feet. Chamfer the top. Set the post in concrete, 2 feet into the ground, away from traffic, and to the side of the pipeline. Coat with a seal and finish coat

of white alkyd exterior paint. On the side facing the valve, letter in black the word “VALVE” and the distance in feet from the marker post to the valve box cap.

E. Install debris cap as close as possible under the cast-iron cover without interfering with the cover operation. Trim flexible skirt to provide a smooth contact with the interior or the extension pipe.

3.04 INSTALLING EXTENSION STEM GUIDE BRACKETS

A. Install extension stem guide brackets at 6- to 8-foot centers. Provide at least two support brackets for stems longer than 10 feet, with one support near the bottom of the stem and one near the top.

3.05 FIELD COATING BURIED VALVES

A. Coat flanges of buried valves and the flanges of the adjacent piping and the bolts and nuts of flanges and mechanical joints, as specified in Section 09000, System No. 3.

B. Wrap buried metal valves 6 inches and larger with polyethylene sheet as specified in Section 15070, Ductile Iron Pipe and Fittings.

3.06 VALVE LEAKAGE AND FIELD TESTING

A. Test valves for leakage at the same time that the connecting pipelines are tested. See Section 15144, Pressure Testing of Piping, for pressure testing requirements. Protect or isolate any parts of valves, actuators, or control and instrumentation systems whose pressure rating is less than the pressure test. Valves shall show zero leakage. Repair or replace any leaking valves and retest.

B. Operate manual valves through three full cycles of opening and closing. Valves shall operate from full open to full close without sticking or binding. Do not backfill buried valves until after verifying that valves operate from full open to full closed. If valves stick or bind, or do not operate from full open to full closed, repair or replace the valve and repeat the tests.

C. Test gear actuators through three from full-open to full-close cycles without binding or sticking. The pull required to operate hand wheel- or chain wheel-operated valves shall not exceed 80 pounds. The torque required to operate valves having 2-inch AWWA nuts shall not exceed 150 foot-pounds. If actuators stick or bind or if pulling forces and torques

exceed the values stated previously, repair or replace the actuators and repeat the tests. Operators shall be lubricated in accordance with the manufacturer's recommendations before operating.

END OF SECTION

SECTION 15121
PIPE COUPLING AND ADAPTOR FITTINGS AND ACCESSORIES

PART 1 GENERAL

1.01 SCOPE OF WORK

A. This Section describes requirements for materials and installation of pipe couplings and adaptor fittings and associated accessories.

1.02 RELATED WORK (NOT USED)

1.03 SUBMITTALS

A. The Contractor shall submit shop drawings in accordance with Section 01300, Shop Drawings, Submittals and Samples. Submit manufacturer's catalog data and descriptive literature showing dimensions and materials of construction by ASTM reference and grade. Show coatings.

PART 2 PRODUCTS

2.01 METALLIC QUICK-CONNECT COUPLINGS

A. Type 6 – Quick-connect couplers shall be female-coupler/female-thread type with locking handles. Provide dust plug and security chain with each coupler. Bodies and locking handles shall be Type 316 stainless steel. The gasket shall be Teflon. Couplers shall be CIVACON Kamlok 633-D/634-A, Evertite Part D/DP, or equal.

B. Type 8 – Quick-connect couplers shall be male-adapter/female-thread type. Provide dust cap and security chain with each coupler. Bodies and locking handles shall be Type 316 stainless steel. The gasket shall be Teflon. Adapters shall be CIVACON Kamlock 633-A/634-B, Evertite Part A/DC, or equal.

C. Type 10 – Quick connect couplers shall be male-adapter/hose-shank type. Provide dust cap with each coupler. Bodies and dust caps shall be Type 316 stainless steel. The gasket shall be Teflon. Adapters shall be CIVACON Kamlok 633-E/634-B, Evertite Part C/DC, or equal.

2.02 NON METALLIC QUICK-CONNECT COUPLINGS

A. Type 6A – Quick-connect couplers shall be female-coupler/female-thread type with locking handles. The Contractor shall provide a dust plug and security chain with each coupler. Bodies shall be glass-fiber-reinforced polypropylene. Locking handles shall be stainless steel. The gasket shall be Teflon. Couplers shall be Evertite Part D/DP, Banjo Corporation Female Cplg/Female Thread and Dust Plug, Murray Equipment Inc. Style D/DP, or equal.

B. Type 8A – Quick-connect couplers shall be male-adapter/female-thread type. Provide dust cap and security chain with each coupler. Bodies shall be glass-fiber-reinforced polypropylene. Locking handles shall be stainless steel. The gasket shall be Teflon. Adapters shall be Evertite Part A/DC, Banjo Corporation Male Adapter/Female Thread and Dust Cap, Murray Equipment Inc. Style A/DC, or equal.

C. Type 10A – Quick-connect couplers shall be male-adapter/hose-shank type. Provide dust cap with security chain with each coupler. Bodies shall be glass-fiber-reinforced polypropylene. Locking handles shall be stainless steel. The gasket shall be Teflon. Adapters shall be Evertite Part C/DC, Banjo Corporation Male Adapter/Hose Shank and Dust Cap, Murray Equipment Inc. Style E, or equal.

2.03 PIPE COUPLINGS AND ADAPTORS

A. General

1. Thrust Ties: The Contractor shall provide thrust ties where shown and where required to restrain the force developed by 12 times the maximum operating pressure specified.

    a. Steel Pipe: Attach with fabricated lugs.

    b. Ductile Iron Pipe: Attach with bell hanger and wedge restraint glands for buried mechanical joint and push-on joint piping; and thrust retention plates and tie-rods, nuts, washers, and bolts for exposed, flanged piping.

2. Exposed Installations: Zinc-plated nuts and bolts. High-strength, low-alloy steel, in accordance with AWWA C111, may be substituted for use on cast-iron and ductile-iron couplings.

3. Buried and Submerged Installations: Provide Type 304 stainless steel tie rods, bolts, and nuts and assemble with an anti-galling compound.

4. Steel Middle Rings and Followers: Fusion-bonded epoxy-lined and coated in accordance with AWWA C213.

5. Restrained couplings or other fittings that use set screws, pointed-end screws to penetrate the outside surface of the pipe for restraint are not acceptable.

B. Flexible Couplings: Coupling shall consist of a steel middle ring or sleeve, two steel or malleable iron flange or follower rings, two wedge-shaped resilient gaskets and sufficient number of track-head bolts and nuts.

1. Middle Ring or Sleeve: Steel construction, ASTM A 513, ASTM A635, or ASME SA675 GR60, fabricated in a true circular section and free of surface defect.

2. Follower Rings or Flanges: Steel construction, AISI C 1012 or ASME SA36, fabricated in a true circular section and free of surface defect.

3. Bolts and Nuts: Steel bolt, AWWA C 111/ANSI A 21.22

4. Gaskets: Grade 27 BUNA-S.

5. Shop Paint: Fusion- bonded epoxy coating.

6. Acceptable Manufacturers:

   a. Dresser Manufacturing Division of Dresser Industries, Inc.; Dresser Styles 38 and 138.
   b. Or approved equal.

C. Transition Couplings: Transition Coupling shall consist of a high-strength steel body, two steel or malleable iron flange or follower rings, a wedge shaped resilient gasket and sufficient number of follower bolts.

1. Adapter: Steel construction, ASTM A513, ASTM A 635 or ASME SA675 GR60, free of surface defect.

2. Followers: AISI C1012 or ASME SA36.

3. Bolts: AWWA C 111/ANSI A21.11

4. Gasket: Grade 27 BUNA-S.

5. Shop Paint: Fusion bonded epoxy coating.

6. Acceptable Manufacturers:

   a. Dresser Manufacturing Division of Dresser Industries, Inc.; Dresser Styles 62 and 162.
   b. Or approved equal.

D. Flanged Coupling Adapters: Adapters shall consist of a cast-iron or high-strength steel body, two steel or ductile iron follower rings, a wedge shaped resilient gasket and sufficient number of follower bolts.

1. 3-12 inch DIP Flange Coupling Adapters:

   a. Adapter: Ductile iron construction, ASTM A536, Grade 65-45-12, free of surface defect. Adapter shall be rated to 200 psi working pressure per AWWA C219, and -20°°°°°°F to 212° F.

   b. Flanges: Ductile iron construction, ASTM A536, Grade 65-45-12, free of surface defect. Bolt circles and bolt holes shall match those of ANSI B16.1 Class 125 flanges.

   c. Bolts and nuts: Corrosion-resistant alloy bolts and nuts.

   d. Gasket: Grade 27 BUNA-S.

   e. Shop paint: fusion bonded powder epoxy coating.

   f. Acceptable Manufacturers:

      i. Dresser Manufacturing Division of Dresser Industries, Inc.; Dresser Style 127.
      ii. Or Equal.

2. 14-36-inch DIP Flange Coupling Adapters

a. Adapter: Steel construction, ASTM A 513, ASTM A 635 or ASME SA675 GR60, free of surface defect.

b. Flanges: Steel construction, ASTM A513, ASTM A 635 or ASME SA675 GR60, free of surface defect. Bolt circles and bolt holes shall match those of ANSI B 16.1 Class 125 flanges.

c. Bolts and nuts: Alloy to AWWA C 111/ANSI A21.11.

d. Gasket: Grade 27 BUNA-S.

e. Acceptable Manufacturers:

i. Dresser Manufacturing Division of Dresser Industries, Inc.; Dresser Style 128.
ii. Or approved equal.

E. Dismantling Joint: Joint shall consist of a carbon steel body, a spool piece, a flange adaptor, a wedge shaped resilient gasket, and sufficient number of tie rods and follower bolts.

1. 36 inch Dismantling Joint:

a. Spool Piece: Steel construction, AISI C 1010-C1015. Bolt circles and bolt holes shall match those of ANSI B16.1 Class 125 flanges.

b. Flange Adapter: Steel construction, AISI C 1010-C1015. Adapter shall be rated to 150 psi working pressure per AWWA C219, and -20°°°°°° F to 212° F. Bolt circles and bolt holes shall match those of ANSI B 16.1 Class 125 flanges.

c. Bolts and nuts: Corrosion-resistant alloy bolts and nuts, AWWA C111/ANSI A21.11.

d. Tie Rods: Steel construction, ASTM A193 Grade B 7. Provide sufficient number of tie rods to withstand the pipe test pressure specified in Section 15000.

e. Tie Rod Nuts: ASTM A194 Grade 2H.

f. Gasket: Grade 27 BUNA-S.

g. Shop paint: fusion bonded powder epoxy coating.

h. Acceptable Manufacturers:

i. Dresser Manufacturing Division of Dresser Industries, Inc.; Dresser Style 131.
ii. Or Equal.

2.04 BOLTED SPLIT-SLEEVE AND SINGLE- POINT CLOSURE COUPLINGS

A. Bolted, split-sleeve, and single-point closure couplings shall meet the materials and performance conforming to AWWA C219, which shall be used for steel pipe and stainless steel pipe.

B. When the connecting piping is carbon steel, the coupling shall be manufactured from ASTM A36 carbon steel. When the connecting piping is stainless steel, the coupling shall be manufactured from ASTM A240 Type 316/316L stainless steel.

C. The coupling shall be of the split type with a single-point closure coupling. Provide welded restraint rings on the pipe ends for end restraint. As the coupling closes, it shall confine an elastomeric o-ring type gasket on each pipe end to create a radial seal. The axial seal shall be affected at the closure plates as bolts pull the coupling snug round the pipe.

D. The coupling manufacturer shall provide the restraint rings for each coupling. The Contractor's fabricator shall weld the restraint rings to the pipe in strict accordance with the coupling manufacturer's recommendations.

E. For water service, the elastomeric o-ring type gaskets shall be EPDM (or other material accepted by the Engineer) conforming to ASTM D2000 for the design pressure for the temperature range of minus 20 to 180˚ Fahrenheit.

F. Type C 201 shall be a shouldered, bolted, split-sleeve, fully restrained coupling. Type C 201 coupling shall be Depend-O-Lok F x F (Fixed x Fixed), Type 2 manufactured by Victaulic, Depend-O-Lok, Inc., or approved equal.

G. Type C 202 shall be a shouldered, bolted, split-sleeve, fully restrained coupling that allows angular deflection of the connecting pipes. Type C202 coupling shall be Depend-O-Lok F x F (Fixed x Fixed), Type 2, Modified manufactured by Victaulic, Depend-O-Lok, Inc., or approved equal.

PART 3 EXECUTION

3.01 INSTALLING QUICK-CONNECT COUPLINGS

A. Attach to piping in accordance with the relevant piping specification.

3.02 INSTALLING COUPLINGS

A. Pipe for use with flexible couplings shall have plain ends as specified in the respective pipe sections in Division 15.

B. Alloy steel bolts and nut for flanged joints shall be made with high strength, low alloy Cor-Ten bolts, nuts, and washers. Cor-Ten for mechanical joints shall be made with mild corrosion resistant alloy steel bolts and nuts. All exposed bolts shall be painted the same color as the pipe. All joints to be wrapped with 8 mil color coded poly wrap.

C. Prior to the installation of sleeve-type couplings, the pipe ends shall be cleaned thoroughly for a distance of 8 inches. Soapy water may be used as a gasket lubricant. A follower and gasket, in that order, shall be slipped over each pipe to a distance of about 6 inches from the end, and the middle ring shall be placed on the substantial completion date unless otherwise requested by the Owner.

D. Mechanical joints shall be made in the standard manner. Valve stems shall be vertical in all cases. Set cast iron box as shown in the Drawings. 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 after installation. Extend tracing wire outside of valve box extension pipe and enter at valve box.

E. Thoroughly clean oil, scale, rust, and dirt from the pipe to provide a clean seat for the gasket.

F. Wipe gaskets clean prior to installations.

G. Lubricate flexible couplings and flanged coupling adapter gaskets with soapy water or manufacturer's standard lubricant before installation on the pipe ends.

H. Install couplings, service saddles, and anchor studs in accordance with manufacturer's instruction.

I. Tighten bolts progressively, drawing up bolts on opposite sides a little at a time until all bolts have a uniform tightness.

J. Use torque-limiting wrenches to tighten bolts to manufacturer's specified torque values.

END OF SECTION

SECTION 15125
PIPING APPURTENANCES

PART 1 GENERAL

1.01 SCOPE OF WORK

A. Furnish all labor, materials, equipment, and incidentals required and install complete and ready for operation all piping appurtenances as shown on the Drawings and as specified in this Section.

B. All piping appurtenances shall be of the size shown on the Drawings. All equipment of the same type shall be from one manufacturer, unless authorized in writing by the Engineer.

C. All piping appurtenances shall have the name of the manufacturer and the working pressure for which they are designed cast in raised letters upon the body.

D. The piping appurtenances shall include, but not be limited to, the following:

1. Tapping Saddles
2. Tapping Sleeves and Valves
3. Fire Hydrant
4. Water Meter
5. Corporation Stop
6. Curb Stop
7. Strainers
8. Emergency Shower/Eyewash and Face/Eyewash Station
9. Spray Nozzles
10. Pipe Insulation and Jacketing

1.02 RELATED WORK

A. Section 01300: Shop Drawings, Submittals and Samples.
B. Section 01620: Delivery, Storage and Protection
C. Section 09000: Painting and Protective Coatings.
D. Section 15060: Piping Systems—General.
E. Section 15144: Pressure Testing of Piping

1.03 SUBMITTALS

A. The Contractor shall submit shop drawings in accordance with Section 01300, Shop Drawings, Submittals and Samples:

1. Product technical submittal data shall contain the following information and data:

a. Acknowledgment that products submitted meet requirements of standards referenced.

b. Manufacturer's installation instructions.

c. Expansion joints, flexible joints, couplings, adaptors, tapping sleeves, and other appurtenances:

(1) Pressure rating.
(2) Materials of construction.
(3) Linings.
(4) Dimensions and weight.
(5) Accessories.
(6) Manufacturer's product brochures, cut-sheets, and parts diagrams.

1.04 WORK SEQUENCE (NOT USED)

1.05 REFERENCE STANDARDS (NOT USED)

1.06 QUALITY ASSURANCE (NOT USED)

1.07 WARRANTIES (NOT USED)

1.08 DELIVERY, HANDLING, AND STORAGE

A. The Contractor shall adhere to the requirements specified in Section 01620 for delivery, storage, and protection of the items specified in this Section.

B. All piping appurtenances, unless otherwise directed, shall be loaded and unloaded by lifting, and under no circumstances shall and piping appurtenances be dropped, skidded, or rolled.

C. Slings, hooks, or tongs used for lifting shall be padded in such a manner as to prevent damage to exterior surface or interior linings of piping appurtenances. If any part of the coating, lining, or components is damaged, the Contractor shall make repairs or replacement at his expense and in a manner satisfactory to the Engineer before attempting to install such piping appurtenances.

D. Only new piping appurtenances will be allowed for installation and shall be stored in a manner to prevent damage and be kept free of dirt, mud, or other debris.

1.09 QUALIFICATIONS

A. All of the piping appurtenances shall be products of well-established firms which are fully experienced, reputable, have been selling this product for a minimum of 10 years, and qualified in the manufacture of the particular product furnished. The piping appurtenances shall be designed, constructed, and installed in accordance with the requirements and procedures of applicable AWWA standards and shall comply with these Specifications as applicable.

1.10 TESTING REQUIREMENTS (NOT USED)

1.11 MAINTENANCE (NOT USED)

1.12 OPERATIONS AND MAINTENANCE (O&M) MANUALS (NOT USED)

PART 2 PRODUCTS

2.01 TAPPING SADDLE

A. Saddle body shall be made of malleable iron, ductile iron, or bronze. Malleable iron and ductile iron shall be epoxy or nylon coated. Saddles shall be of the single or multiple strap design (multiple straps are required for sizes 10 inches and above). The straps shall be made from Type 304 stainless steel or bronze. The straps shall have a nominal width of 2 inches. Strap studs shall be made from AISI Type 304L stainless steel.

B. Nuts and washers shall be made from Type 304 stainless steel and shall be treated to prevent galling. The straps shall have a curvature accurately formed to meet the diameter of the pipe on which the service saddle is to be installed. A Neoprene gasket shall be securely glued to or imbedded in

the body of the clamp to ensure positive sealing against the pipe. Outlet sizes of ¾ inch and 1 inch shall have female C.C. thread while the outlet for 1-1/2 inches and 2 inches shall be female I.P. thread.

C. Tapping saddles shall not be used on HDPE due to expansion and contraction problems unless specifically approved in writing by the Engineer on a case-by-case basis.

2.02 TAPPING SLEEVES AND VALVES

A. Tapping sleeves and valves shall be designed for a minimum water working pressure of 150 psi and shall be tested at 300 psi. The design shall allow for the insertion of bolts from either side and the internal seal is to be the "O-ring" type. The tapping sleeve shall be furnished complete with bolts, nuts, and gaskets.

B. With the exception of the valve ends and other modifications necessary for tapping service, tapping valves shall conform to AWWA C500 and shall be Mueller "No. T-2360," or approved equal. Each tapping valve shall be provided with a flanged inlet end designed, faced, and drilled for attachment to the outlet flange of the tapping sleeve; an outlet end provided with a tapping flange for attachment of a standard drilling machine; and a mechanical-joint-type bell end for connection of the branch main.

C. Tapping sleeves for 4-inch- through 24-inch-diameter pipe shall be epoxy-coated fabricated-steel construction and manufactured to meet material specification ASTM 285 GRADE C for the body. The flange shall conform to AWWA C207 CLASS D and have an ANSI 150-lb drilling and recessed for tapping valve.

D. Tapping sleeves shall be of the flanged outlet type designed for attachment to the flanged inlet end of the tapping valve and shall be provided with mechanical joint ends at each end of the run. Tapping sleeves shall be Mueller "No. H-615," or approved equal.

2.03 FIRE HYDRANT

A. Fire hydrants shall be in accordance with AWWA C502, for dry barrel-type fire hydrants. Fire hydrants shall meet the following requirements:

Catalogue and maintenance data	Required.
Type of shutoff	Compression or gate.

Size of hydrant (valve opening)	4.5-inch.
Inlet connection	6-inch,verify with drawings.
Outlet nozzles	Two 2.5-inch hose and one 5 ¼ -inch pumper. See Note 1
Outlet nozzle threads	Direction to open counterclockwise.
Stem seals	O-ring.
Outlet nozzle cap chains	Required.
Drain outlet, non-corrodible	Required.
Traffic breakaway body and valve rod	Required.
Working pressure rating	250 psi (minimum).
Fire hydrant wrenches	Provide five wrenches as spare parts.
Nozzle wrenches	Provide five wrenches as spare parts for each size nozzle provided.
Breakaway repair kit	Provide five kits as spare parts.

Notes

1. Outlet nozzle threads shall be the Owner's standard fire hydrant thread. The Contractor shall verify thread type before submittal.

B. Hydrants shall have Underwriter's Laboratory (UL) and Factory Mutual (FM) approvals. Hydrant exteriors shall be painted with one coat of zinc-chromate alkyd primer and two finish coats of approved paint of the color required by the Owner. (Confirm that "chrome yellow" is the color required by the Owner's Fire Department.) Hydrant interiors shall be painted with a paint system approved by NSF for use in potable water. Working parts shall be bronze. All internal parts shall be removable through the top of the hydrant. Hydrants shall conform to NFPA 24.

C. Fire hydrant extensions shall be provided at no additional cost to the Owner to meet final grade requirements. All hydrants shall stand plumb. No portion of the fire hydrant shall be within 6 inches of a sidewalk. After installation, all hydrants shall be inspected, cleaned, and opened and closed as many times as required to verify that all aspects of the hydrant work properly.

D. Fire hydrants shall be AVK, American Flow (American Darling B-48-B) or approved or equal.

2.04 WATER METER

A. Water meters through 2-inch diameter shall comply with AWWA C700 and NSF 61 standards. The meter housing, bottom plates, and trim shall be bronze. The measuring chamber, disc, strainer, generator housing, register lid, and shroud shall be thermoplastic. The magnet shall be ceramic. The disc and magnet spindles shall be stainless steel. External bolts shall be non-corrosive metal.

B. Water meters shall be rated for continuous operation and have a maximum operating pressure of 150 psi. The measuring element shall be a positive displacement mutating disc. An oscillating piston-type meter is not acceptable. The sealed register shall consist of a straight reading, odometer-type totalizing display with a 10,000,000-gallon capacity (minimum) for meters smaller than the 1.5-inch unit and a 100,000,000-gallon capacity (minimum) for the 1.5-inch meter and larger, 360º test circle with center sweep hand, and flow finder to detect leaks. All meters shall have rigid, non-ferrous strainers that are easily removable and have an effective straining area of double that of the main-case inlet.

C. The meters shall have the following minimum characteristics:

Meter Size	Minimum Test Flow	Normal Test Flow Limits	Pressure Loss @AWWA Max. Cap.	Laying Length
5/8" x ¾"	¼ gpm	½ - 20 gpm	5.0 psi	7 ½"
¾" x ¾"	3/8 gpm	¾ - 30 gpm	7.5 psi	7 ½" (only)
1"	¾ gpm	1 ¼ - 50 gpm	7.0 psi	10 ¾"
1 ½"	1 ¼ gpm	2 ½ - 100 gpm	7.5 psi	12 5/8" or 13"
2"	1 ½ gpm	2 ½ - 160 gpm	9.0 psi	15 ¼" or 17"

D. Water meters shall be Badger Recordall Model, Neptune or approved equal. Headloss through the meter shall not exceed the published headloss through the named meters at any point on the headloss curve.

E. The water meters larger than 1 inch shall have flanges for inlet and outlet connections; other water meters shall have threaded male inlet and outlet. All meters shall be easily removed from the installed piping.

2.05 CORPORATION STOPS

A. Corporation stops (through 2 inches in diameter) shall be manufactured from cast bronze with machined fitting surfaces and in accordance with AWWA C800. Corporation stops shall withstand a minimum working pressure of 200 psi and be constructed for direct buried service. The inlet and outlet connections shall be coordinated to connect to the adjoining equipment, tubing, piping, couplings, unions, adapters, reducers, etc. by the Contractor. The inlet and outlet size shall be the same. The corporation stop outlet shall have the required all-bronze adapters, unions, reducers, bushings, or couplings to properly secure to the adjacent items and appurtenances. Corporation stops shall be Model FB series as manufactured by Ford Meter Box Company, Inc., or approved equal. Each corporation stop shall be furnished with a solid bronze square-head plug for plugging the corporation stop outlet. Ford stainless-steel insert stiffeners shall be used as required for connection to tubing, PVC pipe, HDPE pipe, or as required.

2.06 CURB STOPS

A. Curb stops shall be manufactured from cast bronze with machined fitting surfaces. Curb stops shall withstand a minimum working pressure of 150 psi. For curb stops (through 2 inches in diameter), the inlet and outlet connections shall be threaded or have 2-hole flanges to connect to the adjoining equipment, tubing, piping, couplings, unions, adapters, reducers, etc. as coordinated by the Contractor. The nuts and bolts for the flanges shall be cadmium-coated or zinc-plated. The inlet and outlet size shall be the same diameter, unless otherwise approved by the Engineer. The curb stop inlet and outlet shall have the required all-bronze adapters, unions, bushings, or couplings to properly secure it to the adjacent items and appurtenances. Curb stops shall have padlock wings and be lockable with standard size padlocks. Curb stops shall be as manufactured by Ford Meter Box Company, Inc., or approved equal. Each curb stop shall be furnished with a solid bronze square-head plug for plugging the curb stop outlet. Ford stainless steel, insert stiffeners shall be used as required for connection to tubing, PVC pipe, HDPE pipe, or as required.

B. Buried curb stops shall be equipped with a standard cast-iron roadway valve box as specified in Section 15110, Manual, Check, and Process Valves.

2.07 STRAINERS

A. Strainers shall be installed where indicated on the Drawings and as specified in this Section. Unless specified otherwise, strainers shall be Y-pattern units with flanged ends and cap, brass or cast-iron body, and stainless steel screens. Screens shall have 40-mesh perforations. Strainers shall be Hayward Industrial Model 80, Hoffman Specialty Model 450, Metraflex Style M1, or approved equal. The blow off from each strainer shall be equipped with a shutoff valve. Three-fourth-inch and smaller blow-down shutoff valves shall be provided with male threaded hose adapters. Strainers upstream from double mechanical pump seals shall have 80-mesh screens.

B. A strainer installed in piping immediately upstream from a solenoid valve in water service shall be a Y-pattern unit with brass or bronze body and monel or stainless steel screen. Strainers shall be Cash-Acme Model SY, Hoffman Specialty “Model 420,” or Wright-Austin Model Y, or approved equal. The blow off from each strainer shall be equipped with a shutoff valve.

C. A strainer installed in piping immediately upstream from each 2-inch or smaller pressure-reducing valve shall be a Y-pattern unit with bronze, brass, or cast-iron body and monel or stainless steel screen. Strainers shall be Cash-Acme Model SY, Hoffman Specialty Model 420, Metraflex Style S, or Wright-Austin Model Y, or approved equal. Strainers installed in copper piping shall be of bronze or brass construction. The blow off from each strainer shall be equipped with a shutoff valve.

2.08 EMERGENCY SHOWER/EYEWASH AND FACE/EYEWASH STATION

A. The emergency shower shall be a drench shower with a large epoxy-finished Schedule 80 PVC arm and stainless steel pull rod with large, easy-to-find triangle handle. Eyewash shall be activated with a foot treadle for hands-free operation or with a large push flag. The face wash will have an antisurge design and spray ring to wash the entire face. All valves shall stay open until manually closed. The facility must meet current ANSI standards and OSHA requirements. Units installed outdoors shall have insulation and heat tracing suitable for minimum outdoor temperatures to 20 degrees Fahrenheit. The unit shall be a Haws Corporation Model 8336 or approved equal.

2.09 VALVE KEYS

A. Four T-handle valve key wrenches each of various lengths as required to operate the shallowest to the deepest standard 2-inch nuts settings on buried valves and buried valve actuators furnished and installed shall be provided as part of the work.

2.10 CORPORATION STOPS

A. Corporation stops (through 2 inches in diameter) shall be manufactured from cast bronze with machined fitting surfaces and in accordance with AWWA C800. Corporation stops shall withstand a minimum working pressure of 200 psi and be constructed for direct buried service. The inlet and outlet connections shall be coordinated to connect to the adjoining equipment, tubing, piping, couplings, unions, adapters, reducers, etc. by the Contractor. The inlet and outlet size shall be the same. The corporation stop outlet shall have the required all-bronze adapters, unions, reducers, bushings, or couplings to properly secure to the adjacent items and appurtenances. Corporation stops shall be Model FB series as manufactured by Ford Meter Box Company, Inc., or approved equal. Each corporation stop shall be furnished with a solid bronze square-head plug for plugging the corporation stop outlet. Ford stainless-steel insert stiffeners shall be used as required for connection to tubing, PVC pipe, HDPE pipe, or as required.

2.11 CURB STOPS

A. Curb stops shall be manufactured from cast bronze with machined fitting surfaces. Curb stops shall withstand a minimum working pressure of 150 psi. For curb stops (through 2 inches in diameter), the inlet and outlet connections shall be threaded or have 2-hole flanges to connect to the adjoining equipment, tubing, piping, couplings, unions, adapters, reducers, etc. as coordinated by the Contractor. The nuts and bolts for the flanges shall be cadmium-coated or zinc-plated. The inlet and outlet size shall be the same diameter, unless otherwise approved by the Engineer. The curb stop inlet and outlet shall have the required all-bronze adapters, unions, bushings, or couplings to properly secure it to the adjacent items and appurtenances. Curb stops shall have padlock wings and be lockable with standard size padlocks. Curb stops shall be as manufactured by Ford Meter Box Company, Inc., or approved equal. Each curb stop shall be furnished with a solid bronze square-head plug for plugging the curb stop outlet. Ford stainless steel, insert stiffeners shall be used as required for connection to tubing, PVC pipe, HDPE pipe, or as required.

B. Buried curb stops shall be equipped with a standard cast-iron roadway valve box. The valve box is specified in Section 15110, Manual, Check, and Process Valves.

2.12 STRAINERS

A. Strainers shall be installed where indicated on the Drawings and as specified in this Section. Unless specified otherwise, strainers shall be wye-pattern units with flanged ends and cap, brass or cast-iron body, and stainless steel screens. Screens shall have 40-mesh perforations. Strainers shall be Hayward Industrial Model 80, Hoffman Specialty Model 450, Metraflex Style M1, or approved equal. The blow off from each strainer shall be equipped with a shutoff valve. Three-fourth-inch and smaller blow-down shutoff valves shall be provided with male threaded hose adapters. Strainers upstream from double mechanical pump seals shall have 80-mesh screens.

B. A strainer installed in piping immediately upstream from a solenoid valve in water service shall be a wye-pattern unit with brass or bronze body and monel or stainless steel screen. Strainers shall be Cash-Acme Model SY, Hoffman Specialty “Model 420,” or Wright-Austin Model Y, or approved equal. The blow off from each strainer shall be equipped with a shutoff valve.

C. A strainer installed in piping immediately upstream from each 2-inch or smaller pressure-reducing valve shall be a wye-pattern unit with bronze, brass, or cast-iron body and monel or stainless steel screen. Strainers shall be Cash-Acme Model SY, Hoffman Specialty Model 420, Metraflex Style S, or Wright-Austin Model Y, or approved equal. Strainers installed in copper piping shall be of bronze or brass construction. The blow off from each strainer shall be equipped with a shutoff valve.

D. Where shown on the drawings, stainless steel wye-pattern strainers 2 inches and smaller shall be minimum pressure rating of 300-psi WOG. Material shall conform to ASTM A 351 or A 743, Grade CF8M. Screen shall be 20 mesh and the same material as the strainer. Provide pet cock of the same material as the strainer body in the blowoff connection. Ends shall be threaded conforming to ANSI B1.20.1. Provide one spare screen for each strainer. Strainers shall be Sarco Type 316, Muessco No. 861, or equal.

2.13 SPRAY ASSEMBLIES

A. The clarifier surface spray assemblies shall include a flat wide pattern, Type 316 stainless steel spray nozzle with a 95-degree V shaped spray pattern delivering 4.2 gallons per minute flow at 80 psig to the water surface of the clarifier and as shown in the Drawings. The assembly shall include a Type 316 stainless steel ball joint for directing the spray nozzle and a stainless steel ball valve for flow control and shut-off, as shown in the Drawings. Spray nozzle and ball joint shall be Order Numbers HU-1/2-VV-316SS-95-30 and 36275 with ½ -inch MNPT inlet and ½ -inch FNPT outlet, as manufactured by Spraying Systems Co (www.spray.com).

B. The headworks channels spray assemblies shall include a flat narrow pattern, Type 316 stainless steel spray nozzle with a 35-degree V shaped spray pattern delivering 4.2 gallons per minute flow at 80 psig to the water surface of the headworks channel and as shown in the Drawings. The assembly shall include a Type 316 stainless steel ball joint for directing the spray nozzle and a stainless steel ball valve for flow control and shut-off, as shown in the Drawings. Spray nozzle and ball joint shall be Order Numbers 3/8-P-316SS-35-30 and 36275 with ½ -inch MNPT inlet and 3/8 -inch FNPT outlet, as manufactured by Spraying Systems Co (www.spray.com).

2.14 PIPE INSULATION AND JACKETING

A. Pipe insulation shall be polyethylene, ½-inch minimum thickness,pre- split and self-seal type, sized for each pipe outer diameter, as manufactured by Thermacel, or approved equal.

B. Pipe jacketing shall be white PVC jacketing with self-seal lap, minimum thickness of 0.020-inches and suitable for outdoor installation, sized to cover pipe and polyethylene insulation applied to pipe, as manufactured by Proto, or approved equal.

PART 3 EXECUTION

3.01 INSTALLATION

A. The Contractor shall install all piping appurtenances as shown on the Drawings.

B. All piping appurtenances shall be installed in the location shown, unless approved otherwise, true to alignment and rigidly supported. Any damage

to the above items shall be repaired to the satisfaction of the Owner and the Engineer.

C. Install all pipe insulation and jacketing according to manufacturer's instructions and recommendations including sealing of exposed insulation surfaces with approved sealants and lapping of PVC jacket to reduce water intrusion, absorption, degradation of the pipe insulation product.

3.02 SHOP PAINTING

A. Exterior surfaces of ferrous piping appurtenances shall be painted in accordance with Section 09000, Painting and Protective Coatings, unless noted or specified otherwise.

3.03 INSPECTION AND TESTING

A. Completed piping appurtenances shall be subjected to hydrostatic pressure test as described in Section 15060, Piping Systems—General and Section 15144 Pressure Testing of Piping, and the detail pipe sections of these Specifications. All leaks in piping appurtenances shall be repaired retested as approved by the Engineer. Before testing, the appurtenances and pipelines shall be supported and thrust restrained for forces in excess of the test pressure to prevent movement during tests.

END OF SECTION

SECTION 15144
PRESSURE TESTING OF PIPING

PART 1 GENERAL

1.01 SCOPE OF WORK

A. This Section specifies the hydrostatic, pneumatic, and leakage testing for piping systems furnished and installed at wastewater pumping stations, wastewater treatment plants, and raw sewage force mains and lift stations.

1.02 RELATED WORK

A. Section 01620, Storage and Protection.

1.03 SUBMITTALS

A. The Contractor shall submit shop drawings in accordance with Section 01300, Shop Drawings, Submittals and Samples:

1. Test bulkhead locations and design calculations, pipe attachment details, and methods to prevent excessive pipe wall stresses.

2. Six copies of the test records to the Engineer upon completion of the testing.

1.04 WORK SEQUENCE (NOT USED)

1.05 REFERENCE STANDARDS (NOT USED)

Reference standards and recommended practices referred to in this Specification Section shall be the latest revision of any such document in effect at the bid time. The following documents are a part of this Section. Where this Section differs from these documents, the requirements of this Section shall apply.

A. American National Standards Institute (ANSI) Standards:

1. AWWA C600—Installation of Ductile Iron Water Mains.
2. AWWA C 605—Underground Installation of Polyvinyl Chloride (PVC) Pressure Pipe.

1.06 QUALITY ASSURANCE (NOT USED)

1.07 WARRANTIES (NOT USED)

1.08 DELIVERY, STORAGE, AND HANDLING (NOT USED)

1.09 QUALIFICATIONS (NOT USED)

1.10 TEST PRESSURES

A. Test pressures for the various services and types of piping are given in the Piping Schedule included in Specification Section 15000 Piping Systems – Schedule. For piping furnished and installed and not listed in the Piping Schedule, the Contractor shall perform pressure and leakage test at 1.5 times the maximum system operating pressure (based on the elevation or the lowest point of the section under test and corrected for gage location).

1.11 TESTING RECORDS

A. The Contractor shall provide field testing records of each piping system installation. These records shall include the following information:

1. Date and times of test.

2. Identification of process, pipeline, or pipeline section tested or retested, and Contractor's and/or Subcontractor's employee name(s) and Engineer and/or Owner's Representative witnessing the test.

3. Identification of pipeline material.

4. Identification of pipe specification.

5. Test fluid.

6. Test duration and gage pressure sustained over the duration of the test.

B. Test pressure at low point in process, pipeline, or pipeline section and correlating test gage pressure to meet or exceed and demonstrate compliance with the test pressure at low point.

C. Remarks: Leaks identified (type and location), types of repairs, or corrections made.

D. Certification by Contractor that the leakage rate measured conforms to these Specifications.

PART 2 PRODUCTS

2.01 VENTS AND DRAINS FOR ABOVEGROUND PIPING

A. The Contractor shall install vents on the high points of aboveground piping, whether shown in the Drawings or not. Install drains on low points of aboveground piping, whether shown in the Drawings or not. Provide a valve at each vent or drain point. Valves shall be 3/4 inch for piping 3 inches and larger and 1/2 inch for piping smaller than 3 inches. Valves shall be ball or gate valves unless otherwise shown on the Drawings. Valves shall be rated for the pressure of the adjacent piping and shall be suitable for use with the adjacent pipe material.

2.02 MANUAL AIR-RELEASE VALVES FOR BURIED PIPING

A. The Contractor shall 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.

2.03 TEST BULKHEADS

A. The Contractor shall design and fabricate test bulkheads in accordance with Section VIII of the ASME Boiler and Pressure Vessel Code. Materials shall comply with Part UCS of the code. Design pressure shall be at least 2.0 times the specified test pressure for the section of pipe containing the bulkhead. Limit stresses to 70% of yield strength of the bulkhead material at the bulkhead design pressure. Include air-release and water drainage connections.

2.04 TESTING FLUID

A. The Contractor shall provide supply of testing water of treated effluent from the existing wastewater treatment plant and for the filling the lines. Treated effluent shall not be used for testing potable water lines, chemical feed lines, and other lines as directed by the Engineer. Potable water lines

and chemical feed lines shall be filled and tested with potable water available at the plant site. An air break shall be maintained at all times between the potable water supply system and the Contractor's testing equipment. Piping shall be slowly filled with testing water and the specified test pressure shall be maintained in the pipe for the entire test period by means of a pump furnished by the Contractor. Provide accurate means for measuring the quantity of water required to maintain this pressure. The amount of water required is a measure of the leakage.

B. Testing fluid shall be treated effluent or potable water unless a pneumatic test is indicated on the Piping Schedule.

C. For fuel oil piping, use potable water for hydrostatic testing and flushing.

D. For potable water pipelines, obtain and use only potable water for hydrostatic testing.

E. Submit request for use of potable water from of Owner 48 hours in advance.

2.05 TESTING EQUIPMENT

A. The Contractors shall provide calibrated pressure gauges, pipes, bulkheads, pumps, compressors, chart recorder, and meters to perform the hydrostatic testing. The Contractors shall provide any necessary assistance required for testing.

PART 3 EXECUTION

3.01 TESTING PREPARATION

A. Pipes shall be in place, backfilled, and anchored before beginning pressure testing.

B. The Contractor shall 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. However, perform the final pressure test 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.

F. Before starting the test, the Contractor shall notify the Engineer and the Owner's Representative.

3.02 CLEANING

A. Before conducting hydrostatic tests, the Contractor shall flush pipes with water to remove dirt and debris. For pneumatic tests, blow air through the pipes. Maintain a flushing velocity of at least 3 fps for water testing and at least 2,000 fpm for pneumatic testing. Flush pipes for the period given by the formula

$$T = \frac{2L}{3}$$

in which:

T = flushing time (seconds)
L = pipe length (feet).

B. For pipelines 24 inches or larger in diameter, acceptable alternatives to flushing are use of high-pressure water jet, sweeping, or scrubbing. Water, sediment, dirt, and foreign material accumulated during this cleaning operation shall be discharged, vacuumed, or otherwise removed from the pipe.

3.03 TESTING AND DISINFECTION SEQUENCE FOR POTABLE WATER PIPING

A. Perform required disinfection after hydrostatic testing, unless otherwise indicated.

B. Disinfection shall be performed as described in Section 15141, Disinfection of Potable Water Piping and Storage Facilities.

3.04 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 3,500 feet; for buried pipe larger than 12 inches, 1 mile. Provide intermediate test bulkheads where the pipeline length exceeds these limits.

3.05 INITIAL PIPELINE FILLING FOR HYDROSTATIC TESTING

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

3.06 TESTING NEW PIPE WHICH CONNECTS TO EXISTING PIPE

A. Before testing new pipelines that are to be connected to existing pipelines, the Contractor shall isolate the new line from the existing line by 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.

3.07 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. Maintain the test pressure for a minimum of 2 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.

3.08 HYDROSTATIC TESTING OF BURIED PIPING

A. Where any section of the piping contains concrete thrust blocks or encasement, the Contractor shall 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 for at least 24 hours before conducting the pressure test.

B. Apply and maintain the test pressure by a positive displacement hydraulic force pump.

C. Maintain the test pressure for the 2 hours by restoring the pressure whenever it falls 5 psi.

D. After the test pressure is reached, use a meter to measure the additional water added to maintain the pressure. This amount of water is the loss due to leakage in the piping system. The allowable leakage volume is defined by the formula

$$L = \frac{HND(P)^{1/2}}{C}$$

in which:

L = allowable leakage (gallons)
H = specified test period (hours)
N = number of rubber-gasketed joints in the pipe tested
D = diameter of the pipe (inches)
P = specified test pressure (psig)
C = 7,400

E. The leakage test shall be a separate test following the pressure test and shall not be less than 2 hours long. All leaks evident at the surface shall be repaired and leakage eliminated regardless of the total leakage as shown by test. Lines that fail to meet tests shall be repaired and retested as necessary until test requirements are complied with. Defective materials, pipes, valves, and accessories shall be removed and replaced.

F. The allowable leakage for buried piping having threaded, brazed, or welded (including solvent welded) joints shall be zero.

G. Submit plan for testing to the Engineer for review at least 10 days before starting the test.

H. Peening shall not be used to repair pinhole leaks in welded pipes. Any leakage in welded pipes shall be repaired by appropriate welding techniques.

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

3.09 HYDROSTATIC FLUSHING AND TESTING OF FUEL OIL PIPING

A. Flush pipes with water to remove dirt and debris. Remove loose foreign material such as scale, sand, weld spatter particles, and cutting chips from the inside of piping assemblies. Hammer on the outside of steel piping with a nonmarring hammer to aid in freeing weld spatter, scale, and dirt.

B. Perform hydrostatic pressure testing as described previously.

C. After successfully completing the pressure testing, blow out the piping with clean, dry air having a dewpoint of at least -40°F. Circulate the air through the piping system until the exiting air has the same dew point as the applied air.

3.10 PRESSURE TESTING OF DOUBLE-WALLED CONTAINMENT PIPING

A. Test the primary pipe as described for buried and aboveground or exposed piping.

B. Test the secondary containment piping by performing a pneumatic test as described above of the annular space between the primary and secondary pipes at a pressure of 5 psi.

3.11 REPETITION OF TEST

A. If the actual leakage exceeds the allowable leakage, 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.

3.12 BULKHEAD AND TEST FACILITY REMOVAL

A. After a satisfactory test, the Contractor shall remove the testing fluid, remove test bulkheads and other test facilities, and restore the pipe coatings/linings.

END OF SECTION

SECTION 15251
SMALL DIAMETER GALVANIZED STEEL PIPING

PART 1 GENERAL

1.01 SCOPE OF WORK

A. Description: Provide small diameter galvanized steel piping and fittings (nominal diameters less than equal to 4 inches unless noted otherwise in the Drawings) as shown on the Contract Drawings and listed in the Piping Schedule, Section 15000 Piping Systems – Schedule.

1.02 RELATED WORK

A. Section 01300: Shop Drawings, Submittals and Samples
B. Section 02221: Trenching, Bedding, and Backfill for Pipe.
C. Section 15060: Piping Systems—General

1.03 SUBMITTALS

A. All submittals shall conform to the requirements of Specification Section 01300, Shop Drawings, Submittals and Samples, and Section 15060, Piping Systems—General.

1.04 QUALITY ASSURANCE

A. Piping materials and manufacturing shall adhere to the standards referenced herein.

B. Contractor shall strictly adhere to manufacturer's written storage, handling, installation, joining, and connection directions.

1.05 HANDLING, STORAGE, INSPECTION, AND PROTECTION

A. See Section 15060, Piping Systems—General.

PART 2 PRODUCTS

2.01 GENERAL

A. All pipe joints and fittings shall have the same schedule, pressure ratings, thermal resistance, chemical resistance, and other pertinent properties as the pipe being joined or connected.

B. Each pipe length shall be clearly marked with manufacturer's name or trademark, applicable ASTM standards, size, pressure rating and/or schedule.

C. Provide line size reducing tees for connection of lateral or instrumentation to pipe systems. Seal threaded fittings with Teflon™ tape or Teflon™ paste. Engage threaded fittings in accordance with ASTM A-53.

D. All flange bolts, nuts, and washers shall be AISI Type 304 stainless steel, ASTM A 193, Grade B8M hex head bolts and ASTM A 194, Grade 8M hex head nuts. Bolts shall be fabricated in accordance with ANSI B18.2.1 and shall be provided with washers. All bolts shall be treated with anti-galling compound prior to assembly.

2.02 GALVANIZED STEEL PIPE

A. Pipe: Steel piping shall conform to the requirements of ASTM A 53, Type S, Grade B, and ANSI B 36.10, Schedule 40, and installed in locations shown on the Contract Drawings and as listed in the Piping Schedule, Section 15000, Piping Systems - Schedule.

B. Fittings: Forged steel conforming to ASTM A 105 and ANSI B16.11, Class 2000.

C. Joints: Threaded conforming to ANSI B1.20.1.

D. Galvanizing: Conform to ASTM A 90.

PART 3 EXECUTION

3.01 GENERAL INSTALLATION REQUIREMENTS

A. All pipes shall be laid and maintained straight and true to line in conformance with the lines, grades, and elevations indicated in the drawings. Line and grade tolerances, where applicable, shall be in accordance with limits given for specific material.

B. Trenching, bedding, and backfills shall be in accordance with Section 02221, Trenching, Bedding, and Backfill for Pipe, and shall be installed in accordance with Section 15060, Piping Systems—General.

C. During laying operations, the Contractor shall not permit debris, tools, clothing, or similar items to be placed in pipes. Pipe interior shall be free of mud and kept clean at all times. Contractor shall secure the open ends of all piping at the end of construction each work day or any portion of a work day to prevent the intrusion of debris, precipitation, or soil from erosion. The proposed method of securing pipe open ends shall be approved by the Engineer. If piping is failed to be secured by the Contractor or if secured end is dislodged, the Engineer shall require the Contractor to flush all affected piping to remove accumulated debris, and verify that the piping is free of debris using a method acceptable to the Engineer, at no additional cost to the Owner.

D. Pipe ends shall be kept clear and clean and the Contractor shall ensure that inside surfaces are maintained smooth and free from any projections that may interfere with joint assembly or flow through the completed line.

E. Care shall be exercised when lowering pipe into trenches or on subgrade to prevent damage or twisting of the pipe. After laying and prior to completion of backfill or cover operations, pipe shall be protected from any vehicular traffic.

F. Existing piping flanged joints which are disassembled by the Contractor shall be fitted with new gaskets, as specified, upon reassembly.

3.02 PRESSURE AND LEAKAGE TESTS

A. Pressure Testing

1. Perform pressure and leak testing on all new galvanized steel piping shown in the Drawings and given in the Piping Schedule in accordance with Section 15060, Piping Systems—General and Section 15144, Pressure Testing of Piping.

END OF SECTION

SECTION 15276
STAINLESS STEEL PIPE

PART 1 GENERAL

1.01 DESCRIPTION

A. This Section includes materials and installation of stainless steel pipe and fittings 3 inches in diameter and smaller.

1.02 SUBMITTALS

A. The Contractor must do the following:

1. Submit shop drawings in accordance with Section 01300, Shop Drawings, Submittals and Samples, and the following.

2. Submit materials list showing material of pipe and fittings with ASTM reference and grade. Submit manufacturer's certification of compliance with referenced standards, e.g., ASTM A 53, A 135, A 587, AWWA C200. Show piping service (fuel oil, gasoline, water, air, etc.).

3. For piping 6 inches and larger, submit piping layout drawings showing location and dimensions of pipe and fittings. Include laying lengths of valves, meters, in-line pumps, and other equipment determining piping dimensions. Label or number each fitting or piece of pipe and provide the following information for each item:

a. Material of construction, with ASTM or API reference and grade.

b. Wall thickness of steel cylinder.

c. Manufacturer's certificates of compliance with referenced pipe standards, e.g., ASTM A 53, ASTM A 135, API 5L, AWWA C200.

d. Show weld sizes and dimensions of grooved-end collars, flanges, reinforcing collars, wrapper plates, and crotch plates.

PART 2 MATERIALS

2.01 PIPE

A. Pipe smaller than 3 inches shall conform to ASTM A 312, Grade TP 304L. Pipe 3 inches and larger shall conform to ASTM A 312, Grade TP 304L.

B. Pipe sizes and wall thicknesses shall conform to ANSI B36.19 as follows:

Pipe Size	Wall Thickness
3 inch and smaller	Schedule 40S

2.02 FITTINGS

A. Fittings 3 inches and smaller shall be socket welded, conforming to ANSI B16.11, 3,000-pound CWP. Material for socket welded fittings shall conform to ASTM A 403, Class WP 304L or ASTM A 182, Grade F304L.

2.03 PICKLING, PASSIVATING, AND FINAL CLEANING

A. Pipe and fittings shall be final cleaned, pickled, and passivated in accordance with ASTM A 380. Passivation shall be the removal of exogenous (not inherent in the base metal) iron or iron compounds from the surface of the stainless steel by means of a chemical dissolution, by a treatment with an acid solution that will completely remove the surface contamination but will not significantly affect the stainless steel itself. After final cleaning, wet surfaces with water and inspect for rust spots after 24 hours. Reclean if there is any evidence of rusting.

2.04 QUALITY CONTROL

A. Include the "Hydrostatic Test" and "Flattening Test" requirements described in ASTM A 530.

2.05 PROTECTIVE END CAPS

A. Provide protective end caps on each piece of pipe or fabricated section, completely sealing the piece from contamination during shipment and storage. Provide the same type of seals on each fitting or ship and store fittings in sealed boxes or containers.

2.06 UNIONS

A. Unions shall be 3,000-pound WOG forged stainless steel, with dimensions conforming to MSS SP-83. Ends shall be socket-welded type. Material shall conform to ASTM A 182, Grade F304L for socket-welded type.

2.07 JOINTS

A. Joints for pipes 3 inches and smaller shall be socket welded, the same material as specified for fittings, 3,000-pound WOG, conforming to ANSI B16.11.

B. Provide plain-end pipe where flexible pipe couplings are to be provided. Provide lugs for thrust harnesses where shown in the Drawings.

C. Where piping connects to wall pipes, meters, valves, or other equipment, the pipe ends shall match the ends of the wall pipes, meters, valves, or equipment.

2.08 OUTLETS AND NOZZLES

A. Outlets of size 3 inches and smaller in piping 4 inches and larger shall be of the Thredolet type, in accordance with MSS SP-97 and AWWA Manual M11 (1989 edition), Figure 13-23. Outlets shall be 3,000-pound WOG stainless steel in accordance with ASTM A 182, Grade F304L F316L or ASTM A 403, Grade WP304L WP316L. Threads shall comply with ANSI B1.20.1. Outlets shall be Bonney Forge Co. "Thredolet," Allied Piping Products Co. "Branchlet," or equal.

B. Alternatively, threaded openings not less than 2 inches or more than 3 inches in nominal size shall be a flat-bottom half-coupling conforming to ANSI B16.11, Class 3000. Where the mounting surface is curved to a diameter of 36 inches or less, the mounting diameter shall be the same as that of the surface upon which it is to be mounted. Forge the threaded outlet and its plug from steel conforming to ASTM A 105 or ASTM A 181, Class 70.

C. For outlets 3 inches and smaller in piping smaller than 4 inches, use a tee with a threaded outlet.

D. For outlets larger than 3 inches, use a tee with a flanged outlet.

2.09 GROOVED-END COUPLINGS

A. Grooved-end couplings for piping shall be Type 316 stainless steel. Couplings shall be flexible type, square-cut grooved, per AWWA C606. Couplings shall be Victaulic Style 77-S, Gustin-Bacon Figure 100, or equal.

B. Gaskets shall be CPDM and shall conform to ASTM D 2000.

C. Bolts in exposed service shall conform to ASTM A 193, GradeB8M, Class 2. Bolts in buried or submerged service shall be ASTM A 193, Grade B8M, Class 2.

D. Couplings for connecting to grooved-end valves shall be Victaulic Style 75 to match the valve ends.

E. Grooved-end adapter flanges having a maximum test pressure of 200 psi shall comply with ANSI B16.1, Class 125 dimensions. Flanges shall be Victaulic Style 741 or 742, Gustin-Bacon Figure 154, or equal.

2.10 THREAD LUBRICANT

A. Use Teflon thread lubricating compound or Teflon tape.

2.11 FLANGES

A. Provide weld-neck flanges (conforming to ANSI B16.5) for piping 3 inches and smaller to connect to flanged valves, fittings, or equipment. Flanges shall be Class 150 per ANSI B16.5. Flanges shall match the connecting flanges on the adjacent fitting, valve, or piece of equipment. Flanges shall be flat face.

B. Material for weld-neck flanges shall conform to ASTM A 182, Grade F304L.

C. Material for Van Stone flanges shall be stainless steel conforming to ASTM A351, Grade CF8M.

2.12 BOLTS AND NUTS FOR FLANGES

A. See Section 15060, Piping Systems—General.

2.13 LUBRICANT FOR STAINLESS STEEL BOLTS AND NUTS

A. See Section 15060, Piping Systems—General.

2.14 GASKETS FOR FLANGES

A. See Section 15060, Piping Systems—General.

PART 3 EXECUTION

3.01 FABRICATION, ASSEMBLY, AND ERECTION

A. Beveled ends for butt-welding shall conform to ANSI B16.25. Remove slag by chipping or grinding. Surfaces shall be clean of paint, oil, rust, scale, slag, and other material detrimental to welding. When welding the reverse side, chip out slag before welding.

B. Fabrication shall comply with ANSI B31.3, Chapter V. Welding procedure and performance qualifications shall be in accordance with Section IX, Articles II and III, respectively, of the ASME Boiler and Pressure Vessel Code.

C. The minimum number of passes for welded joints shall be as follows:

Steel Cylinder Thickness (inch)	Minimum Number of Passes for Welds
Less than 0.1875	1
0.1875 through 0.25	2
Greater than 0.25	3

Welds shall be full penetration.

D. Use the shielded metal arc welding (SMAW) submerged arc welding (SAW), flux-cored arc welding (FCAW), or gas-metal arc welding (GMAW) process for shop welding. Use the SMAW process for field welding.

E. Welding preparation shall comply with ANSI B31.3, paragraph 328.4. Limitations on imperfections in welds shall conform to the requirements in ANSI B31.3, Table 341.3.2, and paragraph 341.4 for visual examination.

F. Identify welds in accordance with ANSI B31.3, paragraph 328.5.

G. Clean each layer of deposited weld metal before depositing the next layer of weld metal, including the final pass, by a power-driven wire brush.

H. Use an inert or shielding gas welding method. Do not use oxygen fuel welding. The interior of the pipe shall be purged with inert gas before the root pass.

I. Welded butt joints (both longitudinal and circumferential) shall comply with AWWA C 220, Section 4. Do not use backing rings. Provide full penetration and smooth internal diameters for the root bead of welds. Grind the inside weld of socket welds flush with the pipe internal diameter. Welds shall be of smooth finish. Use anti-spatter compounds specifically formulated or designed for use with stainless steel. Do not allow heat tint to form in the heat-affected zone or remove heat tint completely from the heat-affected zone of the finished weld. The maximum depth of grinding or abrasive blasting to remove defects shall not exceed 10% of the wall thickness. Do not perform abrasive blasting with steel shot, grit, or sand.

J. No iron or steel surfaces shall come into contact with the stainless steel. This includes placing the stainless steel on steel tables, racks, pipe supports, etc. Do not use carbon steel wire brushes or grinders.

K. Welding electrodes shall comply with AWS A5.4. Bare wire shall comply with AWS A5.9. Use electrodes as follows:

Pipe Material	Welding Electrode Material
Type 304	E 308
Type 304L	E 347
Type 316	E 316
Type 316L	E 318

3.02 SHOP TESTING OF FABRICATED OR WELDED COMPONENTS

A. After completion of fabrication and welding in the shop and before the application of any lining or coating, test each component according to the referenced standards. Test fabricated fittings per AWWA C200. Test the seams in fittings which have not been previously shop hydrostatically tested by the dye penetrant method as described in ASME Boiler and Pressure Vessel Code Section VIII, Appendix B. In lieu of the dye penetrant method of testing, completed fittings may be hydrostatically tested. Use the field hydrostatic test pressure or 125% of the design pressure, whichever is higher.

3.03 INSTALLING THREADED PIPING

A. Ream, clean, and remove burrs from threaded piping before making up joints. Apply thread lubricant to threaded ends before installing fittings, couplings, unions, or joints.

3.04 INSTALLING FLANGED PIPING

A. See Section 15060, Piping Systems—General.

3.05 INSTALLATION OF STAINLESS STEEL BOLTS AND NUTS

A. See Section 15060, Piping Systems—General.

3.06 INSTALLING GROOVED-END PIPING

A. See Section 15060, Piping Systems—General.

3.07 INSTALLING UNIONS

A. Provide unions on exposed piping 3 inches and smaller as follows:

1. At every change in direction (horizontal and vertical).

2. Six to 12 inches downstream of valves.

3. Every 40 feet in straight piping runs.

4. Where shown in the Drawings.

3.08 INSTALLING ABOVEGROUND OR EXPOSED PIPING

A. See Sections 15060, Piping Systems—General.

3.09 INSTALLING BURIED PIPING

A. Install in accordance with Section 02221, Trenching, Bedding, and Backfill for Pipe, and as follows.

B. When installing pipe in trenches, do not deviate more than 1 inch from line or ¼ inch from grade. Measure for grade at the pipe invert.

3.10 INSTALLING SUBMERGED PIPING

A. Install pipe on the alignment shown in the Drawings.

B. Do not add water into the basins while the pipe is empty.

3.11 FIELD HYDROSTATIC TESTING

A. Hydrostatically test pipe and fittings in the field in accordance with Section 15144, Pressure Testing of Piping. See Piping Schedule for test pressures.

B. Do not allow test water to remain in the pipe for more than five days. Drain and dry the piping after completing the testing.

3.12 PAINTING AND COATING

A. Coat exposed carbon steel grooved-end couplings and Van Stone flanges per Section 09000, Painting and Protective Coatings, System No. 2.

B. Coat submerged carbon steel grooved-end couplings with System No. 1 per Section 09000, Painting and Protective Coatings.

C. Coat buried carbon steel grooved-end couplings with System No. 1 per Section 09000, Painting and Protective Coatings.

D. Do not coat stainless steel grooved-end couplings and flanges.

E. Do not coat buried stainless steel piping.

3.13 COATING BURIED AND SUBMERGED BOLTS, NUTS, AND TIE RODS

A. See Section 15060, Piping Systems—General.

END OF SECTION

SECTION 15290
PVC PIPE - 4 INCHES DIAMETER AND SMALLER

PART 1 GENERAL

1.01 DESCRIPTION

A. This Section includes materials, installation, and testing of PVC pipe and fittings of size 4 inches and smaller for use in process piping having a maximum design pressure of 150 psi and having a maximum design temperature of 105°F.

B. Refer to Section 11260, Sodium Hypochlorite Feed System, for additional requirements for all sodium hypochlorite PVC piping systems.

1.02 SUBMITTALS

A. The Contractor shall do the following:

1. Submit shop drawings in accordance with Section 01300, Shop Drawings, Submittals and Samples, and the following.

2. Submit materials list showing materials of pipe and fittings with ASTM reference and grade. Submit manufacturer's certification of compliance with referenced standards, e.g., ASTM D 1784, D 1785, and D 2467. Show wall thickness of pipe and fittings. Show fitting dimensions.

3. Submit data sheets for solvent cement and demonstrating compliance with ASTM D 2564 and F 656.

4. Submit data sheets showing that the pipe and fittings are ANSI/NSF 61 listed for use in potable water service and that the pipe will bear the NSF logo for potable water use.

PART 2 MATERIALS

2.01 PIPE

A. Pipe shall be Schedule 40, Type I, Grade 1 (Class 12454-B), conforming to ASTM D 1784 and D 1785. Pipe for all sodium hypochlorite piping systems shall be Schedule 80.

B. Pipe shall bear the NSF logo for potable water use.

2.02 FITTINGS

A. Fittings shall be Schedule 40 and shall conform to ASTM D 2464 for threaded fittings and ASTM D 2467 for socket-type fittings. Fittings shall be Schedule 80 for all sodium hypochlorite piping systems.

2.03 FLANGES

A. PVC flanges shall be of the one-piece solid socket design and shall be made of the same material as the pipe. Pressure rating shall be at least 150 psi at a temperature of 73°F. Minimum burst pressure shall be 500 psi. Flanges shall match the dimensions of ANSI B16.5, Class 150, steel flanges for outside diameter, bolt circle, and bolt holes. Do not use Van Stone flanges.

2.04 UNIONS

A. Unions shall have socket-type ends, Viton O-rings, and shall be Schedule 80. Material shall be Type I, Grade 1 PVC, per ASTM D 1784.

2.05 JOINTS

A. Pipe and fitting joints shall be socket welded except where threaded and flanged joints are required to connect to valves and equipment.

B. Tape for threaded joints shall be Mil Spec P-27730A Teflon tape.

2.06 SOLVENT CEMENT FOR GENERAL SERVICE

A. Solvent cement for socket joints shall comply with ASTM D 2564 and F 656.

2.07 SOLVENT CEMENT IN CHEMICAL AND SODIUM HYPOCHLORITE SERVICE

A. Solvent cement shall be free of silica. Products: IPS “Weld-On 724”.

2.08 GASKETS FOR FLANGES

A. See Section 15060, Piping Systems—General.

B. Gaskets for sodium hypochlorite service shall be Viton.

2.09 BOLTS AND NUTS FOR FLANGES

A. See Section 15060, Piping Systems—General.

B. Bolts, nuts, and washers for sodium hypochlorite service shall be titanium.

2.10 LUBRICANT FOR STAINLESS STEEL BOLTS AND NUTS

A. See Section 15060, Piping Systems—General.

2.11 WYE STRAINERS

A. PVC wye strainers shall be manufactured of the same material as the pipe, with 30-mesh screens and Viton seals. Connecting ends shall be the socket type, solvent welded. Provide one spare screen for each strainer.

PART 3 EXECUTION

3.01 GENERAL

A. Do not install PVC pipe when the temperature is below 40° F or above 90°F. Store loose pipes on racks with a maximum support spacing of 3 feet. Provide shades for pipe stored outdoors or installed outdoors until the pipe is filled with water.

B. Store fittings indoors in their original cartons.

C. Store solvent cement indoors or, if outdoors, shade from direct sunlight exposure. Do not use solvent cements that have exceeded the shelf life marked on the storage container.

D. Before installation, check pipe and fittings for cuts, scratches, gouges, buckling, kinking, or splitting on pipe ends. Remove any pipe section containing defects by cutting out the damaged section of pipe.

E. Do not drag PVC pipe over the ground, drop it onto the ground, or drop objects on it.

3.02 SOLVENT-WELDED JOINTS

A. Before solvent welding, remove fittings and couplings from their cartons and expose them to the air at the same temperature conditions as the pipe for at least one hour.

B. Cut pipe ends square and remove all burrs, chips, and filings before joining pipe or fittings. Bevel solvent-welded pipe ends as recommended by the pipe manufacturer.

C. Wipe away loose dirt and moisture from the inside and outside of the pipe end and the inside of the fitting before applying solvent cement. Clean the surfaces of both pipes and fittings that are to be solvent welded with a clean cloth moistened with acetone or methylethyl ketone. Do not apply solvent cement to wet surfaces.

D. The pipe and fitting socket shall have an interference fit. The diametrical clearance between pipe and entrance of the fitting socket shall not exceed 0.04 inch. Check the fit at every joint before applying solvent cement.

E. Make up solvent-welded joints per ASTM D 2855. Application of cement to both surfaces to be joined and assembly of these surfaces shall produce a continuous bond between them with visual evidence of cement at least flush with the outer end of the fitting bore around the entire circumference.

F. Allow at least eight hours of drying time before moving solvent-welded joints or subjecting the joints to any internal or external loads or pressures.

G. Acceptance criteria for solvent-welded joints shall be as follows:

1. Unfilled Areas in Joint: None permitted.

2. Unbonded Areas in Joint: None permitted.

3. Protrusion of Material into Pipe Bore, Percent of Pipe Wall Thickness: Cement, 50%.

3.03 FLANGED JOINTS

A. Lubricate carbon steel bolt threads with graphite and oil before installation.

B. Tighten bolts on PVC flanges by tightening the nuts diametrically opposite each other using a torque wrench. Complete tightening shall be

accomplished in stages and the final torque values shall be as shown in the following table:

Pipe Size (inches)	Final Torque (foot-pounds)
1/2 to 1-1/2	10 to 15
2 to 3	20 to 30

3.04 INSTALLATION OF STAINLESS STEEL BOLTS AND NUTS

A. See Section 15060, Piping Systems—General.

3.05 THREADED JOINTS

A. Cut threaded ends on PVC to the dimensions of ANSI B1.20.1. Ends shall be square cut. Follow the pipe manufacturer's recommendations regarding pipe hold-down methods, saw cutting blade size, and saw cutting speed.

B. Pipe or tubing cutters shall be specifically designed for use on PVC pipe. Use cutters manufactured by Reed Manufacturing Company, Ridge Tool Company, or equal.

C. If a hold-down vise is used when the pipe is cut, insert a rubber sheet between the vise jaws and the pipe to avoid scratching the pipe.

D. Thread cutting dies shall be clean and sharp and shall not be used to cut materials other than plastic.

E. Apply Teflon® thread compound or Teflon® tape to threads before screwing on the fitting.

3.06 INSTALLING UNIONS

A. Provide unions on exposed (above grade and in vaults) piping 3 inches and smaller as follows:

1. At every change in direction (horizontal and vertical).
2. Six to 12 inches downstream of valves.
3. Every 40 feet in straight pipe runs.
4. Where shown in the Drawings.

3.07 INSTALLING BURIED PIPE

A. Install in accordance with Section 02221, Trenching, Bedding, and Backfill for Pipe, and as follows.

B. Trench bottom shall be continuous, smooth, and free of rocks. See the details in the Drawings for trench dimensions, pipe bedding, and backfill.

C. After the pipe has been solvent-welded and the joints have set, snake the pipe in the trench according to the pipe manufacturer's recommendations in order to allow for thermal expansion and contraction of the pipe.

D. Do not backfill the pipe trench until the solvent-welded joints have set. Support the pipe uniformly and continuously over its entire length on firm, stable soil. Do not use blocking to change pipe grade or to support pipe in the trench.

E. Install buried PVC pipe in accordance with ASTM D 2774 and the pipe manufacturer's recommendations. Backfill materials in the pipe zone shall be imported sand as specified in Section 02221, Trenching, Bedding, and Backfill for Pipe. If water flooding is used, do not add successive layers unless the previous layer is compacted to 90% relative compaction.

3.08 INSTALLING ABOVEGROUND OR EXPOSED PIPING

A. See Section 15060, Piping Systems—General.

B. Fill empty piping with water, provide temporary shading, or use other means to keep the surface temperature of the pipe below 100°F.

3.09 PAINTING AND COATING

A. Coat piping that is exposed to sunlight as specified, Section 09000, Painting and Protective Coatings, System No. 10.

3.10 PIPE LABELS AND COLOR CODING

A. Label and color code exposed piping and piping located inside concrete pipe trenches with flow stream identification labels and banding in accordance with Section 15110, Manual, Check, and Process Valves, and the Piping Schedule.

3.11 HYDROSTATIC TESTING

A. Perform hydrostatic testing for leakage in accordance with Section 15144, Pressure Testing of Piping.

END OF SECTION

SECTION 16050
ELECTRICAL - GENERAL PROVISIONS

PART 1 - GENERAL

1.01 SCOPE OF WORK

A. Furnish all labor, materials, devices, equipment, appurtenances, and incidentals required for a complete electrical system as hereinafter specified and/or shown on the Contract Drawings. This work may necessarily include interfacing with and/or completely installing devices and/or equipment furnished under other sections of these Specifications.

B. It is the intent of these Specifications that the electrical system be suitable in every way for the service required. All materials and all work/labor which may be reasonably implied as being incidental to the requirements of this Section shall be furnished at no additional cost to the County.

C. All power interruptions to existing equipment shall be at the County's convenience. Each interruption shall have prior approval. Request(s) for power interruption(s) shall be made at least forty-eight (48) hours in advance.

D. The work shall include complete testing of all electrical components, including wiring.

E. All workmanship shall be of the highest quality. Substandard work will be rejected and it shall be replaced entirely at the Contractor's expense with <u>no</u> cost to the County.

F. It shall be the responsibility of each bidder or his authorized representative to physically visit the job site in order that he may be personally acquainted with the area(s), buildings and/or structures intended for use in the installation/construction under this Specification. The submittal of a proposal/bid by a bidder shall be considered evidence that he has complied with this requirement and accepts all responsibility for a complete knowledge of all factors governing his work. Therefore, failure to comply with this requirement of the Specifications will <u>NOT</u> be grounds for the successful bidder (Contractor) to request approval of change orders and/or additional monetary compensation.

1.02 TEMPORARY ELECTRICAL SERVICE

A. The Contractor shall make the requisite arrangements for securing temporary electrical power for his use in accordance with Section 01510 of these Specifications.

1.03 CODES, INSPECTIONS AND FEES

A. All materials and installations shall be in accordance with the National Electrical Code (latest edi tion) an d t he l atest e ditions of al l a pplicable national, state, county and local codes.

B. To the extent that any item is routinely tested and rated by the Underwriter's Laboratories, Inc., that item shall bear the U.L. label. A dditionally, all i tems s hall be manufactured to the applicable NEMA standards.

C. The Contractor shall make the necessary arrangements for obtaining all requisite permits and inspections and pay any applicable fees.

1.04 TESTS

A. The Contractor shall test all items individually and as a system for proper operation.

B. The Contractor shall, at his expense, make all the requisite repairs, adjustments and/or alterations to correct any shortcomings found as a result of the tests performed under Item 1.04.A above.

C. A r epresentative o f t he County shall be pr esent du ring al l t esting. The County shall be notified at least two (2) days prior to any testing.

1.05 SLEEVES AND FORMS FOR OPENINGS

A. Provide and place all sleeves for conduits penetrating floors, walls, partitions, etc. Locate all necessary slots for electrical work and form before concrete is poured.

1.06 CUTTING AND PATCHING

A. All cutting and patching shall be done in a thoroughly workmanlike manner - i.e., care shall be taken when cutting not to damage or mar surrounding areas, and when patching to match the original finish as closely as possible while providing a watertight seal. Refer to Item 1.01.E above.

1.07 INTERPRETATION OF DRAWINGS

A. The layouts and arrangements as shown on the Contract Drawings are indicative of t he ph ysical arrangements desired; however, they are not intended to restrict the C ontractor's f reedom t o ac commodate t he ex act conditions as found in the field. Any deviations from t he ar rangements s hown m ust be appr oved by t he County prior to the final placement of the item(s) in question.

B. The Contract Drawings are not intended to show exact locations of conduit runs.

C. Circuit and conduit layouts shown are not intended to indicate the exact installation details. The Contractor shall furnish and install all requisite items, including all fittings, junction boxes, etc., to insure that the electrical system operates in conformance with the Specifications and the specific requirements of an individual piece of equipment.

D. Where circuits are shown as "home-runs", all necessary fittings and boxes shall be provided for a complete conduit installation.

E. All three-phase circuits shall be run in separate conduits unless otherwise shown on the Contract Drawings.

F. Surface mounted items such as panelboards, junction boxes, conduit, etc., shall be supported by spacers to provide a clearance between the equipment and the mounting surface.

G. The County shall make the final decision in determining the exact location(s) and mounting height(s) of any item(s) or piece(s) of equipment in question.

H. All connections to equipment shall be made in accordance with the approved shop and manufacturer's drawings, regardless of the number of conductors shown on the Contract Bid Drawings.

I. The Contractor shall coordinate the work of the different trades in order to prevent interferences between conduit(s), piping and other non-electrical equipment. In case any interference develops, an authorized representative of the County shall decide which equipment, conduit(s) or piping must be relocated, regardless of which was installed first. Any such interferences shall be remedied solely at the Contractor's expense without any additional cost to the County.

1.08 EQUIPMENT SIZING AND HANDLING

A. The Contractor shall thoroughly check all entryways, doors, hallways, stairways, buildings and structures through which equipment must be transported to reach its final location.

B. If necessary for safe passage of the equipment, the manufacturer shall be required to ship his material in sections sized to pass through the restricted areas. This requirement holds even if such equipment sizing differs from the manufacturer's standard shipping section.

C. To the extent possible, the equipment shall be kept upright at all times. If equipment has to be tilted for ease of passage through restricted areas, the manufacturer shall provide specific handling instructions as well as any requisite bracing in order to assure both the functional integrity of the equipment and the validity of the equipment warranty.

1.09 SUBMITTALS

A. As specified under Section 01340 of these Specifications, the Contractor shall submit shop drawings and/or manufacturer's cut sheets for approval of all materials, equipment, devices, apparatus, and other items as required by the County.

1. Prior to submittal by the Contractor, all shop drawings shall be checked for accuracy and Contract requirements. Shop drawings shall bear the date checked and shall be accompanied by a statement that the shop drawings have been examined for conformity to the Specifications and Contract Drawings. This statement shall also list all discrepancies with the Specifications and Contract Drawings. Shop drawings not so checked and noted shall be returned unchecked by the County.

2. The County's check shall be only for conformance with the design concept of the Project and compliance with the Specifications and Contract Drawings. The responsibility for, or the necessity of, furnishing materials and workmanship required by the Specifications and Contract Drawings which may not be indicated on the shop drawings is included under the work of this Section.

3. No material shall be ordered, no equipment manufacturing shall be started, nor shall any shop work/fabrication commence until the County has approved the shop drawings. Any deviation from this requirement of the Specifications shall be entirely at the risk and expense of the Contractor without any additional cost to the County.

B. Record Drawings: As the work progresses, the Contractor shall legibly record all field changes on a set of Contract Drawings. When the project is completed, the Contractor shall furnish the County with a complete set of reproducible "as-built" drawings.

1.10 MANUFACTURER'S SERVICES

A. The Contractor shall arrange for an authorized manufacturer's representative who shall be an experienced field service engineer to be present for the inspection, installation, testing, calibration, adjusting and start-up of any item(s) or piece(s) of equipment as deemed necessary by the County.

B. In addition to the duties of Item 1.11.A below, the manufacturer's representative shall also instruct the County's personnel in the proper operation and maintenance of the item(s) in question.

1.11 MATERIALS

A. All materials used shall be new, unused and as hereinafter specified. Where not specifically called out, all materials shall be of the very best quality of their respective kinds. Unless specifically otherwise approved in writing by the County, only material manufactured in the United States shall be used!

B. Where applicable, all materials and equipments hall conform with the requirements of Item 1.03.B above.

C. Electrical equipments hall at all times during construction be adequately protected against both mechanical injury and damage by water. Electrical equipment shall be stored indoors in dry shelters. Any damaged equipment shall be replaced by the Contractor at his own expense.

D. All items shall be manufactured from the materials specified - substitute materials will NOT be acceptable.

E. Only the specified manufacturer's equipments hall be used unless an " or approved equal" is noted. The County shall be the sole determiner of what constitutes an "approved equal".

1.12 GUARANTEES AND WARRANTIES

A. All items furnished under the Electrical Specifications shall be guaranteed and/or warranted, in writing, against defects in materials, construction and workmanship as specified under Section 01740 of these Specifications.

1.13 SHOP DRAWINGS

A. As specified under other Sections, shop drawings shall be submitted for approval for all materials, equipment, apparatus, and other items as required by the Engineer.

B. Shop drawings shall be submitted for the following equipment:

1. Motor Control Center
2. PLC Control Cabinet
3. Fiber Optic Cabinets
4. Hauler Access Stations
5. Disconnects
6. Circuit Breakers
7. Ground Rods
8. Conductors
9. Conduit

C. Prior to submittal by the CONTRACTOR, all shop drawings shall be checked for accuracy and contract requirements. Shop drawings shall bear the date checked and shall be accompanied by a statement that the shop drawings have been examined for conformity to Specifications and Drawings. This statement shall also list all discrepancies with the Specifications and Drawings. Shop drawings not so checked and noted shall be returned.

D. The Engineer's check shall be only for conformance with the design concept of the project and compliance with the Specifications and Drawings. The responsibility of, or the necessity of, furnishing materials and workmanship required by the Specifications and Drawings, which may not be indicated on the shop drawings, is included under the work of this Section.

E. The responsibility for all dimensions to be confirmed and correlated at the job site and for coordination of this work with the work of all other trades is also included under the work of this Section.

F. No material shall be ordered or shop work started until the Engineer's approval of shop drawings has been given.

END OF SECTION

SECTION 16075

ELECTRICAL IDENTIFICATION

PART 1 - GENERAL

1.01 SUMMARY

A. Section Includes:
1. Nameplates.
2. Labels.
3. Wire markers.
4. Lockout Devices.

1.02 CLOSEOUT SUBMITTALS

A. Project Record Documents: Record actual locations of tagged devices; include tag numbers.

1.03 DELIVERY, STORAGE, AND HANDLING

A. Division 1 - Product Requirements: Requirements for transporting, handling, storing, and protecting products.

B. Accept identification products on site in original containers. Inspect for damage.

C. Accept materials on site in original factory packaging, labeled with manufacturer's identification, including product density and thickness.

D. Protect insulation from weather and construction traffic, dirt, water, chemical, and mechanical damage, by storing in original wrapping.

1.04 ENVIRONMENTAL REQUIREMENTS

A. Division 1 - Product Requirements: Environmental conditions affecting products on site.

B. Install labels and nameplates only when ambient temperature and humidity conditions for adhesive are within range recommended by manufacturer.

PART 2 - PRODUCTS

2.01 NAMEPLATES

A. Product Description: Laminated three-layer plastic with engraved white letters on black background color.

B. Letter Size:

1. 1/8 inch high letters for identifying individual equipment and loads.
2. 1/4 inch high letters for identifying grouped equipment and loads.

C. Minimum nameplate thickness: 1/8 inch.

1.05 LABELS

A. Labels: Embossed adhesive tape, with 3/16 inch white letters on black background.

1.06 WIRE MARKERS

A. Description: Cloth tape, split sleeve, or tubing type wire markers.

B. Legend:

1. Power and Lighting Circuits: Branch circuit or feeder number.
2. Control Circuits: Control wire number as indicated on shop drawings.

1.07 LOCKOUT DEVICES

A. Lockout Hasps:

1. Anodized aluminum hasp with erasable label surface; size minimum 7-1/4 x 3 inches.

PART 3 – EXECUTION

3.01 PREPARATION

A. Degrease and clean surfaces to receive adhesive for identification materials.

3.02 INSTALLATION

A. Nameplate Installation:

1. Install nameplate parallel to equipment lines.
2. Install nameplate for each electrical distribution and control equipment enclosure with corrosive-resistant mechanical fasteners, or adhesive.
3. Install nameplates for each control panel and major control components located outside panel with corrosive-resistant mechanical fasteners, or adhesive.
4. Secure nameplate to equipment front using screws or adhesive.
5. Secure nameplate to inside surface of door on recessed panelboard in finished locations.
6. Install nameplates for the following:

    a. Transfer Switch.
    b. Main Disconnect Switch.
    c. Generator.
    d. Generator Emergency Shut Down

B. Wire Marker Installation:

1. Install wire marker for each conductor at panelboard gutters, pull boxes, outlet and junction boxes, and each load connection.
2. Mark data cabling at each end. Install additional marking at accessible locations along the cable run.
3. Install labels at data outlets identifying patch panel and port designation.

END OF SECTION

SECTION 16100

BASIC MATERIALS AND METHODS

PART 1 - GENERAL

1.01 SCOPE OF WORK

A. All work shall be executed in a neat and workmanlike manner by experienced and capable electricians so as to present a neat installation upon completion.

1.02 QUALITY ASSURANCE

A. Electrical work shall be performed in accordance with the current standards of the electrical trades. The provisions of the NEC and existing local requirements shall comprise the minimum acceptable standards of electrical work.

1.03 DELIVERY, STORAGE, HANDLING, & ENVIRONMENTAL REQUIREMENTS

A. Equipment and material shall be suitably delivered and stored in the original containers, but shall be readily accessible for inspection. All items subject to moisture damage shall be stored in dry spaces. All material and equipment shall be protected against dirt, dust, water and chemical or mechanical injury, vandalism and theft. Upon completion of the work all equipment and materials shall be cleaned thoroughly, polished and finished in a condition satisfactory to the OWNER.

PART 2 - PRODUCTS

2.01 EQUIPMENT

A. All equipment and materials shall be new and shall bear the manufacturer's name, trade name, and the UL label. In cases where a standard has been established for a particular material, the material shall be so labeled. The equipment to be furnished shall be essentially the standard product of a manufacturer regularly engaged in the production of the required type of equipment for this type of work and shall be the manufacturer's latest approved design.

2.02 ACCESSORIES

A. Clamps, screws, fasteners and support devices shall be of noncorrosive metal.

PART 3 - EXECUTION

3.01 EXAMINATION

A. The electrical drawings are diagrammatic and indicate the general arrangements of the electrical work. The CONTRACTOR shall carefully examine the Drawings and shall ascertain that the equipment and accessories will be properly located and readily accessible.

3.02 INSTALLATION

A. Equipment and appurtenances furnished by various manufacturers shall be installed in strict accordance with the manufacturer's instructions and approved wiring diagrams for type and capacity of each piece of equipment used. These instructions shall be considered as part of these Specifications. Any OWNER-furnished equipment shall be connected by the CONTRACTOR, including all necessary cords and plugs.

B. Dimensions shown on the drawings are based on the information provided by the manufacturer for specific models indicated. The contractor shall be responsible for insuring proper clearances, coordination with other equipment, etc. for any substitutions to the equipment used as the basis for the design.

END OF SECTION

SECTION 16108
MISCELLANEOUS EQUIPMENT

PART 1 - GENERAL

1.01 SCOPE OF WORK

A. Furnish and install all miscellaneous equipment as hereinafter specified and/or shown on the Drawings.

A. Installation shall be in the locations described herein and/or shown on the Drawings and/or where directed by the County's authorized personnel.

PART 2 - PRODUCTS

2.01 MATERIALS

A. CIRCUIT BREAKERS

1. To match existing equipment, the new motor operated valve circuit breakers shall be the Eaton Catalog No. FD3200 for use on an existing Cutler Hammer Freedom Series 2100 Motor Control Center, NO SUBSTITUTIONS!

B. SAFETY SWITCHES

1. The safety switches shall be the visible blade, non-fusible, heavy duty type, shall have a quick-make, quick-break, single throw operating mechanism, and shall have both a dual cover interlock and a color coded indicator handle.

2. The safety switches shall have three (3) poles, rated as indicated at 600 VAC, shall have all current carrying parts made of copper, and shall be furnished in a NEMA 4X stainless steel enclosure.

3. The safety switches shall have 3/4-inch bolt-on hubs and a copper ground kit.

4. In addition to being UL listed under files E2875 and 154828, the safety switches shall comply with the following standards:

a. UL 98, Enclosed and Dead Front Switches.
b. NEMA KS1, Enclosed Switches.
c. Federal Spec WS-865c for Type "HD".

5. To match existing equipment, the safety switches shall be the Class 3110 Heavy Duty Safety Switch, Square "D" Catalog No. HU361SS, NO SUBSTITUTIONS!

C. SUPPORT CHANNEL

1. The stainless steel channel and stainless mounting hardware shall be as manufactured by Unistrut, Kindorf, or approved equal.

PART 3 - EXECUTION

(NOT USED)

END OF SECTION

SECTION 16110
CONDUITS AND FITTINGS

PART 1 - GENERAL

1.01 SCOPE OF WORK

Furnish and install the conduits, fittings, devices and appurtenances as hereinafter specified and/or as shown on the Contract Drawings.

1.02 SUBMITTALS

The requirements of Section 01340 and Section 16050 shall be met.

1.03 APPLICATIONS

A. Except where otherwise shown on the Contract Drawings, or hereinafter specified, all wiring shall be run in rigid conduits.

B. Rigid aluminum conduits shall be used at all locations aboveground and within structures and buildings except where otherwise shown on the Contract Drawings.

C. Rigid aluminum conduits shall be used at all locations for shielded instrumentation and shielded control wiring except where otherwise shown on the Contract Drawings.

D. Schedule 80 PVC conduits shall be used for all underground, under-slab and in-slab applications except where otherwise shown on the Contract Drawings.

E. Schedule 80 PVC conduits shall be used in highly corrosive areas such as chlorine storage areas, digesters, fluoride storage and handling areas, etc.

F. All conduits of a given type shall be the product of one manufacturer.

G. Except where otherwise shown on the Contract Drawings, or hereinafter specified, all boxes shall be metal.

H. Flush mounted switch, receptacle and control station boxes shall be pressed steel.

I. Surface mounted switch, receptacle and control station boxes shall be cast or malleable iron.

J. Devices designated as NEMA Type 4X shall be 316 stainless steel, gasketed.

K. Combination expansion-deflection fittings shall be used where conduits cross structural expansion joints.

PART 2 - PRODUCTS

2.01 MATERIALS

A. Rigid Conduit

1. Rigid aluminum conduit shall be as manufactured by the Youngstown Sheet and Tube Company, Wheeling-Pittsburg Steel Corp., or approved equal.

2. Rigid PVC conduit shall be Carlon Plus 80 rigid PVC non-metallic conduit (extra heavy wall EPC-80) as manufactured by Carlon, or approved equal.

B. Liquidtight, Flexible Conduit

1. Liquidtight, flexible metal conduits shall be Sealtite, Type UA, as manufactured by Anaconda, American Flexible Conduit Co., Inc., or approved equal.

2. Liquidtight, flexible non-metallic conduits shall be Carflex Liquidtight Flexible Non-Metallic Conduit as manufactured by Carlon, or approved equal.

C. Rigid Conduit Fittings

1. Rigid Aluminum Conduit Fittings:

a. Elbows, bends, sweeps, nipples, couplings, etc., shall be aluminum as manufactured by Youngstown Sheet and Tube Company, or approved equal.

b. Conduit hubs shall be as manufactured by Meyers Electric Products, Inc., or approved equal.

2. Rigid Non-Metallic Conduit Fittings: PVC elbows, bends, sweeps, nipples, couplings, device boxes, etc., shall be Plus 80 fittings as manufactured by Carlon, or approved equal.

D. Flexible Conduit Fittings

1. Flexible Metal Conduit Fittings: Fittings used with flexible metal conduit shall be of the screw-in type as manufactured by Thomas and Betts Company, or approved equal.

2. Flexible Non-Metallic Conduit Fittings: Fittings used with flexible non-metallic conduit shall be Carflex Liquidtight Non-metallic Fittings as manufactured by Carlon, or approved equal.

E. Flexible Couplings: Flexible couplings shall be as manufactured by Crouse-Hinds, Appleton Electric Company, or approved equal.

F. Wall Seals: Conduit wall seals shall be type "WSK" as manufactured by the O.Z. Electrical Manufacturing Company, or approved equal.

G. Expansion Fittings: Combination expansion-deflection fittings shall be type "XD" as manufactured by Crouse-Hinds, or approved equal.

H. Boxes

1. Device Boxes

a. Flush mounted wall device boxes shall be galvanized pressed steel as manufactured by the Raco Manufacturing Company, or approved equal.

b. Surfaced mounted wall device boxes shall be cast or malleable iron as manufactured by Crouse-Hinds, Appleton Electric Company, or approved equal.

c. Flush mounted in-floor device boxes shall be cast metal, shall be watertight, shall have adjustable cover frames, and shall be as manufactured by Russell & Stoll Company, Steel City Electric, or approved equal.

2. Other Boxes

a. Terminal boxes, junction boxes, pull boxes, etc., except as otherwise specified and/or shown on the Contract Drawings, shall be hot-dipped galvanized steel.

b. The boxes shall have continuously welded seams which shall be ground smooth prior to being galvanized.

c. The box bodies shall be flanged, shall be not less than 14-gauge metal, and shall <u>not</u> have holes or knockouts.

d. The box covers shall be not less than 12-gauge metal, shall be gasketed, and shall be fastened to the box bodies with stainless steel screws.

e. The boxes shall be as manufactured by Hoffman Engineering Company, or approved equal.

I. Conduit Mounting Devices: Hangers, rods, channel, backplates, clips, straps, beam clamps, etc., shall be 316 grade stainless steel as manufactured by Appleton Electric Company, Thomas and Betts Company, Unistrut Corp., or approved equal.

J. Fixture Support System

1. The fixture support system shall be the channel type and shall be furnished complete with all requisite mounting hardware and appurtenances.

3. The channel, mounting hardware and related appurtenances shall be 316 grade stainless steel.

3. The fixture support system shall be as manufactured by the Unistrut Corp., or approved equal.

PART 3 - EXECUTION

3.01 INSTALLATION

A. No conduit smaller than 3/4-inch electrical trade size shall be used nor shall either 1-1/4-inch conduit or 3-1/2-inch conduit be used. Minimum size underground, under slab or in-slab shall be 1-inch.

B. No wires shall be pulled until the individual conduit runs are complete in all details. Additionally, each conduit shall be cleaned and reamed and certified clear of all burrs and obstructions before any wire is pulled.

C. The ends of all conduits shall be tightly capped to exclude dust and moisture during construction.

D. Conduits shall be supported at intervals of 8-feet or less, as required to obtain a rigid installation.

E. Exposed conduits shall be run parallel with and/or perpendicular to the surrounding surface(s). No diagonal runs will be allowed.

F. Single conduits shall be supported by one-hole pipe clamps in combination with one-screw backplates to provide space between the conduits and the mounting surface.

G. Multiple horizontal runs of conduits shall be supported by trapeze type hangers (channel) suspended by threaded rod, 3/8-inch minimum diameter.

H. Multiple vertical runs of conduits shall be supported by structurally mounted channel in combination with conduit clamps.

I. Conduit support devices shall be attached to structural steel by welding or beam or channel clamps as indicated on the Contract Drawings.

J. Conduit support devices shall be attached to concrete surfaces by " spot type"

concrete inserts.

K. Conduits terminating in pressed steel boxes shall have double locknuts and insulated bushings.

L. Conduits terminating in gasketed enclosures shall be terminated with conduit hubs.

M. Conduit wall seals, waterproof type, shall be used at all locations where conduits penetrate walls.

N. Liquidtight, flexible conduit - metal or non-metallic as shown on the Contract Drawings - shall be used for all motor terminations and for all connections/terminations where vibration is anticipated.

O. Flexible couplings shall be used in hazardous locations for all motor terminations and for all connections/terminations where vibration is anticipated.

P. Conduit stubouts for future construction shall be capped at both ends with threaded PVC conduit caps.

Q. The cement used for PVC conduit installations shall be as manufactured by Carlon, or approved equal.

R. Aluminum conduit shall be used for all risers. The underground portion of the riser and a 12-inch section of the riser immediately above the ground or slab/floor level shall be painted with a bitumastic coating.

S. The use of electrical metallic tubing shall be restricted to low voltage applications (600V or less) in non-process areas where specifically approved by the County on a "per installation" basis - e.g., above suspended ceilings in office areas.

T. Underground ducts for feeders, instrumentation wiring, control wiring, and communication wiring shall be plastic conduit and shall be encased in reinforced concrete as shown. In general, the plastic conduit shall be PVC Schedule 80, NEMA TC-2, as manufactured by Carlon, Triangle, Allied Tube, or equal. Ducts shall be installed as shown and shall be sloped uniformly between the elevations shown. Manufactured fitted plastic duct spacers shall be used for installation spacing.

U. Concrete for the encasement shall be Class B using aggregate not exceeding 3/4 inch and shall be reinforced as shown. Ducts shall drain to the manholes or end structures. End bell fittings shall be provided on the ducts in the manholes.

V. Appropriate expansion fittings or other approved methods shall be used in the installation of plastic ducts so as to avoid expansion and distortion prior to encasement in concrete. Spacers shall be located a maximum of 8 feet, 0 inches on-centers and the duct spacings center-to-center shall not vary in excess of 1/16 inch from the specified spacings shown, prior to and after encasement.

W. Each duct shall be carefully cleaned before and after installation. All inside surfaces shall be free from imperfections likely to injure the cable. After installation of complete duct runs in sizes 2 inches and larger, ducts shall be snaked with an approved tube cleaner equipped with an approved cylindrical mandrel of a diameter not less than 85 percent of the nominal diameter of the duct. Ducts through which the mandrel will not pass shall not be incorporated in the work. After snaking, the ends of dead-ended ducts shall be protected with standard conduit caps to prevent the entrance of water or other foreign matter.

X. Where ducts enter buildings or at stub-ups to equipment, transitions to aluminum conduits shall be made as noted and detailed. Where it is not otherwise shown, all ducts entering buildings and structures, exclusive of manholes, shall have transitions to aluminum conduit at least 5 feet from the outermost edge of the pile cap or footing supporting the outermost vertical wall of the building or structure.

Y. Transition from above-grade rigid aluminum conduit to nonmetallic conduit shall be accomplished with a threaded adapter. Rigid aluminum conduit installed above grade and extending below grade shall include the first 90° elbow. All rigid aluminum conduit extending below grade shall be coated with two coats of an asphaltum-type paint along its entire length below grade and extending 6” above grade or above the top of the finished slab. The asphaltum-type paint shall conform to Fed. Spec. TT-V-51 and equivalent to Koppers Bitumastic Super Service Black.

3.02 GUARANTEES AND WARRANTIES

A. The Contractor shall guarantee and warrant all materials and labor provided under this Section in accordance with Section 01 740 and Section 16050 of these Specifications.

END OF SECTION

SECTION 16120
WIRES AND CABLES

PART 1 - GENERAL

1.01 SCOPE OF WORK

A. Furnish and install all wires, cables and appurtenances as described hereinafter and/or as shown on the Contract Drawings.

A. Furnish and install all wires, cables and appurtenances as described hereinafter and/or as shown on the Contract Drawings.

1.02 SUBMITTALS

A. The requirements of Section 01340 and Section 16050 shall be met.

B. Samples of the actual wires and cables proposed for use shall be submitted for approval. There shall be a sample for each size and type of wire and cable proposed for use. The samples shall be of sufficient length to show the maximum rated voltage, insulation type and class, conductor size, the manufacturer's name, trademark or identifying logo, and the U.L. listing number.

C. The wires and cables as approved for use shall be compared with the wires and cables actually installed. If any unapproved wires and cables are installed, they shall be removed and replaced solely at the Contractor's expense with no additional cost to the County.

1.03 APPLICATIONS

A. The wire for lighting and receptacle circuits shall be type THHN/THWN, stranded.

B. The wire for all power circuits and motor leads shall be type THHN/THWN, stranded.

C. Single conductor wires for control, indication and metering shall be type THHN/THWN, No. 14 AWG, stranded.

D. Multiconductor control cable shall be No. 14 AWG, stranded.

E. The wire for process instrumentation shall be No. 18 AWG, stranded.

1.04 MINIMUM SIZES

A. Except for control and signal leads, no conductor smaller than No. 12 AWG shall be used.

PART 2 - PRODUCTS

2.01 MATERIALS

A. Wire and cables shall be made of annealed, 98% conductivity, soft drawn copper conductors.

B. All conductors shall be stranded except that the uninsulated copper grounding conductors shall be solid. However, the Contractor may, at his option, install solid conductors for the lighting and receptacle circuits.

2.02 600 VOLT WIRE AND CABLE

A. Type THHN/THWN insulation shall be used for all 600 Volt wires and cables. The insulation shall be a flame-retardant, heat-resistant thermoplastic, and shall have a nylon, or equivalent, jacket.

B. The 600 Volt wires and cables shall be as manufactured by Anixter, Rome Cable, Southwire, or approved equal.

2.03 INSTRUMENTATION AND CONTROL WIRING

A. Process instrumentation wiring shall be No. 16 AWG stranded twisted pair, 600 Volt, cross-linked polyethylene insulated, aluminum tape shielded, PVC jacketed. Multiconductor cables with individually twisted pairs shall be installed where shown on the Contract Drawings.

B. Multiconductor control cables shall be Type TC Control Cable, No. 14 AWG copper, stranded, 600 Volt, THWN insulated, PVC jacketed, U. L. listed for direct burial.

C. Instrumentation wiring shall be as manufactured by Belden, Alpha, or approved equal.

A. Control wiring shall be as manufactured by Southwire, or approved equal.

2.04 SEPTAGE AND GREASE STATION EQUIPMENT VFD MOTOR CABLES

A. VFD motor supply cable for shall be rated for 1000V and shall contain 4-conductors, (3) #12 AWG stranded tinned copper circuit conductors plus (1) #12 AWG ground wire with PVC insulation, XLP insulation, overall Duofoil® (100% coverage) plus a tinned copper braid shield (85% coverage), tinned copper drain wire and a sun- & oil-resistant PVC jacket.

B. Where called for in the contract documents, VFD motor supply cable shall be Belden 29502. NO SUBSTITUTIONS!

PART 3 - EXECUTION

3.01 INSTALLATION

A. Wires and cables shall be sized as shown on the Contract Drawings and/or, where applicable, sized to match existing wiring.

B. All conductors shall be carefully handled to avoid kinks or damage to the insulation.

C. Lubricants or pulling compounds shall be used to facilitate wire pulling. Such lubricants/compounds shall be U.L. listed for use with the insulation specified.

D. Use pulling means - fish-tape, cable, rope, basket weave wire/cable grips, etc. - which will not damage the wire/cable insulation or the raceway.

E. Shielded instrumentation wire shall be installed from terminal to terminal with no splicing at any intermediate point.

F. Shielded instrumentation wire shall be installed in rigid steel conduit and pull boxes that contain only instrumentation cables. Instrumentation cables shall be separated from control cables in manholes.

G. Shielding on instrumentation cables shall be grounded at the transmitter end only.

H. All new wires and cables shall be continuous and without splices between points of connection to equipment terminals. However, the County will permit a splice provided that the length between the connection points exceeds the greatest standard shipping length available from the submitted manufacturer and no other manufacturer acceptable to the County is able to furnish wires or cables of the required length.

I. All 600 volt wire and cable connections shall be made using compression type connectors. Insulated connectors shall be used for all terminations. The connections shall be made so that both the conductivity and the insulation resistance shall be not less than that of the uncut conductor.

J. All wires shall be numbered at both ends and at all intermediate junction points. Screw type terminations shall be made with forked tongue (spade), self-insulated, crimp terminals. All other wire terminations shall be made on appropriate terminal strips.

3.02 TESTS

A. Upon the completion of the pulling-in of and prior to the terminating/connecting of the 600 Volt wiring, all wires shall be individually checked and tested for continuity and short circuits, and each wire/cable shall be meggered to check insulation resistance. The test voltage shall be not less than 500 Volts. Three (3) copies of these test results shall be submitted to the County.

B. An authorized representative(s) of the County shall witness all testing. The County shall be notified at least two (2) days in advance of the testing.

C. Any faulty conditions and/or shortcomings found during the testing shall be corrected at no cost to the County. However, a retest to demonstrate compliance shall be conducted before any hook-ups or terminations are made. Any such requisite retesting shall be witnessed by an authorized representative(s) of the County.

3.03 GUARANTEES AND WARRANTIES

A. The Contractor shall guarantee and warrant all materials and labor provided under this Section in accordance with Section 01 740 and Section 16050 of these Specifications.

END OF SECTION

SECTION 16170

OVERCURRENT PROTECTIVE DEVICES

PART 1 - GENERAL

1.01 SYSTEM DESCRIPTION

A. Main Disconnect: A main disconnecting means meeting the requirements of the NEC shall be furnished and installed for the electrical service as shown on the drawings. The main disconnect shall be provided by others.

PART 2 - PRODUCTS

2.01 ACCESSORIES

A. Safety Switches: All safety switches shall be heavy-duty type "HD". The blades of switches shall be quick-make, quick-break operating type. All lugs on all switches shall be equal to Burdy's solderless quick lugs or shall be compression type. Switches shall have the number of poles and be of the size indicated. Enclosures shall be of the NEMA type indicated on the drawings. The switch shall conform to NEMA Standards and shall be UL listed. Switches shall be Square-D.

PART 3 - EXECUTION

3.01 INSTALLATION

A. Install safety switches as recommended by the manufacturer, required by Code, and as shown on the drawings.

END OF SECTION

SECTION 16190

SUPPORTING DEVICES

PART 1 – GENERAL

1.01 WORK INCLUDED

A. Conduit supports.

B. Channel supports for equipment.

1.02 REFERENCE STANDARDS

A. National Electrical Code

PART 2 - PRODUCTS

2.01 CONDUIT SUPPORTS

A. Single Runs: Galvanized conduit straps or ring bolt type hangers with specialty spring clips. Plumbers perforated straps or wire will not be acceptable.

B. Multiple Runs: Conduit rack with 25 percent spare capacity.

C. Vertical Runs: Channel support with conduit fittings.

2.02 CHANNEL SUPPORTS

A. Steel channel sections shall be rolled from AISI 1008 commercial grade steel and be in conformance with ASTM A569-72.

B. The cross sectional width dimension of the channel shall be a minimum of 1-5/8-inch. The depth will be as required to satisfy the load requirements. Channel with 1-5/8-inch depth or greater shall be rolled from manufacturer's standard 12 gauge steel. Channel smaller than 1½-inch may be manufacturer's standard 14 gauge steel.

C. Attachment holes, when required, shall be factory punched on hole centers equal to the channel cross sectional width dimension and shall be a maximum of 9/16-inch in diameter.

D. Channel attachment nuts shall be designed to prelocate in the channel and provide a bearing surface on the turned down lips while making positive contact with the side walls of the channel.

E. Straps for the support of conduit shall be designed such that the attachment nut is captivated on the shoulder of the strap when tightened, and the attachment bolt shall allow tightening by either a screwdriver or wrench.

F. All nuts, bolts, straps, threaded rod and edges of punched holes shall be protected with the same finish as the channel.

G. The finish on steel components shall consist of a combination of .0005 inch electrogalvanizing on steel in accordance with ASTM B633-7B Type LS coating and a gold zinc dichromate barrier formed on the zinc. This coating shall be applied after factory fabrication of the material.

H. When tested in accordance with ASTM B117-73 procedure, there shall be no sign of red rust after 1,000 hours of testing. Certified test results to support this must be submitted upon request.

I. Aluminum strut shall be manufactured of extruded aluminum alloy 6063-T6. All fittings and hardware shall be zinc-plated according to ASTM B663.

2.03 ANCHOR METHODS

A. Hollow Masonary: Toggle bolts or tapcons.

B. Solid Masonary: Tapcons.

C. Metal Surfaces: machine screws, bolts, welded studs, or beam type clamps on steel joints.

D. Wood Surfaces: Wood Screws

E. Concrete Surfaces: Tapcons.

PART 3 - EXECUTION

3.01 INSTALLATION

A. Layout to maintain headroom, neat mechanical appearance, and to support equipment loads required.

B. Verify exact mounting and installation requirements with the Owner's representative prior to installation.

END OF SECTION

SECTION 16370
VARIABLE FREQUENCY DRIVES

PART 1 - GENERAL

1.01 SCOPE OF WORK

A. Furnish two (2) variable frequency drives as specified hereinafter.

1.02 DRIVE APPLICATION

A. The variable frequency drives will be used to control the speed of inverter duty rated NEMA B design squirrel cage induction motors driving horizontal axial flow pumps in wastewater effluent pumping service. The motors will be rated 40 HP and 7.5 HP.

1.03 DRIVE PARAMETERS

A. The variable frequency drives shall be designed and sized for the loads intended, shall not exceed their full-rated capacity when the driven pumps are operating at maximum capacity, shall not overload under any operating condition of the pumps, and shall be provided with an integral bypass motor starter package.

1.04 SPARE PARTS

A. As a minimum, each of the variable frequency drives shall be furnished with the following spare parts:

1. One (1) circuit board of each type used.
2. Three (3) spare bulbs of each type and size used.
3. Three (3) lens caps of each color and size used.
4. Three (3) sets of power fuses.
5. Three (3) sets of control fuses.

1.05 MANUFACTURER'S QUALIFICATIONS

A. The variable frequency drives shall be the products of a single manufacturer who has been in the business of designing and manufacturing variable frequency drives for a period of at least ten (10) years.

B. The manufacturer shall have a factory authorized representative (s) and/or a certified repair shop(s) located within the State of Florida staffed with factory trained service personnel capable of providing installation and start-up assistance, routine and 24-hour emergency repair services (including parts), and training for the County's personnel in operating and maintenance procedures associated with the specific variable frequency drives furnished.

C The manufacturer shall offer both standard and extended period service contracts as part of his normal operating policy.

A. The Variable Frequency Drive shall have a minimum of 28 years documented mean time between failure (MTBF). MTBF to be based on the Bellcore TR-322 standard. A certification that this standard is met is to be provided with the bid.

1.06 MANUFACTURER'S REPRESENTATIVE

A. A factory trained authorized representative(s) of the manufacturer shall be available to perform the following functions:

1. Provide installation assistance to the County's personnel on an "as needed" basis, one (1) scheduled day minimum.

2. Provide checkout and start-up services as well as conduct the final acceptance tests, two (2) scheduled days.

3. Provide training for the County's personnel in the proper operation and maintenance techniques to be used with the specific AFD's furnished, two (2) scheduled days.

B. The manufacturer shall include in his bid sufficient funds to cover all the costs (travel, meals, lodging) associated with providing the services listed in Item 1.06.A.1, 2 and 3 above.

1.07 SUBMITTALS

A. Within six (6) weeks of receiving the order, the manufacturer shall furnish the County with certified dimension prints which clearly show the nameplate data and outline dimensions.

B. Prior to start of manufacture of the variable frequency drives, the manufacturer shall submit sets of drawings which shall include, but not necessarily be limited to, enclosure drawings showing the location of both internally and externally mounted components, master wiring diagrams showing all interconnections to the discrete component level, elementary or control schematics including coordination with other external control devices operating in conjunction with the variable frequency drives, and outline drawings with sufficient details to allow for locating conduit stub-ups and field wiring. In addition, documentation certifying compliance with the MTBF standard listed in 1.05,D is to be provided.

C. Failure to comply with Item 1.06.B above shall be entirely at the manufacturer's risk. Any changes required as a result of the County's review will be solely at the manufacturer's expense with no cost to the County.

1.08 WARRANTY

A. The manufacturer shall warrant that the variable frequency drives shall be free from defects in all materials and workmanship for a period of two (2) years from date of final acceptance.

B During the Warranty period, any and all covered defects shall be corrected by the manufacturer solely at his own expense with no cost to the County.

PART 2 - PRODUCTS

2.01 VARIABLE FREQUENCY DRIVES

A. GENERAL

1. The variable frequency drives shall be the adjustable frequency (AF), variable torque (VT), p ulse w idth modulated (PWM) t ype d esigned t o pr ovide continuous s peed ad justment of 3 -phase N EMA B s quirrel c age i nduction motors, inverter duty rated.

2. The adjustable frequency drives (AFD's) shall be d esigned to control 50 H P motors respectively, a nd shall be rated f or t he hor sepower (HP), f ull-load current (Amps), and speed (RPM) of the motors actually supplied.

3. The AFD's shall be furnished in the new motor control center. The enclosures shall be forced air ventilated using door-mounted fans. F an installation shall include cleanable, reuseable air filters.

B. CONSTRUCTION

1. The A FD's s hall b e m icroprocessor b ased s olid s tate dev ices c onsisting of three (3) basic sections:

a. A rectifier section to change the constant frequency AC input voltage to a D C voltage. A 12-pulse full wave rectifier shall integral to the AFD power section as part of it's core design and shall reduce harmonics and pr event i nput l ine n otching. I nternal fast acting s emiconductor fuses s hall b e i nstalled t o pr eclude t he n ecessity f or h aving ex ternal AC line fuses. 12-pulse low harmonic technology is to be used. Other mulit-pulse systems utilizing aut otransformer t echnology or r equiring separate r ectifiers are no t al lowed. P assive harmonic filters utilizing capacitors are not acceptable.

b. A DC b us/link s ection t o i nterconnect the r ectifier s ection and the inverter s ection. A D C l ine r eactor and c apacitors s hall b e used to smooth the DC bus/link operation, improve displacement power factor, lower har monic di stortion, a nd eliminate t he ne ed for a n i solation transformer.

c. An inverter section to convert the D C voltage to a variable frequency AC voltage. I nsulated g ate bipolar transistors (IGBT's) shall be used as output switching devices to allow "tripless" operation, reduce motor noise, pr ovide s moother m otor operation, a ssure r eliable and s afe shutdowns u nder f ault conditions, a nd increase dr ive efficiency; specifically, SCR's, G TO's, an d Darlington T ransistors ar e not

acceptable as switching devices under this Specification.

3. The AFD's shall be capable of operating from a 3-phase input voltage of 480 Volts ±10% over a frequency range of 48-63 Hertz while providing a constant volts per Hertz excitation to the motors.

4. The AFD's shall have a one minute overload rating of 110%, minimum.

5. The AFD's shall employ surface mount technology for reduced size, high reliability, ease of maintenance, and resistance to vibration.

6. The AFD's shall incorporate full internal protection against short circuits, ground faults, over- and undervoltage, over- and undercurrent, and temperature extremes.

7. The AFD's shall contain an adjustable electronic motor overload (I^2t) circuit to eliminate the need for an external motor overload relay.

8. The AFD's shall utilize advanced diagnostic techniques to simplify trouble shooting and correcting problems.

9. The AFD's shall have a minimum drive efficiency of 97% at full speed and full load.

10. The AFD's shall have a minimum fundamental power factor of 0.98 at all speeds and loads.

11. The AFD's shall be able to operate under the following environmental conditions without modification or derating:

    a. Temperature: 0 to 40 degress C.

    b. Altitude: Up to 3,300' above sea level.

    c. Humidity: O to 95%, non-condensing.

12. The AFD's shall be UL listed and shall comply fully with the applicable standards and provisions of ANSI, NEMA, IEEE, IEC, and NEC, latest revisions.

C. STANDARD FEATURES

1. The AFD's shall, as a minimum, have the standard features and adjustments listed below:

    a. The AFD's shall have the same customer interface regardless of horsepower rating, including keypad, digital display, and user connections. The keypad and the digital display shall be accessible without opening the main door of the drive enclosures.

b. The keypad shall be the seven (7) button touch type and shall be used for start-up, for setting all parameters, for stepping through the displays and menus, and for local control, including speed adjustments.

b. In addition to the keypad speeds adjustment provisions, the AFD's shall also be furnished with a manual speed adjustment potentiometer. The potentiometer shall be accessible without opening the main door of the drive enclosures.

c. The digital display shall be the LCD alphanumeric type with 40-character, 2-line capability. The LCD display shall be backlit to provide easy viewing at any angle in any light condition. The display shall have adjustable contrast.

d. The display shall utilize plain English - i.e., all set-up parameters, indications, faults, warnings, and other such information must be displayed in words for easy user understanding; specifically, alphanumeric code numbers requiring memorization, cross-reference tables, or manuals for interpretation will not be acceptable under this Specification.

e. The AFD's shall incorporate pre-programmed application macros for ease of start-up. To reduce programming time, the macros shall provide one command operation to reprogram all parameters and user interfaces for a particular application.

f. The AFD's shall provide a user selectable option of either displaying a fault or running at a preset speed if a reference input is lost.

g. The AFD's shall be capable of a "flying start" into a rotating load and accelerating to setpoint without safety tripping or damage to the drives or driven equipment.

h. The user terminal strip shall be isolated from both the line and ground.

i. The AFD's shall have the ability to automatically restart after an overcurrent, overvoltage, undervoltage, or loss of input signal protective trip. The number of restart attempts, trial time, and time between reset attempts shall be programmable. If the time between reset attempts is greater than zero, the time remaining until reset occurs shall count down on the display to warn an operator that a restart will occur.

k. The AFD's shall be equipped with an automatic extended power loss ride-through circuit which will utilize the inertia of the load to keep the drive powered. Minimum power loss ride-through shall be two seconds, based on full load and no inertia. Removing power from the motor will not be an acceptable method of increasing power loss ride-through under this Specification.

l. The AFD's shall be optimized for a 3 kHz carrier frequency to reduce motor noise.

m. The AFD's shall incorporate the following three (3) separate current limit circuits to provide "trip free" operation:

1) A slow current regulation limit circuit which shall be an adjustable percentage of the AFD's variable torque current rating, minimum setting of 125%. This adjustment shall be made via the keypad and shall be displayed in actual amperes, not as a percentage of full load.

2) A rapid current regulation limit circuit which shall be an adjustable percentage of the AFD's variable torque current rating, minimum setting of 170%.

3) A current switch-off limit circuit which shall be a fixed percentage of the AFD's variable torque current rating, minimum setting of 255% instantaneous.

n. In addition to any software items listed above, the AFD's shall, as a minimum, contain the following built-in software features:

1) Automatic slip-compensation for maintaining motor speed under varying load conditions.

2) A motor under-load function to protect the pumps.

3) Starting torque up to 180% of full load torque.

4) User selectable manual or automatic IR compensation for torque increases over a selected frequency range.

5) Five (5) adjustable/selectable critical frequency lock-out bands to avoid load resonance points during ramp-up or ramp-down.

6) Two (2) acceleration and two (2) deceleration ramps, adjustable from 0.1 seconds to 1800 seconds.

7) Three (3) adjustable S-curve acceleration and deceleration patterns.

8) User selectable linear, squared, or automatic control of the Volts-per-Hertz shape to assure maximum energy efficiency.

9) Precise full range frequency resolution adjustable in 0.01 Hertz increments.

10) Integral kilowatt-hour and elapsed-time displays.

11) Integral PI and sequential control functions.

12) Hand-Off-Auto function for local control through the integral keypad and remote control via pushbuttons and/or potentiometers.

o. The AFD's shall have seven (7) programmable preset speeds as well as unidirectional rotation and coast-to-a-stop features.

p. The AFD's shall have two (2) programmable analog inputs capable of accepting either a current or a voltage signal. Inputs shall be filtered and shall have adjustable gain and offset.

q. The AFD's shall have six (6) programmable digital inputs.

r. The AFD's shall have two (2) programmable analog outputs proportional to the chosen reference (frequency, motor speed, etc.).

s. The AFD's shall have three (3) programmable digital outputs. Outputs must be true Form C relays; specifically, open collector outputs will not be acceptable under this Specification.

t. The AFD's shall be equipped with an RS-485 serial port capable of communicating with external PLC's, DCS's, DDC's, and touch-screen graphic operator panels.

u. The AFD's digital display shall contain, as a minimum, the following information shown in complete English words; specifically, alphanumeric code numbers requiring memorization, cross-reference tables, or manuals for interpretation will not be acceptable under this Specification:

Output Frequency	DC Bus Voltage
Output Voltage	Heatsink Temperature
Motor Speed	Analog Input Values
Motor Current	Keypad Reference Values
Calculated Motor Torque	Elapsed Time
Calculated Motor Power	Kilowatt-hours

v. The AFD's shall, as a minimum, incorporate the following protective circuits which, in the case of a protective trip, shall stop the drive and announce the fault condition in complete English words; specifically, alphanumeric code numbers requiring memorization, cross-reference tables, or manuals for interpretation will not be acceptable under this Specification:

1) Overcurrent: Trip set at 315% instantaneous (225% RMS) of the AFD's variable torque current rating.

2) Overvoltage: Trip set at 130% of the AFD's rated voltage.

3) Undervoltage: Trip set at 65% of the AFD's rated voltage.

4) Overtemperature: Trip set at +70EC or +85EC dependent upon drive furnished.

5) Ground Fault: Both "running" and "at start".

6) Adaptable Electrical Motor Overload (I^2t): Motor protection shall be based on motor speed and load; specifically, circuits which are not speed dependant will not be acceptable under this Specification.

w. The VFD's shall incorporate a parameter lock feature which will prevent unauthorized personnel from altering the drive parameters without entering a programmable password or combination number. The parameter lock shall also be settable to a digital input.

D. FACTORY INSTALLED OPTIONS

1. In addition to the Hand-Off-Auto switch and speed potentiometer mentioned hereinabove, the AFD's shall include the following factory installed options:

a. Circuit Breaker: The circuit breaker shall be the thermal magnetic, thru-the-door interlock type, padlockable in the Off position.

b. 115 VAC Control Transformer and Terminal Board: A terminal board shall be provided for convenient connection of all field control wiring, including all drive inputs and outputs and 115 VAC start input. A control transformer, 150 VA minimum, shall also be included.

c. Numbered Wires: All internal drive wires shall be numbered at both ends to facilitate maintenance and trouble shooting.

F. ACCEPTABLE MANUFACTURERS: The AFD's shall be as manufactured by the ABB Industrial Systems Inc., Eaton Corporation (Cutler Hammer Division), Allen-Bradley, or Yaskawa by ICON Technologies.

PART 3 - EXECUTION

3.01 FACTORY TESTING

A. Prior to assembly in the AFD's, all printed circuit boards shall be thoroughly factory tested and given a minimum eight (8) hour burn-in.

B. After assembly, the drives shall be given a minimum eight (8) hour load test using a driven motor. The load shall be continuously cycled from no-load to full rated load to induce maximum stress and thermal variations in the drive components.

C. During the load test, the major drive parameters (input volts, output volts, output current, output speed, output frequency, percent load, etc.) shall be recorded and a copy of the test results shall be reviewed by the County prior to the shipment of the AFD's. Similarly, any failure(s) of the drives during the load test shall be recorded, analyzed, corrected, and reported to the County before shipment of the AFD's.

3.02 SHIPPING

A. The AFD's shall be so packaged for shipment that they are maximally protected from both physical and environmental damage.

B. The AFD's shall be transported to the County's job sites utilizing the manufacturer's customary method of shipment.

3.03 INSTALLATION

A. The AFD's shall be installed by the County's personnel in accordance with the recommendations and procedures set forth in the installation manual furnished by the manufacturer.

B. An authorized factory trained representative(s) of the manufacturer shall be available to assist the County's personnel on an "as needed" basis.

3.04 CHECKOUT AND START-UP

A. Prior to start-up, a factory trained representative(s) of the manufacturer shall be on hand to assure that the AFD's have been properly installed and that all field wiring is correctly terminated.

B. After checkout, the manufacturer's representative(s) shall then conduct a certified factory start-up using procedures and forms established by the manufacturer of the AFD's.

C. A copy of the certified start-up form(s) for each drive shall be provided to the County, and a copy shall be kept on file by the manufacturer.

3.05 FIELD TESTING

A. After satisfactory completion of the checkout and start-up procedures, the manufacturer's representative(s) shall begin an eight (8) hour acceptance test using actual plant loads.

B. Any and all short-comings discovered and/or failures occurring during the

acceptance test shall be remedied by the manufacturer solely at his own expense with no cost to the County.

C. Any time after four (4) hours of acceptance testing, the County may, at his option, curtail further testing and take acceptance of the AFD's.

3.06 TRAINING

A. As set forth in Items 1.05.B and 1.06.A above, a factory trained authorized representative(s) of the manufacturer shall be available at such a time(s) and place(s) established by the owner to train the County's personnel in the proper operation and maintenance procedures required by the specific AFD's furnished.

3.07 WARRANTY

A. The manufacturer shall furnish to the County a written warranty which complies with the requirements set forth in Item 1.08 above.

END OF SECTION

SECTION 16445
MOTOR CONTROL CENTERS

PART 1 GENERAL

1.01 SUMMARY

A. Section Includes: Requirements for providing new motor control centers.

B. Related Work Specified in Other Sections Includes:

1. Section 16050 - Basic Electrical Materials and Methods
2. Section 16110 - Wires and Cables
3. Section 16370 – Variable Frequency Drives

1.02 REFERENCES

A. Codes and standards referred to in this Section are:

1. IEEE C37.90 - IEEE Standard for Relay and Relay Systems Associated with Electrical Power Apparatus

2. IEEE C62.41 - IEEE Recommended Practice on Surge Voltages in Low Voltage AC Power Circuits

3. IEEE C62.45 - IEEE Guide on Surge Testing for Equipment Connected to Low Voltage AC Power Circuits

4. MIL-STD-220A - Method of Insertion-loss Measurement 12/1/59; with N1and N2 (Fed/mil H-q)

5. NEMA ICS 2 - Industrial Control and Systems Controllers, Contactors and Overload Relays Not More than 2000 Volts AC or 750 Volts DC.

6. NEMA ICS 3 - Industrial Control and Systems Factory Built Assemblies

7. NEMA 250 - Enclosures for Electrical Equipment (1000 Volts Maximum)

8. UL 486A - Wire Connectors and Soldering Lugs for Use With Copper Conductors

9. UL 845 - Motor Control Centers

10. UL 1283 - Electromagnetic Interference Filters

11. UL 1449 - Transient Voltage Surge Suppressors

1.03 SYSTEM DESCRIPTION

A. Design Requirements: Provide equipment capable of operating in an ambient temperature range of 0 to 40 degrees C and humidity of up to 90 percent noncondensing.

1. Provide motor control centers designed for 480-volt, three-phase, three-wire, 60-hertz operation.

2. Provide all control devices in the center suitable for operation at 120-volts, 60-hertz, unless specifically noted otherwise.

3. Provide all control equipment and devices that meet the requirements of the 600-volt insulation class.

4. Provide motor control centers to include the indicated number of 20-inch deep sections and the components arranged as shown.

5. Arrange the equipment for convenient and ready accessibility from the front for inspection and maintenance of devices, terminals and wiring.

1.04 SUBMITTALS

A. General: Furnish all submittals, including the following, as specified in the Specific/General Provisions and Section 16050.

B. Product Data and Information: Provide catalog data for all associated equipment and devices.

C. Shop Drawings: Furnish shop drawings customized to the project for motor control centers to include the following:

1. Outline drawings showing dimensions, weights, arrangement, elevations, identification of components and a nameplate schedule for all units.

2. Bill of materials including manufacturers' name and catalog number.

3. Interconnecting wiring diagrams, where required.

4. Individual schematic and wiring diagrams for each compartment.

5. Furnish details showing electrical connections between main and tie circuit breakers and corresponding main buses.

6. Furnish instruction booklets and time-current curves for each circuit breaker supplied.

8. Furnish the following information on surge protection devices (SPDs):

    a. Verification that surge protection devices comply with UL 1449.

    b. Actual let through voltage test data in the form of oscillograph results for both the ANSI/IEEE C62.41 Category C3 (combination wave) and B3 (ringwave) tests in accordance with ANSI/IEEE C62.45.

    c. Spectrum analysis of each unit based on MIL-STD-220A test procedures between 50 kHz and 200 kHz verifying that the device's noise attenuation exceeds 50 dB at 100 kHz.

    d. Test reports from a recognized independent testing laboratory verifying the suppressor components can survive published surge current ratings on both a per mode and per phase basis using the IEEE C62.41, 8 x 20 microsecond current wave. Test data on individual modules are not acceptable. Obtain and enter full performance details on all motors and other equipment being served on the above drawings.

D. Quality Control: Furnish the following test reports and certificates as specified below:

1. Certified Shop Test Reports for motor control centers and related components. Provide a minimum of 15 days written notice prior to shop tests.

2. Detailed field test reports of all tests indicating test performed as specified, discrepancies found, and corrective action taken.

E. Operation and Maintenance Manuals: Furnish operation and maintenance manuals.

1.05 QUALITY ASSURANCE

A. Standards: Provide motor control centers in accordance with NEMAICS 2, ICS 3, and UL Standard No. 845.

B. Codes: Provide motor control centers in accordance with the NEC and local codes.

C. UL Label: Provide a UL Label on each vertical section of each motor control center.

1.06 DELIVERY, STORAGE AND HANDLING

A. General: Deliver, store, and handle all products and materials as specified in the Specific/General Provisions.

B. Shipping and Packing: Provide all structures, equipment and materials rigidly braced and protected against weather, damage, and undue strain during shipment.

C. Storage and Protection: Store all equipment and materials in a dry, covered, heated and ventilated location. Provide any additional measures in accordance with manufacturer's instructions.

1.07 SPARE PARTS

A. General: Furnish the following spare parts:

1. One set of contact tips, control power transformers and operating coils for each six or less of each size of motor starter.

2. One auxiliary contact unit or one set of auxiliary contact tips for each six or less motor control units.

3. Ten percent but not less than two complete control, latching and timing relays of each type used in motor control centers.

4. Two complete replacements of overload heater units for each catalog number installed in motor control centers and motor starters.

5. Two complete replacements of all LED indicating lamps and fuses used in the installation.

6. One complete magnetic starter with motor circuit protector for each size required.

7. Two sets of replacement indicating light color lenses of each color furnished.

8. Three 12-ounce spray cans of the final finish for touch-up

B. Packaging: Pack spare parts in containers bearing labels clearly designating contents and related pieces of equipment. Deliver spare parts in original factory packages. Identify all spare parts with information needed for reordering.

PART 2 PRODUCTS

2.01 MANUFACTURERS

A. Acceptable Manufacturers: Acceptable manufacturers are listed below.

1. Motor Control Centers:

a. Square-D Model 6 Series

b. Cutler-Hammer 2100 Series

c. General Electric (GE) Evolution Series E9000

2. Surge Protection Devices (SPDs):

a. Advanced Protection Technology

2.02 MOTOR CONTROL CENTER

A. Basic Structural Components: Provide totally enclosed, dead-front, rigid, NEMA1, Motor Control Center in a NEMA 3R, stainless steel, gasketed, self-supporting and freestanding structure.

1. Construct the various sections from channels not less than 12 gauge, formed into proper shape, suitably reinforced and welded. Grind all internal welds smooth and round off all corners to give a neat and pleasing appearance. Construct doors and covers from a minimum of 14-gauge steel sheets.

2. Provide steel bottom plates in each compartment section.

3. Cover the rear of each structure with easily removable steel panels for rear access.

4. Provide hinges, screws, bolts, circuit breaker operating mechanisms, nameplate mounting screws and other metallic appurtenances with a noncorrodible metal covering.

6. Install full height steel barriers on each side of the tie breaker structure to prevent the passage of flames and ionized gases.

7. Provide each motor control center with a three-phase bus compartment at the top and a conduit and cable compartment at the top and bottom.

8. Provide the cable compartments that run the full length of the motor control center.

9. Provide access to cable compartments by means of removable hinged doors.

10. Provide each structure with a vertical wiring space between the starter cells and side sheet for unit wiring.

11. Equip the vertical wiring space with cable supports to hold the cables and wiring in place.

B. Motor Control Center Enclosure:

1. Provide motor control center in NEMA 3R stainless steel enclosure suitable for outdoor installation.

C. Bus Requirements: Provide main buses of tin plated copper bars across each structure, sized in accordance with UL temperature rise of 50 degrees C based on a 40-degree C ambient temperature.

1. Provide a 600-ampere minimum, main horizontal bus, unless otherwise shown.

2. Support all bus bars in each structure by means of bus supports fabricated from an insulating material.

3. Connect the horizontal bus to the incoming line circuit breakers and from both sides of the tie breaker with copper bars securely fastened in place.

4. Provide tin-plated vertical three-phase copper bus of sufficient size to carry loads served.

5. Insulate main and vertical buses over their entire length. Provide insulated covers over all bolted connections.

6. Separate the bus bar compartments from breaker and controller cubicles by insulated barriers or steel plates.

7. Provide a 300-ampere uninsulated copper grounding bus with lugs for connections to the plant grounding system in the bottom of each motor control center.

8. Brace all bus work suitably to withstand a minimum of 42,000 rms amperes symmetrical short circuit current. Substantiate construction by a certified laboratory test covering units of similar construction.

D. Individual Units: Provide motor control or circuit breaker units in combinations of not less than 12-inch modular heights.

1. Provide units of the plug-in or nonremovable type in accordance with the manufacturer's standard for type and size of controller.

2. Provide plug-in units within-plated, pressure-type line disconnecting stabs of high strength copper alloy. Hold each plug-in unit in place and arrange the units such that they can be removed or remounted readily without access to the rear of the structure.

3. Construct doors to be drip-proof and dust-tight. Provide all doors with hinges and screw fasteners for holding the doors closed. Fabricate each door as a part of the structure and not part of the unit.

7. Equip the doors for motor control compartments with a motor circuit protector operating mechanism, thermal overload relay reset mechanism, controls and indicating lights and other required devices as shown.

8. Equip the doors for branch feeder equipment with a circuit breaker operating mechanism.

9. Provide mechanical interlocks between the compartment door and circuit breaker operating mechanism to prevent opening of the door unless the breaker is in the OFF position, and to prevent closing the breaker unless the door is fully closed.

10. Provide circuit breaker operating mechanisms or handles that are padlockable in the OFF position with room for a minimum of three padlocks.

11. Provide units having devices that are serviceable from the front, without provisions for rear access.

12. Provide control power transformers, relays, timers, space heaters and accessories for each unit as shown or specified.

E. Wiring:

1. Provide NEMA Class II Type B wiring for the motor control centers, including internal interlock and internal wiring between controller units and devices.

2. Provide internal wiring runs for interconnecting units with stranded switchboard wire having 600-volt rated, flame-resistant, type SIS insulation. Provide No. 14 AWG wire for control interconnections. Provide power connections as required for the service.

3. Provide wire markers at each end of all wires.

4. Where wiring connections are made to equipment mounted on hinged doors, provide connections with extra flexible wires suitably cabled together and cleated.

5. Provide the wiring of all control connections to individual terminal blocks at each motor starter. Locate terminal blocks for front access.

6. Provide interlocking wiring between units of a motor control center or between units of grouped centers as internal wiring with terminals provided for external connections.

7. Provide sufficient pull apart terminal blocks for all devices external to the motor control center.

F. Magnetic Starters: Provide 480-volt, 3-phase, 60-hertz across-the-line combination motor circuit protector and magnetic starters having individual control power transformers.

1. Provide full-voltage nonreversing starters as required.

2. Provide starter contacts of the replaceable, spring-loaded, wedge type with silver-cadmium oxide-plated contact surfaces. Provide replaceable coils of the epoxy sealed type.

3. Thermal Overload Elements: Provide each magnetic starter unit with a Class 20 thermal overload element and all required accessories.

    a. Provide overload relays of the bimetallic type with an adjustment knob that allow plus or minus 15 percent adjustment of the nominal heater rating.

    b. Provide and adjust overload relays to match the associated motor nameplate running current rating. Size the overload relays after approval of the corresponding motor.

    c. Provide a set of isolated normally-open and normally-closed contacts for each overload relay.

G. Feeder Circuit Breakers: Provide molded-case type, two- or three-pole feeder circuit breakers as shown, with a minimum voltage rating of 600-volt ac.

1. Interrupting Ratings: Provide an interrupting capacity of 42,000 rms symmetrical amperes at 480 volts. Base interrupting rating on the IEEE and NEMA Standard duty cycle for this class of equipment.

2. Provide circuit breakers trip units as follows:

    a. Provide individual, thermal-magnetic trip units for all frame sizes smaller than 400 amperes.

    b. Provide trip units that actuate a common tripping bar to open all poles when an overload or short circuit occurs on any one.

    c. Provide trip elements with inverse time tripping and instantaneous tripping at about ten times the normal trip device rating.

    d. Provide circuit breakers with trip-free handles.

H. Main Circuit breaker: Provide main circuit breaker rated as shown, of equal construction to the feeder breakers.

I. Surge Protection Devices (SPDs):

1. Provide surge protection devices (SPDs) that complies with UL 1449.

2. Provide units with a maximum, continuous-operating voltage that exceeds 115 percent of the nominal system operating voltage.

3. Provide surge protection devices suitable for delta configured systems.

4. Provide surge protection devices that distribute the surge current to all MOV components to ensure equal stressing and maximum performance and provides equal impedance paths to each matched MOV.

6. Provide high-performance EMI/RFI noise rejection filters that attenuate the electric line noise at least 50 dB at 100 kHz using the MIL-STD-220A
insertion loss test method.

7. Wire internal components with connections utilizing low impedance conductors and compression fittings.

8. Provide a monitoring panel for each system that incorporates the following features:

   a. Green/red solid state indicator light to indicate which phase(s) have been damaged.

9. Provide SPDs suitable for branch location application with a minimum total surge current capable of withstanding 100kA per phase respectively.

10. Provide SPD with circuit breaker sized per manufacturer’s recommendations. Circuit breaker handle for SPD shall extend through SPD door.

J. Control Power Transformers: Provide individual control power transformers for each starter to derive the 120 volts for the unit's control circuit. Ground the unfused leg of the secondary to the enclosure.

K. Selector Switches and Indicating Lights: Mixers shall have a red, pump running indication light . Mixer starters shall include On-Off selector switch. Include legend plates having the same type, appearance, shape and catalog number throughout each motor control center.

L. Control Components: Provide control components including elapsed time meters, On-Off selector switches, pushbuttons, control relays, latching relays, time delay relays, reset timers, repeat cycle timers, alternators, phase failure and undervoltage relay and ground fault protection relays as indicated.

M. Feeder Cable Terminals: Provide closed-end, compression-type, solderless connectors and terminals, suitable for copper conductors for terminating cables.

N. Wiring Schematic: Provide a schematic wiring diagram of each unit and affix it to the inside of the door of that unit.

O. Identification: Provide nameplates having the same type, appearance and shape throughout each motor control center in accordance with the requirements of Section 16075.

P. Variable Frequency Drives (VFD's) : Provide VFD's per specification section 16370.

Q. Integral 480-120/208V, 30 KVA Transformer.

1. The transformer shall have average sound levels which do not exceed the levels established by NEMA and ANSI standards.

2. The transformer shall be installed with external vibration pads between the enclosure and mounting surface; the core and coil shall be internally isolated from the enclosure. Terminals of the proper size for wire as shown on the drawings for line, load and ground shall be supplied by the transformer manufacturer. A grounding strap shall be provided by the manufacturer to ground the transformer.

3. The manufacturer of the transformer shall submit certified test reports of similar ratings for each transformer showing temperature rise, sound level, ratio, polarity, exiting current, no-load losses, full load losses, resistance, impedance, applied and induced potential, impulse test, short-circuit test, rated KVA, and voltage rating.

4. All insulating materials to be in accordance with NEMA standards for 220 degree C UL component recognized insulation system.
5. Transformer coils shall be of the continuous wound construction and shall be impregnated with non-hydroscopic, thermo-setting varnish.

6. All cores to be constructed of high grade, non-aging silicon steel

with high magnetic permeability, and low hysteresis and eddy current losses. Magnet flux densities are to be kept well below the saturation point. The core laminations shall be clamped together with structural steel angles. The completed core and coil shall then be bolted to the base of the enclosure but isolated there from by means of rubber, vibration-absorbing mounts. There shall be no metal-to-metal contact between the core and coil and the enclosure. The vibration isolating system shall be designed to provide a permanent fastening of the core and coil to the enclosure. Sound isolating systems requiring the complete removal of all fastening devices will not be acceptable.2.2.8. Transformers shall be in heavy gauge, sheet steel, ventilated enclosures. The ventilating openings shall be designed to prevent accidental access to live parts in accordance with UL, NEMA, and National Electrical Code Standards for ventilated enclosures. Transformers shall be designed so that they can be floor mounted.

7. The entire transformer enclosure shall be degreased, cleaned, phosphatized, primed, and finished with a gray, baked enamel.

8. The maximum temperature of the enclosure shall not exceed 50 degrees C rise above a 40 degree C ambient.

9. The core of the transformer shall be visibly grounded to the enclosure by means of a flexible grounding conductor sized in accordance with applicable NEMA, IEEE, and ANSI Standards.

10. The transformer shall have full capacity taps.

R. Integral 100 Ampere, 120/208V, 3-phase, 4-wire panelboard.

1. The Distribution Panelboard shall be dead-front type, metal enclosed. Panelboard shall comply with Article 230 of the National Electrical Code. .

2. Panelboard shall be silverplated copper sized to comply with U.L. Standards for temperature rise of 65° C. over 40° C. ambient. Copper bus shall be used for connections to components. A ground bus with a minimum rating of 25% of the main bus ampacity shall be provided. Panelboards shall be braced to withstand fault currents indicated on the drawings.

2.03 SOURCE QUALITY CONTROL

A. Tests: Shop test each motor control center in accordance with IEEE and NEMA standards.

1. Operational Tests: After the equipment has been completely assembled, perform operational tests to determine the general operating conditions and circuit continuity. Also, perform high potential tests and other standard tests for that particular class of equipment.

PART 3 EXECUTION

3.01 INSTALLATION

A. General: Install all equipment in accordance with the manufacturer's recommendations and approved shop drawings and as specified in the Specific/General Provisions.

B. Overloads: Adjust the thermal overloads on each phase of the starter units to the actual motor installed.

C. Cable Connections: Terminate and label all field wiring per the approved diagrams.

D. Torque Requirements: Tighten electrical connectors and terminals, including screws and bolts, in accordance with equipment manufacturers' published torque tightening recommendations. Where manufacturers' torquing requirements are not available, tighten connectors and terminals in accordance with UL Standard 486A.

3.02 FIELD QUALITY CONTROL

A. Inspections: Inspect, adjust and check the installation for physical alignment, cable terminations and ventilation.

B. Tests: Perform the following field tests:

1. Close and open each circuit breaker and motor circuit protector to test operation.

2. Energize the motor control center and test for hot spots.

3. When site conditions permit, energize and de-energize each equipment item served by each motor control center, testing the complete control sequence of each item.

3.03 OPERATION DEMONSTRATION

A. Manufacturer’s Representative: Furnish the services of a qualified, factory-trained service engineer to assist in installation, start-up, field testing,

calibration, placing into operation and provide training of each motor control center.

1. Furnish the services of a service engineer when the equipment is placed into operation.

2. Furnish the services of a service engineer at job site as often as necessary until all problems are corrected and the equipment installation and operation are satisfactory.

3. Training: Following completion of installation and field testing provide training for 6 Manatee County employees in the proper operation, troubleshooting and maintenance of the equipment as outlined below. All training will be at the Manatee County's facility at a time agreeable to the County:

a. Operational Training: A minimum of two 4-hour sessions combining both classroom and hands-on instruction, excluding travel time.

b. Maintenance Training: A minimum of two 4-hour sessions combining both classroom and hands-on instruction, excluding travel time.

B. Operation and Maintenance: Furnish operation and maintenance instructions as specified in the General Provisions.

3.04 CLEANING AND PAINTING

A. Field Painting: Clean and touch up any scratched or marred surface to match original finish.

END OF SECTION

SECTION 16450
GROUNDING

PART 1 GENERAL

1.01 SCOPE OF WORK

A. Furnish and install a complete grounding system in strict accordance with Article 250 of the National Electrical Code and/or as hereinafter specified and/or as shown on the Contract Drawings.

1.02 SUBMITTALS

A. The requirements of Section 01340 and Section 16050 shall be met.

B. Test results as indicated in 3.02 C shall be submitted.

PART 2 - PRODUCTS

2.01 MATERIALS

A. Ground Rods: The ground rods shall be solid copper or copper-clad steel having a diameter of 5/8-inch and a length of 10-feet. The ground rods shall be as manufactured by Copperweld, or approved equal.

B. Grounding Conductors

1. All grounding conductors shall be copper. Aluminum or copper-clad aluminum grounding conductors will not be allowed.
2. The grounding conductors shall be sized in accordance with the latest edition of the National Electrical Code, Table 250-94 or Table 250-95, whichever is applicable to the particular grounding conductor.

C. Ground Rod Clamps: The ground rod clamps shall be malleable iron or cast bronze fittings suitable for use with copper conductors. The ground rod clamps shall be as manufactured by Bridgeport Fittings, Inc.; ITT Blackburn, Inc.; or approved equal.

D. Dissimilar Metals Junctions: Connections between different metals shall be sealed using NO-OXIDE paint, Grade A, or approved equal.

PART 3 - EXECUTION

3.01 INSTALLATION

A. Wherever possible, the Contractor shall connect to an existing plant, area or building grounding grid. Where no such grounding grid exists, the Contractor shall provide grounding as hereinafter specified and/or as shown on the Contract Drawings.

B. Building grounding grid conductors shall be embedded in backfill material around the structures.

C. All underground conductors shall be laid slack and, where exposed to mechanical injury, shall be protected by pipes or other substantial guards. If guards are iron pipe or other magnetic material, conductors shall be electrically connected to both ends of the guard.

D. Grounding electrodes shall be driven as required. Where rock is encountered, grounding plates may be used in lieu of grounding rods.

E. All equipment enclosures, motor and transformer frames, conduit systems, cable armor, exposed structural steel and similar items as required by Article 250 of the NEC shall be grounded.

F. All steel building columns shall be bonded together and connected to the building ground grid.

G. Exposed connections shall be made utilizing approved grounding clamps. Buried connections shall be Cadweld, or approved equal, welding process.

H. The ground bus of service entrance equipment shall be connected to the plant, area or building ground grid, whichever is applicable.

I. For reasons of mechanical strength, grounding conductors extending from the plant, area or building grounding grid or service entrance ground bus, whichever is applicable, to the ground buses of motor control centers and/or unit substations shall be No. 1/0 AWG bare copper.

J. Lighting transformer neutrals shall be grounded to the nearest grounding electrode.

K. Conduits stubbed-up below a motor control center shall be fitted with insulated grounding bushings and connected to the motor control center ground bus. Boxes mounted below motor control centers shall be bonded to the motor control center ground bus. The grounding wire shall be sized in accordance with Table 250-95 of the National Electrical Code, except that a minimum No. 12 AWG shall be used.

L. Motors shall be grounded in accordance with Section 16150, Item 3.01.A of these Specifications.

M. The Contractor shall exercise care to insure good ground continuity, in particular between conduits and equipment frames and enclosures. Where necessary, jumper wires shall be installed.

3.02 TESTS

A. The Contractor shall test the ground resistance of the system. The Contractor shall provide all test equipment of which the County shall have approval.

B. The dry season resistance of the system shall not exceed five (5) ohms. If a single

driven rod does not produce this value, the Contractor shall drive additional rods and/or take other measures as directed by the County without any cost to the County.

C. The Contractor shall furnish to the County three (3) copies of the test report certifying that the system is in compliance with the ohmic value requirement. The certified test report shall include, but not necessarily be limited to, the following:

1. Description of the test.
2. Type of test equipment used.
3. Moisture content of the soil.
4. Date and time of the test.
5. Resistance measurement of each rod cluster.
6. Name of individual(s) performing the test.
7. Contractor's certification stamp or seal.

3.03 GUARANTEES AND WARRANTIES

A. The Contractor shall guarantee and warrant all materials and labor provided under this Section in accordance with Section 01 740 and Section 16050 of these Specifications.

END OF SECTION

SECTION 16500
LIGHTING FIXTURES

PART 1 - GENERAL

1.01 WORK INCLUDED

A. The work included under this section of the specifications consists of furnishing all materials and equipment and performing all labor and services necessary for the complete installation of lighting fixtures, including all related systems and accessories, as shown on the drawing or hereinafter specified.

PART 2 - PRODUCTS

2.01 LIGHTING FIXTURES

A. Materials.

1. Lighting Fixtures shall be as specified in the lighting fixture schedule on the drawings and as specified herein.

2. Fixtures shall be cast-aluminum, corrosion-resistant housing with bronze polyester power paint. Casting shall be sealed with one-piece gasket and shall be U.L listed for outdoor applications.

3. Fixture shall contain two high-powered LED's providing a minimum of 3,400 lumens.

4. Fixtures shall be Lithonia VRC LED series, 50K color temperature with multivolt (120-277V) driver.

PART 3 - EXECUTION

3.1 INSTALLATION

A. Lighting fixture shall be installed as indicated on drawings.

B. Fasten fixtures securely to provide adequate support.

C. Ensure that lighting fixtures are plumb.

END OF SECTION

SECTION 16745
FIBER OPTIC CABLE SYSTEM

PART 1 - GENERAL

1.01 WORK INCLUDED:

A. The CONTRACTOR shall supply and install fiber optic cable in accordance with the drawings and specifications.

B. The fiber optic cable shall be installed as shown in the drawings. After delivery to the site, but prior to installation, the CONTRACTOR shall notify the ENGINEER the fiber optic cable is ready for inspection and testing. Fiber optic cable found to be defective, failing to pass the tests designated herein (using an optical time domain reflectometer), shall be replaced at no additional cost to the OWNER.

C. Within five working days of delivery (Monday through Friday, non-State Holidays, 8 AM to 5 PM), the ENGINEER will inspect and witness the test of the fiber optic cable.

D. After installation, the CONTRACTOR shall notify the ENGINEER the fiber optic cable is again ready for inspection and testing. Fiber optic cable found to be defective, failing to pass the tests designated herein, shall be repaired or replaced at no additional cost to the OWNER.

1.02 SUBMITTALS

A. The CONTRACTOR shall submit shop drawings and certificates of compliance for the material specified herein, and have them approved by the ENGINEER before procurement, fabrication, or delivery of the items to the job site. Partial submittals will not be acceptable and will be returned without review. Submittals shall include the supplier's (manufacturer's) name, trade name, catalog model or number, nameplate data, size, layout dimensions, capacity, applicable federal, industry, and technical society publication references, and other information necessary to establish compliance of each item the CONTRACTOR proposes to furnish.

1. Shop Drawings: Shop drawings shall include the length of fiber optic cable per spool and other items that must be shown to assure a coordinated installation. If the fiber optic cable is disapproved, the shop drawings shall be revised to show acceptable materials and/or equipment and shall be resubmitted. Submit to the ENGINEER, shop drawings for fiber optic cable and appurtenances.

2. Standards Compliance: When materials or equipment must conform to the standards of organizations such as the American National Standards Institute (ANSI), American Water Works Association (AWWA), the Chlorine Institute, the Hydraulics Institute, National Electrical Code (NEC), and Underwriter's Laboratories (UL), proof of such conformance, in the form of a

standard label or certificate of compliance from the supplier (manufacturer), shall be submitted for approval. The certificate shall identify the supplier, the product, and the referenced standard and shall simply state the supplier certifies that the product conforms to all requirements of the specifications and of the referenced standards listed. Fiber optic cable shall be suitable for underground use and conform to applicable sections of the following standards:

a. ICEA-S-83-596.

b. ICEA-S-104-696.

c. GR-409-CORE.

d. TIA-568.

e. TIA-598.

f. NECA/FOA 301-2009.

The CONTRACTOR shall submit to the ENGINEER, supplier's certificates of compliance for materials.

3. Certified Test Reports: Before delivery of materials and equipment, certified copies of all test reports specified in these specifications or referenced standards shall be submitted for approval.

4. The CONTRACTOR shall submit for review the name of the supplier, identifying trade name and catalog cuts. Information to be included:

a. Maximum attenuation dB/Km @ 850/1300 nm

b. Bandwidth MHz-Km @ 850/1300 nm

c. Minimum bend radius

1.03 DELIVERY AND STORAGE

A. The fiber optic cable shall be carefully handled, properly stored, and adequately protected to prevent damage before and during installation, in strict accordance with the supplier's recommendations, and as approved by the ENGINEER. Items damaged or defective in the opinion of the ENGINEER shall be replaced at the CONTRACTOR's cost.

1.04 MATERIALS AND WORKMANSHIP

A. Materials and Workmanship: All materials shall be new, unused, and suitable for the service intended. Workmanship shall be of the highest quality, performed by skilled and experienced workers. Materials and equipment shall be cataloged, standard products of supplier regularly engaged in the production of such materials or equipment and shall be supplier's latest design that complies with the specification requirements. Materials and equipment shall duplicate items that have been in satisfactory commercial or industrial use at least five (5) years. Where two or more items of the same class of equipment are required, these items shall be products of a single supplier. Each item of equipment shall have the supplier's name, address, model number, and serial number on the nameplate securely affixed in a conspicuous place; the nameplate of the distributing agent will not be acceptable.

1.05 SUPPLIER'S (MANUFACTURER'S) RECOMMENDATIONS

A. Installation procedures shall be in accordance with the recommendations of the supplier (manufacturer) of the materials and/or equipment. Printed copies of these recommendations shall be furnished to the ENGINEER prior to installation. Installation of the item will not be allowed to proceed until the recommendations are received. Failure to furnish these recommendations can be cause for rejection of the material.

1.06 WARRANTY

A. The CONTRACTOR shall furnish, unless otherwise noted herein, a full one (1) year express warranty for all equipment and/or materials furnished.

PART 2 - PRODUCTS

2.01 PRODUCTS

A. Fiber Optic Cable:

1. The fiber optic cable shall contain six (6) optical fibers and shall be plenum rated (OFNP) with a flourpolymer sheath. The fiber optic cable shall be of tight bundle construction suitable for underground installation in conduit. Fiber optic cable shall be constructed of 900 µm tight-buffered fibers surrounded by aramid yarns and shall provide water blocking. Fiber optic cable shall be all-dielectric. Each optical fiber shall have a strength member. Individual optical fiber size shall be 62.5/125/900 micron (core/clad/buffer) and suitable for data communications.

   Additional fiber optic cable requirements are:

   a. Maximum attenuation - 3.5 dB/Km at 850 nm
      1.0 dB/Km at 1300 nm

b. Bandwidth –

Laser:	220 MHz - Km at 850 nm 500 MHz - Km at 1300 nm
LED:	200 MHz - Km at 850 nm 500 MHz - Km at 1300 nm

c. EI/TIA - 598 color coding for optical fibers.

d. Aramid yarn strength member capable of supporting a short-term tensile load of 300 lbs. without stretching.

e. Cable bend radius as small as 3.1 inches under installation load and 2.1 inches under long term load.

f. A minimum crush resistance of 195 lbs./inch.

2.02 ACCEPTABLE SUPPLIERS MANUFACTURERS

A. Products that are specified by supplier (manufacturer), trade name or catalog number establish a standard of quality. Substitution of equal suppliers will not be allowed unless specifically stated herein, and shall be subject to review and approval by the ENGINEER. Recommended suppliers include Berk-Tek PDP006-HE(BLA) CB3510/25 Series or equal by Optical Cable Corporation (OCC), Corning Cable Systems, or Lucent.

2.03 FIBER OPTIC CABLE CONNECTORS

A. All multi-mode connections shall be via ST type connector.

B. ST Connectors shall be comprised of a 2.5 mm ceramic ferrule, or composite connector keyed body to accommodate a field bayonet connection.

C. The maximum attenuation loss per ST connector shall be 0.3 dB.

D. Provide PC polish for ≤ -30dB back reflection

2.04 FIBER OPTIC MEDIA CONVERTERS

A. The contractor shall provide fiber optic media converters to transition from copper to fiber optic media.

B. The Fiber Optic Media Converter's UTP port shall be auto-sensing and shall adjust to the highest level of performance supported by the attached device.

C. The media converters to be supplied for the multimode fiber optic cable connections shall have ST connectors and be 100% compatible with the fiber optic cable as detailed in this specification.

D. 10BASE-T or 100BASE-TX UTP to 100BASE-FX applications shall be accommodated by media converters with the following characteristics:

1. Supported protocols:

   a. IEEE 802.3
   b. 10BASE-T
   c. 100BASE-TX
   d. 100BASE-FX

2. Supported UTP cable: EIA/TIA 568A/B, Category 5 and higher.

3. Supported fiber cables: 62.5/125 um for multimode.

4. Supported Fiber Connectors: ST.

5. The media converters shall be provided with switches to allow the user to:

   a. Select straight-through or cross-over connection.

   b. Select whether the UTP port will automatically determine the speed and duplex mode of the connected device.

   c. Select the speed of operation (10 or 100 Mbps) if the port is not set for automatic negotiation.

   d. Select the UTP port full-duplex or half-duplex mode.

   e. Select the half-duplex or full-duplex mode of the fiber port.

6. The media converters shall be provided with LED displays to indicate the following:

   a. Power: Yellow LED to indicate that power is applied.

   b. UTP AN: Green LED to indicate that Auto Negotiation is enabled.

   c. UTP Duplex Mode: Green LED to indicate that the unit is set to full-duplex. LED off indicates half-duplex.

   d. Fiber Port Mode: Green LED to indicate that the unit is set to full-duplex. LED off indicates half-duplex.

   e. UTP Link: Green LED indicates a device is present.

   f. Fiber Link: Green LED to indicate a device is present.

   g. UTP 10Mbps: Yellow LED to indicate data received at 10Mbps.

h. UTP 100Mbps: Green LED to indicate data received at 100Mbps.

7. The media converters dimensions shall be 3 inches wide x 4 inches deep by 1 inch in height.

8. The media converters shall be UL listed CE approved and be in compliance with FCC Class A.

9. The media converters shall operate on 9V DC, with an acceptable voltage range from 6.0 V DC to 15.0V DC. The units shall consume no more than 1 ampere at the rated voltage.

10. The media converters shall be capable of operating under the following environmental conditions:

    a. Minimum Operating Temperature: 32° F.

    b. Maximum Operating Temperature: 122° F.

    c. Humidity Range Operating: 5 – 95% (noncondensing)

11. The Media Converters shall be supplied with an individual 120V AC power adapter and shall have a Mean Time Between Failure (MTBF) of 250,000 hours.

12. The fiber optic media converters for 10BASE-T or 100BASE-TX UTP to 100BASE-FX applications shall be FlexPoint 10/100 series as manufactured by Omnitron Systems Technology, Inc. or equal.

PART 3 - EXECUTION

3.01 PRE-SHIPMENT TESTING

A. Prior to shipment, the equipment shall be tested in the factory for conformance with these specifications. The CONTRACTOR shall furnish a certified report that such testing has been conducted prior to shipment.

3.02 DELIVERY

A. The CONTRACTOR shall furnish and deliver the material to the installation site(s) as noted on the drawings.

3.03 INSTALLATION

A. The installation and termination of all fiber optic cable shall meet the requirements of NECA/FOA 301-2009, Standard For Installing and Testing Fiber Optics.

B. The CONTRACTOR's attention is directed to the possible existence of pipelines, structures and other improvements which may be within the work area or adjacent thereto and may or may not be shown on the drawings. The fact that any underground facility may not be shown on the drawings shall not relieve the CONTRACTOR of responsibility to ascertain the existence, position and ownership of any such structures that may be subject to damage by reason of the CONTRACTOR's operations. The CONTRACTOR shall take every precaution to preserve any such improvements from injury or damage and shall repair or replace any facilities damaged by the work of this project.

C. No nicks, cuts or splices will be permitted along the fiber optic cable length. All nicks and cuts in the fiber optic cable shall be brought to the attention of the ENGINEER and shall be repaired or replaced as deemed appropriate by the ENGINEER. Repair will require splices in the optical fibers in an above grade junction box for splicing.

D. CONTRACTOR shall perform all junction box and end of cable terminations and testing. CONTRACTOR shall be responsible for terminating all optical fibers in ST-type connectors with composite ferrules. Optical fiber ends shall be polished and adhesive applied to terminate the fiber in the connector. All terminations shall be coordinated with the ENGINEER.

1. CONTRACTOR shall not exceed the maximum pulling tension rating of the fiber optic cable. The CONTRACTOR shall consult the cable manufacturer's specifications for guidelines on tension rating and lubricant use.

2. The CONTRACTOR shall not bend the fiber optic cable or individual optical fibers to less than the minimum bend radius, as recommended by the supplier, at any time during installation and handling. The fiber optic cable shall be installed as to minimize the need for splice/termination boxes. The CONTRACTOR shall submit for approval by the ENGINEER, the proposed cable installation plan detailing the equipment, procedures and order of work. The CONTRACTOR shall be responsible for and replace any fiber optic cable damaged during installation and prior to final completion.

3. The CONTRACTOR shall be responsible for construction under roads and pipelines as necessary. All fiber optic cable installations below grade shall be installed inside a 2-inch diameter, schedule 80 PVC conduit encased in concrete in accordance with the construction details. All transition points from below ground, as well as, all penetration points, shall be rigid aluminum with protective coating to prevent corrosion. All above ground conduits shall be rigid aluminum.

E. Fiber Optic Cable Installation Acceptance Tests:

1. CONTRACTOR shall furnish test equipment, instrumentation, personnel and supplies to perform all testing. The ENGINEER will witness and certify all fiber optic tests prior to installation and after installation. The CONTRACTOR shall provide the ENGINEER with five (5) working days notice prior to each test.

2. CONTRACTOR shall perform test measurements using equipment, procedures, and wavelengths in accordance with NECA/FOA 301-2009 and as recommended and approved by the cable supplier. Tests shall be performed for each existing and proposed optical fiber. Field tests shall include as a minimum:

   a. Optical time domain reflectometer (OTDR) test at 850 nanometers of the fiber optic cable on the reel prior to installation. Calibrate the OTDR to show anomalies of 0.2 dB minimum. The length of the fiber optic cable shall be recorded. Anomalies of 0.2 dB or more in the OTDR tests shall be recorded and brought to the ENGINEER's immediate attention.

   b. After the fiber optic cable has been installed and prior to termination, OTDR tests shall be repeated. The installed fiber optic cable lengths shall be recorded by the CONTRACTOR and supplied to the ENGINEER. Tests shall be performed in a manner identical to the tests performed prior to installation. Variations in any of the OTDR tests of more than 30% from the values measured prior to installation will be cause for rejection of the installed fiber optic cable. If the fiber optic cable installation is rejected, the CONTRACTOR shall replace all defective or damaged fiber optic cable at CONTRACTOR's expense.

   c. Continuity testing to determine whether the fiber routing and/or polarization is correct and documentation is proper. Perform continuity testing of optical fibers by using an Optical Loss Test Set (OLTS) power meter and source. Trace the fiber from end-to-end through any interconnections to ensure the path is properly installed, and polarization and routing are correct and documented.

   d. End-to-end insertion loss by using an OLTS power meter and source. Test multimode cables by using TIA/EIA 526-14 Method B, and single-mode cables using TIA/EIA 526-7 (single-mode). Total loss shall be less than the calculated maximum loss for the cable based on appropriate standards.

e. After installation of the fiber optic cable and termination of the optical fiber at each end of the cable segment, the CONTRACTOR shall perform power attenuation tests at the light wavelength of the transmitter to be used by OWNER on the circuit being tested. Measure the flux at the fiber optic receiver end and compare to the flux injected at the transmitter end. Provide a jumper at each end of the circuit under test to validate end connector loss. Rotational optimization of the connectors will not be permitted. Circuit loss shall not exceed the calculated circuit loss by more than 2 dB. When any test is unsatisfactory, CONTRACTOR shall examine circuit to determine the problem. CONTRACTOR shall notify the ENGINEER of the problem and proposed procedures to eliminate the problem.

f. The insertion loss for each mated fiber optic connector pair shall be 0.75 dB or less. Mated connector pair loss testing shall be based on applicable EIA/TIA standards.

3. The CONTRACTOR shall provide Manatee County with one (1) printed copy and one (1) electronic copy of all test results. The test results shall include a description of each test, a description of the test equipment used and the test results of each optical fiber tested. Test results shall include testing of the cable on the reel, test of each cable segment and tests of each termination. Test results shall also be incorporated into the O&M Manual supplied by the CONTRACTOR.

END OF SECTION

SECTION 16950
TESTS AND INSPECTIONS

PART 1 - GENERAL

1.01 SCOPE OF WORK

A. The CONTRACTOR shall arrange for all inspections required by the local authority having jurisdiction. Approval of the installation by any such local authority shall not relieve the CONTRACTOR of any portion of his responsibility for adequate performance of the completed installation.

1.02 SUBMITTALS

A. The CONTRACTOR shall furnish at least two copies of test records to the ENGINEER. At the completion of all tests specified herein and any others required to make operational all equipment, all records shall be viewed by the CONTRACTOR, then transmitted directly to the ENGINEER. All prints shall be corrected and verified for corrections of in-field changes by the CONTACTOR prior to submittal.

PART 2 - PRODUCTS (Not Used)

PART 3 - EXECUTION

3.01 PREPARATION

A. After completion and prior to being energized, the electrical installation shall be tested to the extent necessary to demonstrate that all systems are complete and ready for operation. The CONTRACTOR shall notify the ENGINEER and the OWNER for the final inspection prior to energizing the system.

B. The CONTRACTOR shall furnish all necessary test equipment to satisfactorily perform all tests specified herein or required by applicable codes and standards.

3.02 TESTING

A. The CONTRACTOR shall test all wire, cable, equipment, and systems installed or connected under the Agreement to assure proper installation, settings, connection, and functioning in accordance with the Drawings, Specifications and the manufacturer's recommendations.

B. When conducting tests the CONTRACTOR shall:

1. Include all tests and inspections recommended by the equipment manufacturer and applicable Codes and Standards.

2. Include any additional tests required by the ENGINEER that he deems necessary because of field conditions to determine that equipment, material, and systems meet the requirements of the Specifications.

3. Maintain in quadruplicate a written record of all tests showing date, personnel conducting tests, equipment or material tested, tests performed, manufacturer and serial number of testing equipment and results.

C. Tests to be accomplished as a minimum are as follows:

1. Control Panels/Panelboards: provide temporary power source to all control/power circuits and check for proper operation prior to energizing equipment served.

2. Wires and Cables:

a. The 600-volt insulated cables shall be factory tested prior to shipment in accordance with IPCEA standards for the insulation specified.

b. The following 600-volt wires and cable shall be tested after installation but before final connections are made up:

i. All feeders from motor control centers to motors 10 horsepower and larger.
ii. All feeders from variable speed drive units.
iii. All feeders from motor control centers to lighting panels and dry-type transformers.

c. For the above listed cables, a test voltage of 500 volts ac shall be applied for a period of 1 minute between all conductors in the same conduit, and between each conductor and ground.

d. All tests shall be made at the Contractor's expense, and certification of the tests shall be submitted to the Engineer. If any failures occur during the tests, the Contractor shall replace the cable.

3. Motor Test: Motor rotation will be checked by momentary energizing of motor. Correction of rotation shall be made by changing leads on the motor. Motors shall only be energized in the presence of a representative of the OWNER.

4. Check phase rotation on all bussing. Phasing shall be A-B-C, left to right, top to bottom, front to rear, as viewed from the front.

D. CONTRACTOR shall be responsible for any damage to equipment or material due to improper test procedures or test apparatus handling, and shall replace or restore to original condition any damaged equipment or material.

E. CONTRACTOR shall furnish and use safety devices such as rubber gloves and blankets, protective screens, barriers, and danger signs to adequately protect and warn all personnel in the vicinity of the tests.

3.04 DEMONSTRATION OF COMPLETED ELECTRICAL SYSTEMS

A. Upon the completion of the installation and testing, the CONTRACTOR shall demonstrate and familiarize representatives of the OWNER with the system.

END OF SECTION

FLORIDA DEPARTMENT OF
ENVIRONMENTAL PROTECTION
BOB MARTINEZ CENTER
2600 BLAIRSTONE ROAD
TALLAHASSEE, FLORIDA 32399-2400

SELF CERTIFICATION FOR A STORMWATER MANAGEMENT SYSTEM IN UPLANDS SERVING LESS THAN 10 ACRES OF TOTAL PROJECT AREA AND LESS THAN 2 ACRES OF IMPERVIOUS SURFACES

Owner(s)/Permittee(s):	MANATEE COUNTY UTILITIES DEPARTMENT
File No:	0333481001EG
File Name:	SEPTAGE/GREASE RECEIVING
Site Address:	3331 Lena Rd Bradenton Bradenton FL - 34211 9458
County:	Manatee
Latitude:	27° 28' 6.5771"
Longitude:	-82° 26' 51.6712"
Total Project Area:	1.07
Total Impervious Surface Area:	0.343
Approximate Date of Commencement of Construction:	06/26/2015
Registered Florida Professional:	David O'Connor
License No.:	56803
Company:	Cardno

Date: March 20, 2015

Greg Woodcock certified through the Department's Enterprise Self-Service Application portal that the project described above was designed by the above-named Florida registered professional to meet the following requirements:

1. The total project area involves less than 10 acres and less than 2 acres of impervious surface;
2. No activities will impact wetlands or other surface waters;
3. No activities are conducted in, on, or over wetlands or other surface waters;
4. Drainage facilities will not include pipes having diameters greater than 24 inches, or the hydraulic equivalent, and will not use pumps in any manner;
5. The project is not part of a larger common plan, development, or sale; and
6. The project does not:
    1. Cause adverse water quantity or flooding impacts to receiving water and adjacent lands;
    2. Cause adverse impacts to existing surface water storage and conveyance capabilities;
    3. Cause a violation of state water quality standards; or

4. Cause an adverse impact to the maintenance of surface or ground water levels or surface water flows established pursuant to s. 373.042 or a work of the district established pursuant to s. 373.086, F.S.

This certification was submitted within approximately 30 days after initiation of construction of the above project. As such, construction, alteration, and maintenance of the stormwater management system serving this project is authorized in accordance with s. 403.814(12), F.S., and that there is a rebuttable presumption that the discharge from such system will comply with state water quality standards when the stormwater management system for this project is designed, operated, and maintained in accordance with applicable rules adopted pursuant to part IV of chapter 373, F.S.

Applicants are advised to contact the applicable water management district for requirements that must be followed to properly abandon any existing water wells that need to be removed because they are located where construction is occurring.

In accordance with s. 373.416(2), F.S., if ownership of the property or the stormwater management system is sold or transferred to another party, continued operation of the system is authorized only if notice is provided to the Department within 30 days of the sale or transfer.

This notice can be submitted to:
FDEP Southwest District
13051 N Telecom Pkwy Temple Terrace 33637

This certification was submitted along with the following electronic documents:

If you have submitted this certification as a Florida Registered Professional, you may wish to sign and seal this certification, and return a copy to the Department, in accordance with your professional practice act requirements under Florida Statutes.

I, David O'Connor, License No. 56803, do hereby certify that the above information is true and accurate, based upon my knowledge, information and belief. In the space below, affix signature, date, seal, company name, address and certificate of authorization (if applicable).

This sealed certification may be submitted to the Department, either electronically (as an attachment in Adobe PDF or other secure, digital format) at Erp.selfcerts@dep.state.fl.us, or as a hardcopy, at the postal address below:

Florida Department of Environmental Protection
Office of Submerged Lands and Environmental Resources
2600 Blair Stone Road MS 2500
Tallahassee FL 32399-2400

SECTION C
BID SUMMARY

C.01 MINIMUM QUALIFICATIONS OF BIDDERS

No person who is not certified or registered as a General Contractor pursuant to Chapter 489, Florida Statutes, on the day the bid is submitted, and who has continuously held that certification or registration for a period of at least five (5) consecutive years immediately prior to the day the bid is submitted, may be qualified to bid on this Work. In the event that a bidder is a business organization, including a partnership, corporation, business trust or other legal entity as set forth in Section 489.119(2), Florida Statutes, then the bidder shall only be qualified to bid on this Work if: 1) the bidder (the business organization) is on the day the bid is submitted, and for at least three (3) consecutive years immediately prior to the day the bid is submitted has been, in continuous existence, properly licensed and registered as required by Florida law; and 2) the bidder, on the day the bid is submitted, has a certified or registered Qualifying Agent, as required by Section 489.119, Florida Statutes, and that Qualifying Agent has been the same Qualifying Agent of the bidder for a period of at least five (5) consecutive years immediately prior to the day the bid is submitted.

C.02 BASIS OF AWARD

Award shall be to the lowest, responsive, responsible bidder meeting specifications and having the lowest grand total award offer for **Bid "A"**, or the lowest grand total award offer for **Bid "B"**, for the requirements listed on the Bid Form for the Work as set forth in this IFB. Bid prices shall include costs for furnishing all labor, equipment and/or materials for the completion of the Work in accordance with and in the manner set forth and described in the IFB documents to Owner's satisfaction within the prescribed time.

Two schedules for completion of Work shall be considered. Each bid for completion by the specified stated time shall be offered as a separate "total offer". Owner has the sole authority to select the bid based on the completion time which is in the best interest of Owner. Only one award shall be made.

NOTE: Inspection of the site is a pre-requisite to be considered for award of this bid.

In evaluating bids, Owner shall consider the qualifications of the bidders; and if required, may also consider the qualifications of the Subcontractors, suppliers, and other persons and organizations proposed. Owner may also consider the operating costs, maintenance requirements, performance data and guarantees of major items of materials and equipment proposed for incorporation in the Work.

Whenever two or more bids are equal with respect to price, the bid received from a local business shall be given preference in award.

Whenever two or more bids are equal with respect to price, and all other evaluative factors are otherwise equal, including local preference policies, if the company provides documented environmentally preferable "green" products, materials, or supplies, they shall be given preference in award.

Whenever two or more bids which are equal with respect to price are received, and neither of these bids are from a local business, and neither of these bids provides documented "green" products, the award shall be determined by a chance drawing, coin toss, or similar tie-breaking method conducted by the Purchasing Division and open to the public.

END OF SECTION C

BID FORM

(Submit in duplicate)

For: SOUTHEAST WATER RECLAMATION FACILITY (SEWRF) SEPTAGE / GREASE RECEIVING STATION PROJECT

Total Offer (Bid "A"): _____
Based on a completion time of 480 calendar days
Total Offer (Bid "B"): _____
Based on a completion time of 360 calendar days

We, the undersigned, hereby declare that we have carefully reviewed the IFB Documents in their entirety and with full knowledge and understanding of the aforementioned herewith submit this bid, completely meeting each and every specification, term, and condition contained therein.

Two schedules for completion of the Work shall be considered. Each bid for completion by the specified stated time shall be offered as a separate "total offer". County has the sole authority to select the bid based on the completion time which is in the best interest of County. Only one award shall be made.

As bidder, we understand that the IFB documents, in its entirety, including but not limited to, all specifications, terms, and conditions shall be made a part of any resulting Agreement between Manatee County and the successful bidder. Failure to comply shall result in Agreement default, whereupon, the defaulting successful bidder shall be required to pay for any and all re-procurement costs, damages, and attorney fees as incurred by County, and agrees to forfeit his/her bid bond.

Communications concerning this bid shall be addressed as follows: **(Complete all fields)**

Bidder's Name: _____

Mailing Address: _____

Telephone: ( ) _____ Fax: ( ) _____

Email Address: _____

I, _____ on [date(s)] **_____ attest that I have visited the project site(s) to familiarize myself with the full scope of work required for the bid.**

Acknowledge Addendum No.____ Dated: _____ Acknowledge Addendum No.____ Dated: _____
Acknowledge Addendum No.____ Dated: _____ Acknowledge Addendum No.____ Dated: _____
Acknowledge Addendum No.____ Dated: _____ Acknowledge Addendum No.____ Dated: _____

Authorized Signature(s): _____

Name and Title of Above Signer(s): _____

Date: _____

BID FORM (Submit in Duplicate)

IFB# 15-1058-DS

SEWRF- Septage Grease Receiving Station Project

(Bid "A" - Based on Completion Time of **480** calendar days)

ITEM NO.	DESCRIPTION	QTY	U/M	UNIT PRICE ($)	EXTENDED PRICE ($)
1	Mobilization & Demobilization	LS	1	$	$
2	Septage / Grease Receiving Station	LS	1	$	$
3	Grease Dewatering Screw Press	LS	1	$	$
4	Vacuum Truck Receiving Area	LS	1	$	$
5	Lift Station	LS	1	$	$
6	Glass Fused to Steel Storage Tanks (2) tanks	LS	1	$	$
7	Yard Piping	LS	1	$	$
8	Site Improvements	LS	1	$	$
9	Electrical and Instrumentation	LS	1	$	$
	TOTAL BASE BID (Based on Completion of 480 CALENDAR DAYS)				$
10	**CONTRACT CONTINGENCY (USED ONLY WITH COUNTY APPROVAL)**		**10% of TOTAL BASE BID**		$
	TOTAL OFFER FOR BID with CONTRACT CONTINGENCY (BASED ON COMPLETION TIME OF 480 CALENDAR DAYS)				$

BIDDER:_____

AUTHORIZED BY: _____

BID FORM (Submit in Duplicate)

IFB# 15-1058-DS

SEWRF- Septage Grease Receiving Station Project

(Bid "B" - Based on Completion Time of **360** calendar days)

ITEM NO.	DESCRIPTION	QTY	U/M	UNIT PRICE ($)	EXTENDED PRICE ($)
1	Mobilization & Demobilization	LS	1	$	$
2	Septage / Grease Receiving Station	LS	1	$	$
3	Grease Dewatering Screw Press	LS	1	$	$
4	Vacuum Truck Receiving Area	LS	1	$	$
5	Lift Station	LS	1	$	$
6	Glass Fused to Steel Storage Tanks (2 tanks)	LS	1	$	$
7	Yard Piping	LS	1	$	$
8	Site Improvements	LS	1	$	$
9	Electrical and Instrumentation	LS	1	$	$
	TOTAL BASE BID (Based on Completion of 360 CALENDAR DAYS)				$
10	**CONTRACT CONTINGENCY (USED ONLY WITH COUNTY APPROVAL)**		**10% of TOTAL BASE BID**		$
	TOTAL OFFER FOR BID with CONTRACT CONTINGENCY (BASED ON COMPLETION TIME OF 360 CALENDAR DAYS)				**$**

BIDDER:_____

AUTHORIZED BY:_____

MAILING LABEL

Cut along the outside border and affix this label to your sealed bid envelope to identify it as a "Sealed Bid". Be sure to include the name of the company submitting the bid and the bid due date and time where requested.

MAILING LABEL TO AFFIX TO OUTSIDE OF SEALED BID PACKAGE:

SEALED BID - DO NOT OPEN

BIDDER: _____

SEALED BID NO: IFB #15-1058-DS

BID TITLE: SOUTHEAST WATER RECLAMATION FACILITY (SEWRF) SEPTAGE / GREASE RECEIVING STATION

DUE DATE/TIME: _____ @ _____

Section D

INSURANCE AND BONDING REQUIREMENTS

The successful bidder will not commence Work under the resulting Agreement until all insurance under this section, and such insurance coverage as might be required by Owner, has been obtained. The successful bidder shall obtain, and submit to the Purchasing Division within ten (10) calendar days from the date of notice of intent to award, at his expense, the following minimum amounts of insurance (inclusive of any amounts provided by an umbrella or excess policy):

Insurance / Bond Type	**Required Limits**
1. ☒ Automobile Liability:	Bodily Injury and Property Damage, Owned/Non-Owned/Hired; Automobile included $ 1,000,000 each occurrence *This policy shall contain severability of interests' provisions.*
2. ☒ Commercial General Liability: (Occurrence Form - patterned after the current ISO form)	Bodily Injury and Property Damage $ 1,000,000 single limit per occurrence; $ 2,000,000 aggregate This shall include Premises and Operations; Independent Contractors; Products and Completed Operations and Contractual Liability. *This policy shall contain severability of interests' provisions.*
3. ☒ Employer's Liability:	$ 1,000,000 single limit per occurrence
4. ☒ Worker's Compensation:	Statutory Limits of Chapter 440, Florida Statutes, and all Federal Government Statutory Limits & Requirements
5. ☒ Other Insurance, as noted:	a. ☐ Aircraft Liability $ _____ per occurrence Coverage shall be carried in limits of not less than $5,000,000 each occurrence if applicable to the completion of the services under this Agreement. b. ☐ Installation Floater $ _____ If the resulting Agreement **does not** include construction of or additions to above ground building or structures, but does involve the installation of machinery or equipment, successful bidder shall provide an **"Installation Floater"** with the minimum amount of insurance to be 100% of the value of such addition(s), building(s), or structure(s). c. ☐ Maritime Coverage (Jones Act) $ _____ per occurrence Coverage shall be maintained where applicable to the completion of the Work.

Insurance / Bond Type	Required Limits
	d. ☒ Pollution $ 1,000,000 per occurrence e. ☐ Professional Liability $ _____ per claim and in the aggregate • $1,000,000 per claim and in the aggregate • $2,000,000 per claim and in the aggregate f. ☐ Project Professional Liability $ _____ per occurrence g. ☒ Property Insurance $ _____ If the resulting Agreement includes construction of or additions to above ground buildings or structures, bidder shall provide **"Builder's Risk"** insurance with the minimum amount of insurance to be 100% of the value of such addition(s), building(s), or structure(s). *To the extent that property damage is covered by commercial insurance, Owner and successful bidder agree to waive all subrogation rights against each other, except such rights as they may have to the proceeds of such insurance. Successful bidder shall require a similar waiver of subrogation from each of its bidder personnel and sub-consultants, to include Special Consultants; successful bidder shall provide satisfactory written confirmation to Owner of these additional waivers.* h. ☐ U.S. Longshoreman's and Harborworker's Act Coverage shall be maintained where applicable to the completion of the Work. i. ☐ Valuable Papers Insurance $ _____ per occurrence j. ☐ Watercraft $ _____ per occurrence
6. ☒ Bid Bond:	Bid bond shall be submitted by bidder for 5% of the total amount of the bid.
7. ☒ Payment and Performance Bond:	Payment and Performance Bond shall be submitted by bidder for 100% of the award amount. $ _____

Reviewed by Risk:

INSURANCE REQUIREMENTS

The amounts and types of insurance coverage shall conform to the minimum requirements set forth in this Exhibit, with the use of Insurance Services Office (ISO) forms and endorsements or their equivalents. If successful bidder has any self-insured retentions or deductibles under any of the listed minimum required coverage, successful bidder must identify on the certificate of insurance the nature and amount of such self-insured retentions or deductibles and provide satisfactory evidence of financial responsibility for such obligations. All self-insured retentions or deductibles will be successful bidder's sole responsibility.

Nothing herein shall in any manner create any liability of Owner in connection with any claim against the successful bidder for labor, services, or materials, or of Subcontractors; and nothing herein shall limit the liability of the successful bidder or successful bidder's sureties to Owner or to any workers, suppliers, material men or employees in relation to the resulting Agreement.

Builder's Risk Coverage. The successful bidder shall procure and maintain during the entire course of the Work a builder's risk policy, completed value form, insured to provide coverage on an all risk basis, including coverage for off-site stored materials and including coverage for theft. This coverage shall not be lapsed or cancelled because of partial Acceptance by the Owner prior to final Acceptance of the Project. Successful bidder shall recommend to Owner any additions to the Project Costs resulting from any casualty described in Article XII General Conditions of the Construction Agreement, including those costs, expenses and other charges (including normal and ordinary compensation to the successful bidder) necessary for reconstruction of the Project substantially in accordance with the Project Plans and Specifications. The nature, level and type of builder's risk coverage (including completed value or replacement cost coverage) shall be determined by Owner through insurers selected by successful bidder and approved by Owner.

Excess Policy or Umbrella. An excess policy or umbrella may be used to cover limits over and above Commercial General Liability.

Subcontractor's Public Liability and Property Damage Insurance. The successful bidder shall require each Subcontractor to procure and maintain during the term of the subcontract, insurance of the type specified above, or insure the activities of Subcontractors in its policy, as approved by Owner prior to performance of any services. The levels of coverage as set forth in the table above may be adjusted to require a reduced level of coverage consistent with the scope of Work to be provided by that particular Subcontractor. Any reduction in the levels of insurance coverage required by the successful bidder's standard form of subcontract shall be approved by the Owner.

Waiver of Subrogation. Owner and successful bidder waive against each other and the Owner's separate Vendors, Contractors, Design Consultants, Subcontractors agents and employees of each and all of them, all damages covered by property insurance provided herein, except such rights as they may have to the proceeds of such insurance. The successful bidder and Owner shall, where appropriate, require similar waivers of subrogation from the Owner's separate Vendors, Design Consultants and Subcontractors and shall require each of them to include similar waivers in their contracts.

Worker's Compensation Insurance. The successful bidder shall procure and maintain during the term of the Contract Documents, workers' compensation insurance for all its employees connected with the Work and shall require all Subcontractors similarly to provide workers' compensation insurance for all their employees unless such employees are covered by the protection afforded by successful bidder. Such insurance shall comply with the Florida Workers' Compensation Law. The successful bidder shall provide adequate insurance, satisfactory to Owner, for the protection of employees not otherwise protected.

By way of its submission of a bid hereto, bidder:

a. Represents that bidder maintains, and will maintain during the term of any Agreement arising from this solicitation, all insurance coverage required herein from responsible companies duly authorized to do business under the laws of the State of Florida that hold a rating of "A-" or better by Best's Key Guide, latest edition, and are deemed acceptable to Owner as set forth in this solicitation.

b. Agrees that insurance, as specified herein, shall remain in force and effect without interruption from the date of commencement of the Work throughout the duration of the Project, and shall remain in effect for at least two (2) years after the termination of the Contract Documents.

c. Agrees that if the initial or any subsequently issued certificate of insurance expires prior to completion of the Work, successful bidder shall furnish to Owner renewal or replacement certificate(s) of insurance no later than ten (10) calendar days after the expiration date on the certificate. Failure of successful bidder to provide Owner with such renewal certificate(s) shall be considered justification for Owner to terminate any and all Agreements.

d. Agrees that bidder and/or its insurance carrier shall provide thirty (30) days written notice to Owner of policy cancellation or non-renewal on the part of the insurance carrier or the successful bidder. Successful bidder shall also notify Owner, in a like manner, within twenty-four (24) hours after receipt, of any notices of expiration, cancellation, non-renewal or material change in coverage or limits received by successful bidder from its insurer and nothing contained herein shall relieve successful bidder of this requirement to provide notice. In the event of a reduction in the aggregate limit of any policy to be provided by successful bidder hereunder, successful bidder shall immediately take steps to have the aggregate limit reinstated to the full extent permitted under such policy.

e. Agrees that failure of successful bidder to obtain and maintain proper amounts of insurance at all times as called for herein shall constitute a material breach of the resulting Agreement, which may result in immediate termination.

f. Agrees that, should at any time the successful bidder not maintain the insurance coverage(s) required herein, Owner may terminate the Agreement or at its sole discretion shall be authorized to purchase such coverage(s) and charge successful bidder for such coverage(s) purchased. If successful bidder fails to reimburse Owner for such costs within thirty (30) days after demand, Owner has the right to offset these costs from any amount due successful bidder under this Agreement or any other agreement between Owner and successful bidder. Owner shall be under no obligation to purchase such insurance, nor shall it be responsible for the coverage(s) purchased or the insurance companies used. The decision of Owner to purchase such insurance coverage(s) shall in no way be construed to be a waiver of any of its rights under the Contract Documents.

g. Agrees to provide, upon request, the entire and complete insurance policies required herein.

h. The payment of deductibles for insurance required of the successful bidder by the Contract Documents shall be the sole responsibility of the successful bidder.

Certificate of Insurance Requirements:

a. Certificates of insurance in duplicate evidencing the insurance coverage specified herein shall be filed with the Purchasing Division before operations are begun. The required certificates of insurance shall name the types of policy, policy number, date of expiration, amount of coverage, companies affording coverage, and also shall refer specifically to the bid number and title of the Project, and must read: For any and all work performed on behalf of Manatee County.

b. **Additional Insured:** The Automobile Liability and Commercial General Liability policies provided by the successful bidder to meet the requirements of this IFB shall name Manatee County, Board of County Commissioners, as an additional insured as to the operations of the successful bidder under this IFB and shall contain severability of interests provisions.

c. In order for the certificate of insurance to be accepted it **must** comply with the following:

1. The "Certificate Holder" shall be:
   Manatee County
   Board of County Commissioners
   Bradenton, FL
   IFB# 15-1058-DS, Southeast Water Reclamation Facility (SEWRF) Septage / Grease Receiving Station
   For any and all work performed on behalf of Manatee County.

2. Certificate shall be mailed to:
   Manatee County Purchasing Division
   1112 Manatee Avenue West, Suite 803
   Bradenton, FL 34205
   Attn: Donna M. Stevens, Contract Specialist

BONDING REQUIREMENTS

Bid Bond/Certified Check. By submitting a bid to this IFB, the bidder agrees should the bidder's bid be accepted, **to execute the form of Agreement and present the same to Manatee County for approval within ten (10) calendar days after notice of intent to award.** The bidder further agrees that failure to execute and deliver said form of Agreement **within ten (10) calendar days** will result in damages to Manatee County and as guarantee of payment of same a bid bond/certified check shall be enclosed within the submitted sealed bid in the amount of five (5%) percent of the total amount of the bid. The bidder further agrees that in case the bidder fails to enter into an Agreement, as prescribed by Manatee County, the bid bond/certified check accompanying the bid shall be forfeited to Manatee County as agreed liquidated damages. If Owner enters into an Agreement with a bidder, or if Owner rejects any and/or all bids, accompanying bond will be promptly returned.

Payment and Performance Bonds. Prior to commencing Work, the successful bidder shall obtain, for the benefit of and directed to Owner, a Payment and Performance Bond satisfying the requirements of Section 255.05, Florida Statutes, covering the faithful performance by the successful bidder of its obligation under the Contract Documents, including but not limited to the construction of the Project on the Project Site and the payment and obligations arising thereunder, including all payments to Subcontractors, laborers, and materialmen. The surety selected by the successful bidder to provide the Payment and Performance Bond shall be approved by Owner prior to issuance of such Bond, which approval shall not be unreasonably withheld or delayed provided that surety is rated A- or better by Best's Key Guide, latest edition.

Failure to provide the required bonds on the prescribed form may result in successful bidder being deemed nonresponsive. Bonds must be in the form prescribed in Section 255.05, Florida Statutes, and must not contain notice, demand or other terms and conditions, including informal pre-claim meetings, not provided for in Section 255.05, Florida Statutes.

Surety of such bonds shall be in an amount equal to 100% of the Contract Price issued by a duly authorized and nationally recognized surety company, authorized to do business in the State of Florida, satisfactory to Owner. Surety shall be rated as "A-" or better by Best's Key Guide, latest edition. The attorney-in-fact who signs the bonds must file with the bonds, a certificate and effective dated copy of power-of-attorney. Payment and Performance Bonds shall be issued to Manatee County, a political subdivision of the State of Florida, **within ten (10) calendar days after notice of intent to award**.

In addition, pursuant to Section 255.05(1)(b), Florida Statutes, prior to commencing Work, the successful bidder shall be responsible and bear all costs associated to record the Payment and Performance Bond with the Manatee County Clerk of the Circuit Court. A certified copy of said recording shall be furnished to the Purchasing Division upon filing. Pursuant to Section 255.05(1)(b), Florida Statutes, Owner will make no payment to the successful bidder until the successful bidder has complied with this paragraph.

Furnishing Payment and Performance Bonds shall be requisite to execution of an Agreement with Owner. Said Payment and Performance Bonds will remain in force for the duration of the Agreement with the premiums paid by the successful bidder. Failure of the successful bidder to execute such Agreement and to supply the required bonds shall be just cause for cancellation of the award. Owner may then contract with the next lowest, responsive and responsible bidder or re-advertise this IFB. If another bidder is accepted, and notice given within ninety (90) days after the opening of the bids, this Acceptance shall bind the bidder as though they were originally the successful bidder.

Failure of Owner at any time to require performance by the successful bidder of any provisions set out in the resulting Agreement will in no way affect the right of Owner, thereafter, to enforce those provisions.

BIDDER'S INSURANCE STATEMENT

THE UNDERSIGNED hereto have read and understand the aforementioned insurance requirements of this IFB and note that the evidence of insurability shall be required within ten (10) days from the date of notice of intent to award.

Bidder Name: _____ Date: _____

Bidder's Signature: _____

Print Name: _____

Insurance Agency: _____

Agent Name: _____ Agent Phone: _____

Please return this completed and signed statement with your bid.

ATTACHMENT A

BIDDER'S QUESTIONNAIRE

(Submit in Duplicate)

The bidder warrants the truth and accuracy of all statements and answers herein contained. (Attach additional pages if necessary.)

THIS QUESTIONNAIRE MUST BE COMPLETED AND SUBMITTED WITH YOUR BID

1. Contact Information:

   FEIN #: _____

   License #: _____
   License Issued to: _____
   Date License Issued (MM/DD/YR): _____
   Company Name: _____
   Physical Address: _____
   City: _____ State of Incorporation: _____ Zip Code: _____
   Phone Number: ( ) _____ Fax Number: ( ) _____
   Email address: _____

2. Bidding as: an individual __; a partnership __; a corporation __; a joint venture __

3. If a partnership, list names and addresses of partners; if a corporation, list names of officers, directors, shareholders, and state of incorporation; if joint venture, list names and address of ventures' and the same if any venture are a corporation for each such corporation, partnership, or joint venture:

   _____
   _____
   _____
   _____

4. Bidder is authorized to do business in the State of Florida: ☐ Yes ☐ No

   For how many years? _____

5. Your organization has been in business (under this firm's name) as a

   _____

   Is this firm in bankruptcy? _____

6. Attach a list of projects where this specific type of Work was performed. Note: Contractor shall have a **minimum of 5 years' experience** performing this type of work.

BIDDER: _____

7. Is this firm currently contemplating or in litigation? Provide summary details.

_____

_____

_____

8. Have you ever been assessed liquidated damages under a contract during the past five (5) years? If so, state when, where (contact name, address and phone number) and why.

_____

_____

_____

9. Have you ever failed to complete Work awarded to you? Or failed to complete projects within contract time? If so, state when, where (contact name, address, phone number) and why.

_____

_____

_____

10. Have you ever been debarred or prohibited from providing a bid to a governmental entity? If yes, name the entity and describe the circumstances.

_____

_____

_____

11. Will you subcontract any part of this Work? If so, describe which portion(s) and to whom.

_____

_____

_____

BIDDER: _____

12. If any, list MBE/DBE (with Agreement amount) to be utilized:

_____

_____

_____

13. What equipment do you own to accomplish this Work? (A listing may be attached)

_____

_____

_____

14. What equipment will you purchase/rent for the Work? (Specify which)

_____

_____

_____

15. List the following in connection with the surety which is providing the bond(s):

Surety's Name: _____

Address: _____

_____

Name, address, phone number and email of surety's resident agent for service of process in Florida:

Agent's Name: _____

Address: _____

_____

Phone: _____

Email: _____

BIDDER: _____

ATTACHMENT B

PUBLIC CONTRACTING AND ENVIRONMENTAL CRIMES CERTIFICATION

SWORN STATEMENT PURSUANT TO ARTICLE V, MANATEE COUNTY PROCUREMENT CODE

THIS FORM MUST BE SIGNED AND SWORN TO IN THE PRESENCE OF A NOTARY PUBLIC OR OTHER OFFICIAL AUTHORIZED TO ADMINISTER OATHS.

This sworn statement is submitted to the Manatee County Board of County Commissioners by

_____

[Print individual's name and title]

___ for _____[Print name of entity submitting sworn statement]

whose business address is _____

and (if applicable) its Federal Employer Identification Number (FEIN) is _____. If the entity has no FEIN, include the Social Security Number of the individual signing this sworn statement: _____.

I understand that no person or entity shall be awarded or receive an Owner's Agreement for public improvements, procurement of goods or services (including professional services) or an Owner's lease, franchise, concession or management agreement, or shall receive a grant of Owner's monies unless such person or entity has submitted a written certification to Owner that it has not:

(1) been convicted of bribery or attempting to bribe a public officer or employee of Manatee County, the State of Florida, or any other public entity, including, but not limited to the Government of the United States, any state, or any local government authority in the United States, in that officer's or employee's official capacity; or

(2) been convicted of an agreement or collusion among bidders or prospective bidders in restraint of freedom of competition, by agreement to bid a fixed price, or otherwise; or

(3) been convicted of a violation of an environmental law that, in the sole opinion of Owner's Purchasing Official, reflects negatively upon the ability of the person or entity to conduct business in a responsible manner; or

(4) made an admission of guilt of such conduct described in items (1), (2) or (3) above, which is a matter of record, but has not been prosecuted for such conduct, or has made an admission of guilt of such conduct, which is a matter of record, pursuant to formal prosecution. An admission of guilt shall be construed to include a plea of nolo contendere; or

(5) where an officer, official, agent or employee of a business entity has been convicted of or has admitted guilt to any of the crimes set forth above on behalf of such an entity and pursuant to the direction or authorization of an official thereof (including the person committing the offense, if he is an official of the business entity), the business shall be chargeable with the conduct herein above set forth. A business entity shall be chargeable with the conduct of an affiliated entity, whether wholly owned, partially owned, or one which has common ownership or a common Board of Directors. For purposes of this Form, business entities are affiliated if, directly or indirectly, one business entity controls or has the power to control another business entity, or if an individual or group of individuals controls or has the power to control both entities. Indicia of control shall include, without limitation, interlocking management or ownership, identity of interests among family members, shared organization of a business entity following the ineligibility of a business entity under this Article, or using substantially the same management, ownership or principles as the ineligible entity.

(Continued)

Any person or entity who claims that this Article is inapplicable to him/her/it because a conviction or judgment has been reversed by a court of competent jurisdiction shall prove the same with documentation satisfactory to Owner's Purchasing Official. Upon presentation of such satisfactory proof, the person or entity shall be allowed to contract with Owner.

I UNDERSTAND THAT THE SUBMISSION OF THIS FORM TO THE CONTRACTING OFFICER FOR MANATEE COUNTY IS VALID THROUGH DECEMBER 31 OF THE CALENDAR YEAR IN WHICH IT IS FILED. I ALSO UNDERSTAND THAT ANY AGREEMENT OR BUSINESS TRANSACTION SHALL PROVIDE FOR SUSPENSION OF PAYMENTS, OR TERMINATION, OR BOTH, IF THE CONTRACTING OFFICER OR COUNTY ADMINISTRATOR DETERMINES THAT **SUCH PERSON OR ENTITY HAS MADE FALSE CERTIFICATION.**

_____
[Signature]

STATE OF FLORIDA
COUNTY OF _____

Sworn to and subscribed before me this ___ day of _____, 2015 by _____

Personally known _____ OR Produced identification _____
[Type of identification]

_____ My commission expires _____
Notary Public Signature

_____
[Print, type or stamp Commissioned name of Notary Public]

Signatory Requirement - In the case of a business entity other than a partnership or a corporation, this affidavit shall be executed by an authorized agent of the entity. In the case of a partnership, this affidavit shall be executed by the general partner(s). In the case of a corporation, this affidavit shall be executed by the corporate president.

ATTACHMENT C

SWORN STATEMENT

THE FLORIDA TRENCH SAFETY ACT

THIS FORM MUST BE SIGNED IN THE PRESENCE OF A NOTARY PUBLIC OR BY AN OFFICER AUTHORIZED TO ADMINISTER OATHS.

1. This Sworn Statement is submitted with **IFB NO.15-1058-DS**
2. This Sworn Statement is submitted by _____ whose business address is _____ and, if applicable, its Federal Employer Identification Number (FEIN) is _____. If the entity has no FEIN, include the Social Security Number of the individual signing this sworn statement _____.
3. Name of individual signing this Sworn Statement is: _____, Whose relationship to the above entity is: _____.
4. The Trench Safety Standards that will be in effect during the construction of this project shall include, but are not limited to: Laws of Florida, Chapters 90-96, TRENCH SAFETY ACT, and OSHA RULES AND REGULATIONS 29 CFR 1926.650 Subpart P, effective October 1, 1990.
5. The undersigned assures that the entity will comply with the applicable Trench Safety Standards and agrees to indemnify and hold harmless Owner and Engineer, and any of their agents or employees from any claims arising from the failure to comply with said standard.
6. The undersigned has appropriated the following costs for compliance with the applicable standards:

Trench Safety Measure (Description)	Units of Measure (LF, SY)	Unit Quantity	Unit Cost	Extended Cost
a. _____	_____	_____	$_____	_____
b. _____	_____	_____	$_____	_____
c. _____	_____	_____	$_____	_____
d. _____	_____	_____	$_____	_____

7. The undersigned intends to comply with these standards by instituting the following procedures:

_____

_____

_____

THE UNDERSIGNED, in submitting this bid, represents that they have reviewed and considered all available geotechnical information and made such other investigations and tests as they may deem necessary to adequately design the trench safety system(s) to be utilized on this project.

_____

(AUTHORIZED SIGNATURE / TITLE)

SWORN to and subscribed before me this _____ day of _____, 2015.

(Impress official seal)

Notary Public, State of Florida: _____

My commission expires: _____

R. B. "Chips" Shore
CLERK OF THE CIRCUIT COURT AND COMPTROLLER OF MANATEE COUNTY
1115 Manatee Avenue West, Bradenton, Florida 34205 - Phone (941) 749-1800 – Fax (941) 741-4082
P.O. Box 25400, Bradenton, Florida 34206 - www.manateeclerk.com

ATTACHMENT D: E PAYABLES APPLICATION

Company name_____

Contact person_____

Phone number_____

Email Address_____

FINANCE USE ONLY

Open orders: YES or NO

PEID _____

CREATE DATE _____

CONFIRMED WITH _____
Name and phone number

IFAS _____

BANK _____

INITIALS_____

Return completed form to:

Via email to: lori.bryan@manateeclerk.com

Via fax to: (941) 741-4011

Via mail:

PO Box 1000

Bradenton, Fl 34206

Revised: June 26, 2013

GENERAL CONDITIONS

of the

CONSTRUCTION AGREEMENT

TABLE OF CONTENTS FOR GENERAL CONDITIONS

CONSTRUCTION AGREEMENT FOR
STIPULATED SUM
[PROJECT NAME]

THIS AGREEMENT ("Agreement") is made and entered into by and between Manatee County, a political subdivision of the State of Florida, referred to herein as "Owner", and the firm of _____, incorporated in the State of _____ and registered and licensed to do business in the State of Florida (license #_____), referred to herein as "Contractor."

WHEREAS, the Owner intends to construct **[Southeast Water Reclamation Facility (SEWRF) Septage / Grease Receiving Station Project]**, the aforementioned improvements being hereinafter referred to and defined as the "Project"; and

WHEREAS, in response to Owner's Invitation for Bid No. 15-1058-DS (the "IFB"), Contractor has submitted its Bid (the "Contractor's Bid") to provide the aforementioned construction services.

NOW THEREFORE, the Owner and the Contractor, in consideration of the mutual covenants hereinafter set forth, the sufficiency of which is hereby acknowledged, agree as follows:

1. **Contract Documents.** The Contract Documents consist of this Agreement and attached Exhibits, the attached General Conditions of the Construction Agreement, Supplementary Conditions (if any), Special Conditions (if any), Drawings (the titles of which are attached hereto as Exhibit A), Specifications (the titles of which are attached hereto as Exhibit B), Addenda issued prior to execution of this Agreement, the Invitation for Bid (including any Instructions to Bidders, Scope of Work, Bid Summary, Supplements, and Technical Specifications), any interpretations issued pursuant to the Invitation for Bid, the Contractor's Bid, permits, notice of intent to award, Notice to Proceed, purchase order(s), any other documents listed in this Agreement, and Modifications [to include written Amendment(s), Change Order(s), Work Directive Change(s) and Field Directive(s)] issued after execution of this Agreement. These form the Agreement, and are as fully a part of the Agreement as if attached or repeated herein. This Agreement represents the entire and integrated agreement between the parties hereto and supersedes prior negotiations, representations or agreements, either written or oral. No other documents shall be considered Contract Documents.

2. **Work.** The Contractor shall fully execute the Work described in the Contract Documents, except to the extent specifically indicated in the Contract Documents to be the responsibility of others.

3. **Date of Commencement and Substantial Completion.**

A. Date of Commencement. The date of commencement of the Work shall be the date fixed in a Notice to Proceed issued by the Owner.

B. Contract Time. The Contract Time shall be measured from the date of commencement.

C. Substantial Completion. The Contractor shall achieve Substantial Completion of the entire Work not later than ___ days from the date of commencement, or as follows:

Portion of Work	Substantial Completion Date

subject to adjustments of this Contract Time as provided in the Contract Documents.

Time is of the essence in the Contract Documents and all obligations thereunder. If the Contractor fails to achieve Substantial Completion of the Work within the Contract Time and as otherwise required by the Contract Documents, the Owner shall be entitled to retain or recover from the Contractor, as liquidated damages and not as a penalty, the sum of $_____ per calendar day, commencing upon the first day following expiration of the Contract Time and continuing until the actual date of Substantial Completion. Such liquidated damages are hereby agreed to be a reasonable estimate of damages the Owner will incur as a result of delayed completion of the Work. The Owner may deduct liquidated damages as described in this paragraph from any unpaid amounts then or thereafter due the Contractor under this Agreement. Any liquidated damages not so deducted from any unpaid amounts due the Contractor shall be payable to the Owner at the demand of the Owner, together with interest from the date of the demand at the maximum allowable rate.

4. Contract Sum.

A. Payment. The Owner shall pay the Contractor the Contract Sum in current funds for the Contractor's performance of the Contract. The Contract Sum shall be _____ Dollars and Zero Cents ($_____), subject to additions and deductions as provided in the Contract Documents.

B. Alternates. The Contract Sum is based upon the following alternates, if any, which are described in the Contract Documents and are hereby accepted by the Owner. *(State the numbers or other identification of accepted alternates. If decisions on other alternates are to be made by the Owner subsequent to the execution of this Agreement, attach a schedule of such other alternates showing the amount for each and the date when that amount expires.)*

C. Unit Prices. Unit prices, if any, are reflected in the Contractor's Bid.

5. Payments.

A. Progress Payments.

(1) Based upon Applications for Payment submitted to the Architect/Engineer by the Contractor and Certificates for Payment issued by the Architect/Engineer, the Owner shall make progress payments on account of the Contract Sum to the Contractor as provided below and elsewhere in the Contract Documents.

(2) The period covered by each Application for Payment shall be one calendar month ending on the last day of the month.

(3) Payments shall be made by Owner in accordance with the requirements of Section 218.735, Florida Statutes.

(4) Each Application for Payment shall be based on the most recent schedule of values submitted by the Contractor in accordance with the Contract Documents. The schedule of values shall allocate the entire Contract Sum among the various portions of the Work. The schedule of values shall be prepared in such form and supported by such data to substantiate its accuracy as the Architect/Engineer may require. This schedule, unless objected to by the Owner or Architect/Engineer, shall be used as a basis for reviewing the Contractor's Applications for Payment.

(5) Applications for Payment shall indicate the percentage of completion of each portion of the Work as of the end of the period covered by the Application for Payment.

(6) Subject to other provisions of the Contract Documents, the amount of each progress payment shall be computed as follows:

i. Take that portion of the Contract Sum properly allocable to completed Work as determined by multiplying the percentage completion of each portion of the Work by the share of the Contract Sum allocated to that portion of the Work in the schedule of values, less retainage of ten percent (10.00%). Pending final determination of cost to the Owner of changes in the Work, amounts not in dispute shall be included as provided in Section 3.3.B. of the General Conditions;

ii. Add that portion of the Contract Sum properly allocable to materials and equipment delivered and suitably stored at the site for subsequent incorporation in the completed construction (or, if approved in advance by the Owner, suitably stored off the site at a location agreed upon in writing), supported by paid receipts, less retainage of ten percent (10.00%);

iii. Subtract the aggregate of previous payments made by the Owner; and

iv. Subtract amounts, if any, for which the Architect/Engineer has withheld or nullified an Application for Payment, in whole or in part as provided in Section 3.3.C. of the General Conditions.

(7) The progress payment amount determined in accordance with Section 5.A(6) shall be further modified under the following circumstances:

i. Add, upon Substantial Completion of the Work, a sum sufficient to increase the total payments to the full amount of the Contract Sum, less such amounts as the Architect/Engineer shall determine for incomplete Work, retainage applicable to such work and unsettled claims.

ii. Add, if final completion of the Work is thereafter materially delayed through no fault of the Contractor, any additional amounts payable in accordance with Section 3.2.B. of the General Conditions.

(8) Reduction or limitation of retainage, if any, shall be as follows:

Notwithstanding the foregoing, upon completion of at least 50% of the Work, as determined by the Architect/Engineer and Owner, the Owner shall reduce to five percent (5%) the amount of retainage withheld from each subsequent progress payment.

(9) Except with the Owner's prior approval, the Contractor shall not make advance payments to suppliers for materials or equipment which have not been delivered and stored at the site.

B. Final Payment. Final Payment, constituting the entire unpaid balance of the Contract Sum, shall be made by the Owner to the Contractor when:

(1) The Contractor has fully performed the Work except for the Contractor's responsibility to correct Work as provided in Section 2.4.C. of the General Conditions, and to satisfy other requirements, if any, which extend beyond final payment; and

(2) A final Application for Payment has been approved by the Architect/Engineer.

6. Termination or Suspension.

A. Termination. The Agreement may be terminated by the Owner or the Contractor as provided in Article XIV of the General Conditions.

B. Suspension by Owner. The Work may be suspended by the Owner as provided in Article XIV of the General Conditions.

7. Other Provisions.

A. Substantial Completion Defined. Substantial Completion shall be defined as provided in Article I of the General Conditions. In the event a temporary certificate of

occupancy or completion is issued establishing Substantial Completion, the Contractor shall diligently pursue the issuance of a permanent certificate of occupancy or completion.

B. Project Meetings. There shall be a project meeting, at the jobsite or other location acceptable to the parties, on a regularly scheduled basis. The meeting will be attended by a representative of the Contractor, Architect/Engineer and Owner. These representatives shall be authorized to make decisions that are not otherwise contrary to the requirements of this Agreement.

C. Weather. Any rainfall, temperatures below 32 degrees Fahrenheit or winds greater than 25 m.p.h. which actually prevents Work on a given day, shall be considered lost time and an additional day added to the Contract Time, provided no work could be done on site, and provided written notice has been submitted to the Owner by the Contractor documenting same.

D. Shop Drawings; Critical Submittals. In consideration of the impact of timely review of submittals and shop drawings on the overall progress of the Work, it is hereby agreed that the Owner shall cause his agents and design professionals to accomplish the review of any particular "critical" submittals and/or shop drawings and return same to the Contractor within fourteen (14) days.

E. Applications for Payment. Applications for Payment shall be submitted once monthly at regular intervals and shall include detailed documentation of all costs incurred.

F. Punch List. Within 30 days after obtainment of Substantial Completion, the Owner shall generate a "punch list" of all work items requiring remedial attention by the Contractor. Within 5 days thereafter the Architect/Engineer shall assign a fair value to the punch list items, which sum shall be deducted from the next scheduled progress payment to the Contractor. Upon satisfactory completion of the punch list items, as certified by the Architect/Engineer, the previously deducted sum shall be paid to the Contractor.

G. Closeout documentation. Within 30 days after obtainment of Substantial Completion and before final payment, Contractor shall gather and deliver to Owner all warranty documentation, all manufacturer's product and warranty literature, all manuals (including parts and technical manuals), all schematics and handbooks, and all as-built drawings.

H. Governing Provisions; Conflicts. In the event of a conflict between this Agreement and the Specifications or as between the General Conditions and the Specifications, the Specifications shall govern.

I. E-Verify. The Contractor's employment of unauthorized aliens is a violation of Section 274(e) of the Federal Immigration and Employment Act. The Contractor shall utilize the U.S. Department of Homeland Security E-Verify system to verify the employment eligibility of all new employees hired during the term of this Agreement, and shall require the same verification procedure of all Subcontractors.

8. Insurance and Bonding. If and to the extent required by the Invitation for Bid documents, the Contractor shall furnish insurance coverage for (but not necessarily limited to)

workers' compensation, commercial general liability, auto liability, excess liability, and builder's risk. The Contractor shall furnish to the Owner all appropriate policies and Certificate(s) of Insurance. The Contractor shall also post a Payment and Performance Bond for the Contract Sum, within ten (__) days following notification of intent to award, and otherwise in accordance with the Invitation for Bid documents.

9. Independent Contractor. The Contractor acknowledges that it is functioning as an independent contractor in performing under the terms of this Agreement, and it is not acting as an employee of the Owner.

10. Entire Agreement. This Agreement (inclusive of the Contract Documents incorporated herein by reference) represents the full agreement of the parties.

11. Amendments; Waivers; Assignment.

A. Amendments. This Agreement may be amended only pursuant to an instrument in writing that has been jointly executed by authorized representatives of the parties hereto.

B. Waivers. Neither this Agreement nor any portion of it may be modified or waived orally. However, each party (through its governing body or properly authorized officer) shall have the right, but not the obligation, to waive, on a case-by-case basis, any right or condition herein reserved or intended for the benefit or protection of such party without being deemed or considered to have waived such right or condition for any other case, situation, or circumstance and without being deemed or considered to have waived any other right or condition. No such waiver shall be effective unless made in writing with an express and specific statement of the intent of such governing body or officer to provide such waiver.

C. Assignment. The rights and obligations of either party to this Agreement may be assigned to a third party only pursuant to a written amendment hereto.

12. Validity. Each of the Owner and Contractor represents and warrants to the other its respective authority to enter into this Agreement.

13. Covenant To Defend. Neither the validity of this Agreement nor the validity of any portion hereof may be challenged by any party hereto, and each party hereto hereby waives any right to initiate any such challenge. Furthermore, if this Agreement or any portion hereof is challenged by a third party in any judicial, administrative, or appellate proceeding (each party hereby covenanting with the other party not to initiate, encourage, foster, promote, cooperate with, or acquiesce to such challenge), the parties hereto collectively and individually agree, at their individual sole cost and expense, to defend in good faith its validity through a final judicial determination or other resolution, unless all parties mutually agree in writing not to defend such challenge or not to appeal any decision invalidating this Agreement or any portion thereof.

14. Disclaimer of Third-Party Beneficiaries; Successors and Assigns. This Agreement is solely for the benefit of the parties hereto, and no right, privilege, or cause of action shall by reason hereof accrue upon, to, or for the benefit of any third party. Nothing in this Agreement is intended or shall be construed to confer upon or give any person, corporation,

partnership, trust, private entity, agency, or other governmental entity any right, privilege, remedy, or claim under or by reason of this Agreement or any provisions or conditions hereof. This Agreement shall be binding upon, and its benefits and advantages shall inure to, the successors and assigns of the parties hereto.

15. Construction.

A. Headings and Captions. The headings and captions of articles, sections, and paragraphs used in this Agreement are for convenience of reference only and are not intended to define or limit their contents, nor are they to affect the construction of or be taken into consideration in interpreting this Agreement.

B. Legal References. All references to statutory sections or chapters shall be construed to include subsequent amendments to such provisions, and to refer to the successor provision of any such provision. References to "applicable law" and "general law" shall be construed to include provisions of local, state and federal law, whether established by legislative action, administrative rule or regulation, or judicial decision.

16. Severability. The provisions of this Agreement are declared by the parties hereto to be severable. In the event any term or provision of this Agreement shall be held invalid by a court of competent jurisdiction, such invalid term or provision should not affect the validity of any other term or provision hereof; and all such terms and provisions hereof shall be enforceable to the fullest extent permitted by law as if such invalid term or provision had never been part of this Agreement; provided, however, if any term or provision of this Agreement is held to be invalid due to the scope or extent thereof, then, to the extent permitted by law, such term or provision shall be automatically deemed modified in order that it may be enforced to the maximum scope and extent permitted by law.

17. Governing Law; Venue. This Agreement shall be governed by the laws of the State of Florida. Venue for any petition for writ of certiorari or other court action allowed by this Agreement shall be in the Circuit Court of the Twelfth Judicial Circuit in and for Manatee County, Florida.

18. Attorney's Fees and Costs. In any claim dispute procedure or litigation arising from this Agreement, each party hereto shall be solely responsible for paying its attorney's fees and costs.

19. Notices. All notices, comments, consents, objections, approvals, waivers, and elections under this Agreement shall be in writing and shall be given only by hand delivery for which a receipt is obtained, or certified mail, prepaid with confirmation of delivery requested, or by electronic mail with delivery confirmation. All such communications shall be addressed to the applicable addressees set forth below or as any party may otherwise designate in the manner prescribed herein.

To the Owner: _____

_____

_____

_____

Email: _____

To the Contractor:

_____

_____

_____

_____

Email: _____

Notices, comments, consents, objections, approvals, waivers, and elections shall be deemed given when received by the party for whom such communication is intended at such party's address herein specified, or such other physical address or email address as such party may have substituted by notice to the other.

20. Exhibits. Exhibits to this Agreement are as follows:

Exhibit A—Title(s) of Drawings

Exhibit B—Title(s) of Specifications

Exhibit C—Affidavit of No Conflict

Exhibit D—Certificate(s) of Insurance

Exhibit E—Payment and Performance Bond

Exhibit F—Standard Forms
1—Application for Payment
2—Certificate of Substantial Completion
3—Final Reconciliation / Warranty / Affidavit
4—Change Order
5—Public Construction Bond

WHEREFORE, the parties hereto have executed this Agreement as of the date last executed below.

_____
Name of Contractor

By: _____

Printed Name: _____

Title: _____

Date: _____

MANATEE COUNTY, a political subdivision of the State of Florida

By: _____

Printed Name: _____

Title: _____

Date: _____

GENERAL CONDITIONS

of the

CONSTRUCTION AGREEMENT

GENERAL CONDITIONS
ARTICLE I
DEFINITIONS

1.1 Definitions. For purposes of the Contract Documents, the following terms shall have the following meanings.

A. Acceptance: The acceptance of the Project into the Owner's operating public infrastructure.

B. Application for Payment: The form approved and accepted by the Owner, which is to be used by Contractor in requesting progress payments or final payment and which is to include such supporting documentation as is required by the Contract Documents.

C. Architect/Engineer: _____, a _____ corporation, registered and licensed to do business in the State of Florida.

D. Change Order: A written order signed by the Owner, the Architect/Engineer and the Contractor authorizing a change in the Project Plans and/or Specifications and, if necessary, a corresponding adjustment in the Contract Sum and/or Contract Time, pursuant to Article V.

E. Compensable Delay: Any delay beyond the control and without the fault or negligence of the Contractor resulting from Owner-caused changes in the Work, differing site conditions, suspensions of the Work, or termination for convenience by Owner.

F. Contractor's Personnel: The Contractor's key personnel designated by Contractor.

G. Construction Services: The Construction Services to be provided by Contractor pursuant to Section 2.4, in accordance with the terms and provisions of the Contract Documents.

H. Contract Sum: The total compensation to be paid to the Contractor for Construction Services rendered pursuant to the Contract Documents, as set forth in Contractor's Bid, unless adjusted in accordance with the terms of the Contract Documents.

I. Construction Team: The working team established pursuant to Section 2.1.B.

J. Contract Time: The time period during which all Construction Services are to be completed pursuant to the Contract Documents, to be set forth in the Project Schedule.

K. Days: Calendar days except when specified differently. When time is referred to in the Contract Documents by days, it will be computed to exclude the first and

include the last day of such period. If the last day of any such period falls on a Saturday or Sunday or legal holiday, such day will be omitted from the computation.

L. Defective: When modifying the term "Work", referring to Work that is unsatisfactory, faulty or deficient, or does not conform to the Contract Documents, or that does not meet the requirements of any inspection, reference standard, test or approval referred to in the Contract Documents, or that has been damaged prior to Owner's approval of final payment (unless responsibility for the protection thereof has been assumed by Owner).

M. Excusable Delay: Any delay beyond the control and without the negligence of the Contractor, the Owner, or any other contractor caused by events or circumstances such as, but not limited to, acts of God or of a public enemy, fires, floods, freight embargoes, acts of government other than Owner or epidemics. Labor disputes and above average rainfall shall give rise only to excusable delays.

N. Field Directive: A written order issued by Owner which orders minor changes in the Work not involving a change in Contract Time, to be paid from the Owner's contingency funds.

O. Final Completion Date: The date upon which the Project is fully constructed and all Work required on the Project and Project Site is fully performed as verified in writing by the Owner.

P. Float or Slack Time: The time available in the Project Schedule during which an unexpected activity can be completed without delaying substantial completion of the Work.

Q. Force Majeure: Those conditions constituting excuse from performance as described in and subject to the conditions described in Article XII.

R. Inexcusable Delay: Any delay caused by events or circumstances within the control of the Contractor, such as inadequate crewing, slow submittals, etc., which might have been avoided by the exercise of care, prudence, foresight or diligence on the part of the Contractor.

S. Non-prejudicial Delay: Any delay impacting a portion of the Work within the available total Float or Slack Time and not necessarily preventing Substantial Completion of the Work within the Contract Time.

T. Notice to Proceed: Written notice by Owner (after execution of Contract) to Contractor fixing the date on which the Contract Time will commence to run and on which Contractor shall start to perform the Work.

U. Owner: Manatee County, a political subdivision of the State of Florida.

V. Owner's Project Representative: The individual designated by Owner to perform those functions set forth in Section 7.8.

W. Payment and Performance Bond: The Payment and Performance Bond security posted pursuant to Section 2.4.Y to guarantee payment and performance by the Contractor of its obligations hereunder.

X. Permitting Authority: Any applicable governmental authority acting in its governmental and regulatory capacity which is required to issue or grant any permit, certificate, license or other approval which is required as a condition precedent to the commencement or approved of the Work, or any part thereof, including the building permit.

Y. Prejudicial Delay: Any excusable or compensable delay impacting the Work and exceeding the total float available in the Project Schedule, thus preventing completion of the Work within the Contract Time unless the Work is accelerated.

Z. Progress Report: A report to Owner that includes all information required pursuant to the Contract Documents and submitted in accordance with Section 2.4.EE, hereof.

AA. Project: The total construction of which the Work performed under the Contract Documents may be the whole or a part and which may include construction by Owner and by separate contractors. For the purposes of the Contract Documents, the term Project shall include all areas of proposed improvements and all areas which may reasonably be judged to have an impact on the Project.

BB. Project Costs: The costs incurred by the Contractor to plan, construct and equip the Project and included within, and paid as a component of, the Contract Sum.

CC. Project Manager: Subject to the prior written consent of Owner, the individual designated to receive notices on behalf of the Contractor, or such other individual designated by the Contractor, from time to time, pursuant to written notice in accordance with the Contract Documents.

DD. Project Plans and Specifications: The one hundred percent (100%) construction drawings and specifications prepared by the Architect/Engineer, and any changes, supplements, amendments or additions thereto approved by the Owner, which shall also include any construction drawings and final specifications required for the repair or construction of the Project, as provided herein.

EE. Project Schedule: The schedule and sequence of events for the commencement, progression and completion of the Project, developed pursuant to Section 2.3., as such schedule may be amended as provided herein.

FF. Project Site: The site depicted in the Project Plans and Specifications, inclusive of all rights of way, temporary construction easements or licensed or leased sovereign lands.

GG. Pre-operation Testing: All field inspections, installation checks, water tests, performance tests and necessary corrections required of Contractor to demonstrate that

individual components of the Work have been properly constructed and do operate in accordance with the Contract Documents for their intended purposes.

HH. Procurement Ordinance: The Manatee County Procurement Code, Chapter 2-26 of the Manatee County Code of Laws, as amended from time to time.

II. Punch List Completion Date: The date upon which all previously incomplete or unsatisfactory items, as identified by the Contractor, the Architect/Engineer and/or the Owner are completed in a competent and workmanlike manner, consistent with standards for Work of this type and with good building practices in the State of Florida.

JJ. Subcontractor: Any individual (other than a direct employee of the Contractor) or organization retained by Contractor to plan, construct or equip the Project pursuant to Article IV.

KK. Substantial Completion and Substantially Complete: The stage in the progress of the Work when the Work or designated portion thereof is sufficiently complete in accordance with the Contract Documents so that the Owner can occupy or utilize the Work for its intended use; provided, however, that as a condition precedent to Substantial Completion, the Owner has received all certificates of occupancy or completion and other permits, approvals, licenses, and other documents from any governmental authority which are necessary for the beneficial occupancy of the Project.

LL. Substantial Completion Date: The date on which the Project is deemed to be Substantially Complete, as evidenced by receipt of (i) the Architect/Engineer's certificate of Substantial Completion, (ii) written Acceptance of the Project by the Owner, and (iii) approvals of any other authority as may be necessary or otherwise required.

MM. Unit Price Work: Work to be paid for on the basis of unit prices.

NN. Work: The term "Work" means the construction and services required by the Contract Documents, whether completed or partially completed, and includes all labor, materials, equipment and services provided or to be provided by the Contractor to fulfill the Contractor's obligations. The Work may constitute the whole or a part of the Project.

OO. Work Directive Change: A written directive to Contractor, issued on or after the effective date of the Agreement pursuant to Section 5.8 and signed by Owner's Project Representative, ordering an addition, deletion or revision in the Work, or responding to differing or unforeseen physical conditions under which the Work is to be performed or responding to emergencies.

ARTICLE II
RELATIONSHIP AND RESPONSIBILITIES

2.1 Relationship between Contractor and Owner. The Contractor accepts the relationship of trust and confidence established with Owner pursuant to the Contract Documents. The Contractor shall furnish its best skill and judgment and cooperate with Owner and Owner's Project Representative in furthering the interests of the Owner. The Contractor agrees to provide the professional services required to complete the Project consistent with the Owner's direction and the terms of the Contract Documents. All services provided hereunder by Contractor, either directly or through Subcontractors, shall be provided in accordance with sound construction practices and applicable professional construction standards.

A. Purpose. The purpose of the Contract Documents is to provide for the provision of construction services for the Project on the Project Site by the Contractor, and construction of the Project by the Contractor in accordance with the Project Plans and Specifications. The further purpose of the Contract Documents is to define and delineate the responsibilities and obligations of the parties to the Contract Documents and to express the desire of all such parties to cooperate together to accomplish the purposes and expectations of the Contract Documents.

B. Construction Team. The Contractor, Owner and Architect/Engineer shall be called the "Construction Team" and shall work together as a team commencing upon full execution of the Contract Documents through Substantial Completion. As provided in Section 2.2, the Contractor and Architect/Engineer shall work jointly through completion and shall be available thereafter should additional services be required. The Contractor shall provide leadership to the Construction Team on all matters relating to construction. The Contractor understands, acknowledges and agrees that the Architect/Engineer shall provide leadership to the Construction Team on all matters relating to design.

C. Response to Invitation for Bid. The Contractor acknowledges that the representations, statements, information and pricing contained in its Bid have been relied upon by the Owner and have resulted in the award of this Project to the Contractor.

2.2 General Contractor Responsibilities. In addition to the other responsibilities set forth herein, the Contractor shall have the following responsibilities pursuant to the Contract Documents:

A. Personnel. The Contractor represents that it has secured, or shall secure, all personnel necessary to perform the Work, none of whom shall be employees of the Owner. Primary liaison between the Contractor and the Owner shall be through the Owner's Project Representative and Contractor's Project Manager. All of the services required herein shall be performed by the Contractor or under the Contractor's supervision, and all personnel engaged in the Work shall be fully qualified and shall be authorized or permitted under law to perform such services.

B. Cooperation with Architect/Engineer. The Contractor's services shall be provided in conjunction with the services of the Architect/Engineer. In the performance of

professional services, the Contractor acknowledges that time is critical for Project delivery. The Contractor acknowledges that timely construction utilizing the services of an Architect/Engineer and a Contractor requires maximum cooperation between all parties.

C. Timely Performance. The Contractor shall perform all services as expeditiously as is consistent with professional skill and care and the orderly progress of the Work, in accordance with the Project Schedule. Verification of estimated Project Schedule goals will be made as requested by the Owner.

D. Duty to Defend Work. In the event of any dispute between the Owner and any Permitting Authority that relates to the quality, completeness or professional workmanship of the Contractor's services or Work, the Contractor shall, at its sole cost and expense, cooperate with the Owner to defend the quality and workmanship of the Contractor's services and Work.

E. Trade and Industry Terminology. It is the intent of the Contract Documents to describe a functionally complete Project (or part thereof) to be constructed in accordance with the Contract Documents. Any Work, materials or equipment that may reasonably be inferred from the Contract Documents as being required to produce the intended result will be supplied whether or not specifically called for. When words which have a well-known technical or trade meaning are used to describe Work, materials, or equipment, such words shall be interpreted in accordance with that meaning. Reference to standard specifications, manuals or codes of any technical society, organization or association, or to the laws or regulations of any governmental authority, whether such reference be specific or by implication, shall mean the latest standard specification, manual, code or laws or regulations in effect at the time of opening of Bids, except as may be otherwise specifically stated. However, no provision of any referenced standard specification, manual or code (whether or not specifically incorporated by reference in the Contract Documents) shall be effective to change the duties and responsibilities of Owner or Contractor, or any of their agents or employees from those set forth in the Contract Documents. Computed dimensions shall govern over scaled dimensions.

2.3 Project Schedule. The Contractor, within ten (10) days after being awarded the Contract, shall prepare and submit for the Owner's and Architect/Engineer's information a Contractor's construction schedule for the Work. The schedule shall not exceed time limits current under the Contract Documents, shall be revised at appropriate intervals as required by the conditions of the Work and Project, shall be related to the entire Project to the extent required by the Contract Documents, and shall provide for expeditious and practicable execution of Work.

A. The Project Schedule shall show a breakdown of all tasks to be performed, and their relationship in achieving the completion of each phase of Work, subject to review of Owner and Architect/Engineer and approval or rejection by Owner. The Project Schedule shall show, at a minimum, the approximate dates on which each segment of the Work is expected to be started and finished, the proposed traffic flows during each month, the anticipated earnings by the Contractor for each month and the approximate number of crews and equipment to be used. The Project Schedule shall include all phases of procurement, approval of shop drawings, proposed Change Orders in progress, schedules for Change Orders, and performance

testing requirements. The Project Schedule shall include a construction commencement date and Project Substantial Completion Date, which dates shall accommodate known or reasonably anticipated geographic, atmospheric and weather conditions.

B. The Project Schedule shall serve as the framework for the subsequent development of all detailed schedules. The Project Schedule shall be used to verify Contractor performance and to allow the Owner's Project Representative to monitor the Contractor's efforts.

C. The Project Schedule may be adjusted by the Contractor pursuant to Article V. The Owner shall have the right to reschedule Work provided such rescheduling is in accord with the remainder of terms of the Contract Documents.

D. The Contractor shall prepare a submittal schedule, promptly after being awarded the Contract and thereafter as necessary to maintain a current submittal schedule, and shall submit the schedule(s) for the Architect/Engineer's approval. The Architect/Engineer's approval shall not be unreasonably delayed or withheld. The submittal schedule shall (1) be coordinated with the Contractor's construction schedule, and (2) allow the Architect/Engineer reasonable time to review submittals. If the Contractor fails to submit a submittal schedule, the Contractor shall not be entitled to any increase in Contract Sum or extension of Contract Time based on the time required for review of submittals.

E. The Contractor shall perform the Work in general accordance with the most recent schedules submitted to the Owner and Architect/Engineer.

2.4 Construction Services. The Contractor shall provide the following Construction Services:

A. Construction of Project. The Contractor shall work from the receipt of a Notice to Proceed through the Substantial Completion of the Project in accordance with the terms of the Contract Documents to manage the construction of the Project. The Construction Services provided by the Contractor to construct the Project shall include without limitation (1) all services necessary and commensurate with established construction standards, and (2) all services described in the Invitation for Bid and the Bid.

B. Notice to Proceed. A Notice to Proceed may be given at any time within thirty (30) days after the effective date of the Agreement. Contractor shall start to perform the Work on the date specified in the Notice to Proceed, but no Work shall be done at the site prior to the issuance of the Notice to Proceed.

C. Quality of Work. If at any time the labor used or to be used appears to the Owner as insufficient or improper for securing the quality of Work required or the required rate of progress, the Owner may order the Contractor to increase its efficiency or to improve the character of its Work, and the Contractor shall conform to such an order. Any such order shall

not entitle Contractor to any additional compensation or any increase in Contract Time. The failure of the Owner to demand any increase of such efficiency or any improvement shall not release the Contractor from its obligation to secure the quality of Work or the rate of progress necessary to complete the Work within the limits imposed by the Contract Documents. The Owner may require the Contractor to remove such personnel as the Owner deems incompetent, careless, insubordinate or otherwise objectionable, or whose continued employment on the Project is deemed to be contrary to the Owner's interest. The Contractor shall provide good quality workmanship and shall promptly correct construction defects without additional compensation. Acceptance of the Work by the Owner shall not relieve the Contractor of the responsibility for subsequent correction of any construction defects.

D. Materials. All materials and equipment shall be of good quality and new, except as otherwise provided in the Contract Documents. If required by Architect/Engineer, Contractor shall furnish satisfactory evidence (including reports of required tests) as to the kind and quality of materials and equipment. All materials and equipment shall be applied, installed, connected, erected, used, cleaned and conditioned in accordance with the instruction of the applicable supplier except as otherwise provided in the Contract Documents.

E. Accountability for Work. The Contractor shall be solely accountable for its Work, including plans review and complete submittals. The Contractor shall be solely responsible for means and methods of construction.

F. Contract Sum. The Contractor shall construct the Project so that the Project can be built for a cost not to exceed the Contract Sum.

G. Governing Specifications. The Project shall be constructed in accordance with applicable Owner design standards and guidelines. In the absence of specified Owner design standards or guidelines, the Architect/Engineer shall use, and the Contractor shall comply with, the most recent version of the applicable FDOT or AASHTO design standards. In general, the Project shall be constructed by the Contractor in accordance with applicable industry standards. The Contractor shall be responsible for utilizing and maintaining current knowledge of any laws, ordinances, codes, rules, regulations, standards, guidelines, special conditions, specifications or other mandates relevant to the Project or the services to be performed.

H. Adherence to Project Schedule. The development and equipping of the Project shall be undertaken and completed in accordance with the Project Schedule, and within the Contract Time described therein.

I. Superintendent. The Contractor shall employ a competent superintendent and necessary assistants who shall be in attendance at the Project Site during performance of the Work. The superintendent shall represent the Contractor, and communications given to the superintendent shall be as binding as if given to the Contractor.

(1) The Contractor, as soon as practicable after award of the Contract, shall furnish in writing to the Owner through the Architect/Engineer the name and qualifications of the proposed superintendent. The Architect/Engineer may reply within 14 days to the Contractor in writing stating (1) whether the Owner or the Architect/Engineer has reasonable objection to the proposed superintendent or (2) that the Architect/Engineer requires additional time to review.

Failure of the Architect/Engineer to reply within 14 days shall constitute notice of no reasonable objection.

(2) The Contractor shall not employ a proposed superintendent to whom the Owner or Architect/Engineer has made reasonable and timely objection. The Contractor shall not change the superintendent without the Owner's consent, which shall not be unreasonably withheld or delayed.

J. Work Hours. Contractor shall provide competent, suitable qualified personnel to survey and lay out the Work and perform construction as required by the Contract Documents. Contractor shall at all times maintain good discipline and order at the site. Except in connection with the safety or protection of persons or the Work or property at the site or adjacent thereto and except as otherwise indicated in the Contract Documents, all Work at the site shall be performed during regular working hours, and Contractor shall not permit overtime work or the performance of Work on a Saturday, Sunday or legal holiday without Owner's written consent given after prior notice to Architect/Engineer (at least seventy-two (72) hours in advance).

K. Overtime-Related Costs. Contractor shall pay for all additional Architect/Engineering charges, inspection costs and Owner staff time for any overtime work which may be authorized. Such additional charges shall be a subsidiary obligation of Contractor and no extra payment shall be made by Owner on account of such overtime work. At Owner's option, such overtime costs may be deducted from Contractor's monthly payment request or Contractor's retainage prior to release of final payment.

L. Insurance, Overhead and Utilities. Unless otherwise specified, Contractor shall furnish and assume full responsibility for all bonds, insurance, materials, equipment, labor, transportation, construction equipment and machinery, tools, appliances, fuel, power, light, heat, telephone, water, sanitary facilities, temporary facilities and all other facilities and incidentals necessary for the furnishing, performance, testing, start-up and completion of the Work.

M. Cleanliness. The Contractor shall keep the premises and surrounding area free from accumulation of waste materials or rubbish caused by operations under the Contract. At completion of the Work, the Contractor shall remove waste materials, rubbish, the Contractor's tools, construction equipment, machinery and surplus materials from and about the Project Site. Contractor shall restore to original conditions all property not designated for alteration by the Contract Documents If the Contractor fails to clean up as provided in the Contract Documents, the Owner may do so and Owner shall be entitled to reimbursement from Contractor.

N. Loading. Contractor shall not load nor permit any part of any structure to be loaded in any manner that will endanger the structure, nor shall Contractor subject any part of the Work or adjacent property to stresses or pressures that will endanger it.

O. Safety and Protection. Contractor shall comply with the Florida Department of Commerce Safety Regulations and any local safety regulations. Contractor shall be responsible for initiating, maintaining and supervising all safety precautions and programs in

connection with the Work. Contractor shall take all necessary precautions for the safety of and shall provide the necessary protection to prevent damage, injury or loss to:

(1) All employees on the Work and other persons and organizations who may be affected thereby;

(2) All the Work and materials and equipment to be incorporated therein, whether in storage on or off the Project Site; and

(3) Other property at the Project Site or adjacent thereto, including trees, shrubs, lawns, walks, pavements, roadways, structures, utilities and underground facilities not designated for removal, relocation or replacement in the course of construction.

Contractor shall comply with all applicable laws and regulations of any public body having jurisdiction for the safety of persons or property or to protect them from damage, injury or loss, and shall erect and maintain all necessary safeguards for such safety and protection. Contractor shall provide and maintain all passageways, guard fences, lights and other facilities for the protection required by public authority or local conditions. Contractor shall provide reasonable maintenance of traffic for the public and preservation of the Owner's business, taking into full consideration all local conditions. Contractor's duties and responsibilities for safety and protection with regard to the Work shall continue until such time as all the Work is completed.

P. Emergencies. In emergencies affecting the safety or protection of persons or the Work or property at the Project Site or adjacent thereto, Contractor, without special instruction or authorization from Architect/Engineer or Owner, shall act to prevent threatened damage, injury or loss. Contractor shall give Owner prompt written notice if Contractor believes that any significant changes in the Work or variations from the Contract Documents have been caused thereby. If Owner determines that a change in the Project is required because of the action taken in response to an emergency, a Work Directive Change or Change Order will be issued to document the consequences of the changes or variation.

Q. Substitutes. For substitutes not included with the Bid, but submitted after the effective date of the Contract Documents, Contractor shall make written application to Architect/Engineer for acceptance thereof, certifying that the proposed substitute will perform adequately the functions and achieve the results called for by the general design, be similar and of equal substance to that specified and be suited to the same use as that specified. The application will also contain an itemized estimate of all costs and delays or schedule impacts that will result directly or indirectly from review, acceptance and provisions of such substitute, including costs of redesign and claims of other contractors affected by the resulting change, all of which will be considered by the Architect/Engineer in evaluating the proposed substitute. Architect/Engineer may require Contractor to furnish at Contractor's expense, additional data about the proposed substitute. In rendering a decision, Owner, Architect/Engineer and Contractor shall have access to any available Float Time in the Project Schedule. In the event that substitute materials or equipment not included as part of the Bid, but proposed after the effective date of the Contract Documents, are accepted and are less costly than the originally specified materials or equipment, then the net difference in cost shall be credited to the Owner and an appropriate Change Order executed to adjust the Contract Sum.

(1) If a specific means, method, technique, sequence of procedure of construction is indicated in or required by the Contract Documents, Contractor may furnish or utilize a substitute means, method, sequence, technique or procedure of construction acceptable to Architect/Engineer if Contractor submits sufficient information to allow Architect/Engineer to determine that the substitute proposed is equivalent to that indicated or required by the Contract Documents.

(2) Architect/Engineer will be allowed a reasonable time within which to evaluate each proposed substitute. Architect/Engineer will be the sole judge of acceptability and no substitute will be ordered, installed or utilized without Architect/Engineer's prior written acceptance which will be evidenced by either a Change Order or an approved shop drawing. Owner may require Contractor to furnish at Contractor's expense a special performance guarantee or other surety with respect to any substitute.

(3) Contractor shall reimburse Owner for the charges of Architect/Engineer and Architect/Engineer's Consultants for evaluating each proposed substitute submitted after the effective date of the Contract Documents and all costs resulting from any delays in the Work while the substitute was undergoing review.

R. Surveys and Stakes. The Contractor shall furnish, free of charge, all labor, stakes, surveys, batter boards for structures, grade lines and other materials and supplies and shall set construction stakes and batter boards for establishing lines, position of structures, slopes and other controlling points necessary for the proper prosecution of the Work. Where rights-of-way, easements, property lines or any other conditions which make the lay-out of the Project or parts of the Project critical are involved, the Contractor shall employ a competent surveyor who is registered in the State of Florida for lay-out and staking. These stakes and marks shall constitute the field control by and in accord with which the Contractor shall govern and execute the Work. The Contractor shall be held responsible for the preservation of all stakes and marks and if for any reason any of the stakes or marks or batter boards become destroyed or disturbed, they shall be immediately and accurately replaced by the Contractor.

S. Suitability of Project Site. The Contractor has, by careful examination, satisfied itself as to the nature and location of the Work and all other matters which can in any way affect the Work, including, but not limited to details pertaining to borings, as shown on the drawings. Such boring information is not guaranteed to be more than a general indication of the materials likely to be found adjacent to holes bored at the Project Site, approximately at the locations indicated. The Contractor has examined boring data, where available, made its own interpretation of the subsurface conditions and other preliminary data, and has based its Bid on its own opinion of the conditions likely to be encountered. Except as specifically provided in Sections 2.4.U., 5.4 and 5.5, no extra compensation or extension of time will be considered for any Project Site conditions that existed at the time of bidding. No verbal agreement or conversation with any officer, agent or employee of the Owner, before or after the execution of the Agreement, shall affect or modify any of the terms or obligations herein contained.

T. Project Specification Errors. If the Contractor, in the course of the Work, finds that the drawings, specifications or other Contract Documents cannot be followed, the Contractor shall immediately inform the Owner in writing, and the Owner shall promptly check the accuracy of the information. Any Work done after such discovery, until any necessary changes are authorized, will be done at the Contractor's sole risk of non-payment and delay.

U. Remediation of Contamination: Owner and Contractor recognize that remediation of subsurface conditions may be necessary due to potential hazardous materials contamination. Because the presence or extent of any contamination is not known, Contractor shall include no cost in the Contract Sum, and no time in the Project Schedule, for cost or delays that might result from any necessary remediation. The Project Schedule will provide a period of time between demolition activities and the start of the next activity to commence any remediation if needed. Contractor shall use all reasonable efforts in scheduling the Project to minimize the likelihood that remediation delays construction. Any hazardous materials remediation Work which Contractor agrees to perform shall be done pursuant to a Change Order or amendment consistent with the following:

(1) The dates of Substantial Completion shall be equitably adjusted based on delays, if any, incurred in connection with remediation efforts.

(2) Contractor, and any Subcontractors which have mobilized on the Project Site, shall be paid for demonstrated costs of overhead operations at the Project Site during any period of delay in excess of seven (7) days, except to the extent that Work proceeds concurrently with remediation. The categories of costs to be reimbursed are limited to those reasonably incurred at the jobsite during the delay period (such as trailers or offices, telephones, faxes, and the like); equipment dedicated to the Project and located at the Project Site; salaries and associated costs of personnel dedicated to the Project to the extent that they do not perform Work on other projects; and other jobsite costs that are reasonable and which are incurred during the delay period. Subcontractors and suppliers which have not mobilized are limited to the costs set forth in Section 2.4.U(3).

(3) Contractor and any Subcontractor or supplier on the Project who is eligible for compensation shall be paid any demonstrated costs of escalation in materials or labor, and reasonable costs of off-site storage of materials identified to the Project, arising as a result of any delay in excess of seven (7) days. Such Contractor, Subcontractors and suppliers are obligated to take all reasonable steps to mitigate escalation costs, such as through early purchase of materials.

(4) Contractor, for itself and all Subcontractors and suppliers on the Project, hereby agrees that the extension of time for delays under Section 2.4.U(1), and payment of the costs identified in Sections 2.4.U(2) and/or Section 2.4.U(3), are the sole remedies for costs and delays described in this Section, and waives all claims and demands for extended home office overhead (including, but not limited to, "Eichleay" claims), lost profit or lost opportunities, and any special, indirect, or consequential damages

arising as a result of delays described in this Section. The Contract Sum shall be adjusted to reflect payment of allowable costs.

(5) If any delay described in this section causes the time or cost for the Project to exceed the Contract Time or the Contact Sum, then the Owner may terminate the Agreement pursuant to Section 14.2.

(6) Contractor and any Subcontractor or supplier seeking additional costs under this Section 2.4.U. shall promptly submit estimates or any costs as requested by Owner, and detailed back-up for all costs when payment is sought or whenever reasonably requested by Owner. All costs are auditable, at Owner's discretion. Bid, estimate and pricing information reasonably related to any request for additional compensation will be provided promptly upon request.

(7) Contractor shall include provisions in its subcontracts and purchase orders consistent with this Section.

V. Interfacing.

(1) The Contractor shall take such measures as are necessary to ensure proper construction and delivery of the Project, including but not limited to providing that all procurement of long-lead items, the separate construction Subcontractors, and the general conditions items are performed without duplication or overlap to maintain completion of all Work on schedule. Particular attention shall be given to provide that each bid package clearly identifies the Work included in that particular separate subcontract, it's scheduling for start and completion, and its relationship to other separate contractors.

(2) Without assuming any design responsibilities of the Architect/Engineer, the Contractor shall include in the Progress Reports required under this Section 2.4 comments on overlap with any other separate subcontracts, omissions, lack of correlation between drawings, and any other deficiencies noted, in order that the Architect/Engineer may arrange for necessary corrections.

W. Job Site Facilities. The Contractor shall arrange for all job site facilities required and necessary to enable the Contractor and Architect/Engineer to perform their respective duties and to accommodate any representatives of the Owner which the Owner may choose to have present on the job.

X. Weather Protection. The Contractor shall provide temporary enclosures of building areas in order to assure orderly progress of the Work during periods when extreme weather conditions are likely to be experienced. The Contractor shall also be responsible for providing weather protection for Work in progress and for materials stored on the Project Site. A contingency plan shall be prepared upon request of the Owner for weather conditions that may affect the construction.

Y. Payment and Performance Bond. Prior to the construction commencement date, the Contractor shall obtain, for the benefit of and directed to the Owner, a Payment and Performance Bond satisfying the requirements of Section 255.05, Florida Statutes, covering the faithful performance by the Contractor of its obligations under the Contract Documents, including but not limited to the construction of the Project on the Project Site and the payment of all obligations arising thereunder, including all payments to Subcontractors, laborers, and materialmen. The surety selected by the Contractor to provide the Payment and Performance Bond shall be approved by the Owner prior to the issuance of such Bond, which approval shall not be unreasonably withheld or delayed provided that the surety is rated A or better by Best's Key Guide, latest edition.

Z. Construction Phase; Building Permit; Code Inspections. Unless otherwise provided, Contractor shall obtain and pay for all construction permits and licenses. Owner shall assist Contractor, when necessary, in obtaining such permits and licenses. Contractor shall pay all governmental charges and inspection fees necessary for the prosecution of the Work.

(1) Building Permit. The Owner and Architect/Engineer shall provide such information to any Permitting Authority as is necessary to obtain approval from the Permitting Authority to commence construction prior to beginning construction. The Contractor shall pull any required building permit, and shall be responsible for delivering and posting the building permit at the Project Site prior to the commencement of construction. The cost of the building permit is included in the Contract Sum. The Owner and Architect/Engineer shall fully cooperate with the Contractor when and where necessary.

(2) Code Inspections. The Project requires detailed code compliance inspection during construction in disciplines determined by any Permitting Authority. These disciplines normally include, but are not necessarily limited to, structural, mechanical, electrical, plumbing general building and fire. The Contractor shall notify the appropriate inspector(s) and the Architect/Engineer, no less than 24 hours in advance, when the Work is ready for inspection and before the Work is covered up. All inspections shall be made for conformance with the applicable ordinances and building codes. Costs for all re-inspections of Work found defective and subsequently repaired shall not be included as Project Costs and shall be borne by the Contractor or as provided in the contract between Contractor and Subcontractor.

(3) Contractor's Personnel. The Contractor shall maintain sufficient off-site support staff and competent full-time staff at the Project Site authorized to act on behalf of the Contractor to coordinate, inspect, and provide general direction of the Work and progress of the Subcontractors. At all times during the performance of the Work, the Owner shall have the right to demand replacement of Contractor Personnel to whom the Owner has reasonable objection, without liability to the Contractor.

(4) Lines of Authority. To provide general direction of the Work, the Contractor shall establish and maintain lines of authority for its personnel and shall provide this information to the Owner and all other affected parties, such as the code inspectors of any Permitting Authority, the Subcontractors, and the Architect/Engineer. The Owner and Architect/Engineer may attend meetings between the Contractor and his Subcontractors; however, such attendance is optional and shall not diminish either the authority or responsibility of the Contractor to administer the subcontracts.

AA. Quality Control. The Contractor shall develop and maintain a program, acceptable to the Owner and Architect/Engineer, to assure quality control of the construction. The Contractor shall be responsible for and supervise the Work of all Subcontractors, providing instructions to each when their Work does not conform to the requirements of the Project Plans and Specifications, and the Contractor shall continue to coordinate the Work of each Subcontractor to ensure that corrections are made in a timely manner so as to not affect the efficient progress of the Work. Should a disagreement occur between the Contractor and the Architect/Engineer over the acceptability of the Work, the Owner, at its sole discretion and in addition to any other remedies provided herein, shall have the right to determine the acceptability, provided that such determination is consistent with standards for construction projects of this type and generally accepted industry standards for workmanship in the State of Florida.

BB. Management of Subcontractors. All Subcontractors shall be compensated in accordance with Article IV. The Contractor shall solely control the Subcontractors. The Contractor shall negotiate all Change Orders and Field Orders with all affected Subcontractors and shall review the costs and advise the Owner and Architect/Engineer of their validity and reasonableness, acting in the Owner's best interest. When there is an imminent threat to health and safety, and Owner's Project Representative concurrence is impractical, the Contractor shall act immediately to remove the threats to health and safety and shall subsequently fully inform Owner of all such action taken. The Contractor shall also carefully review all shop drawings and then forward the same to the Architect/Engineer for review and actions. The Architect/Engineer will transmit them back to the Contractor, who will then issue the shop drawings to the affected Subcontractor for fabrication or revision. The Contractor shall maintain a suspense control system to promote expeditious handling. The Contractor shall request the Architect/Engineer to make interpretations of the drawings or specifications requested of him by the Subcontractors and shall maintain a business system to promote timely response. The Contractor shall inform the Architect/Engineer which shop drawings or requests for clarification have the greatest urgency, so as to enable the Architect/Engineer to prioritize requests coming from the Contractor. The Contractor shall advise the Owner and Architect/Engineer when timely response is not occurring on any of the above.

CC. Job Requirements.

(1) The Contractor shall provide each of the following as a part of its services hereunder:

(a) Maintain a log of daily activities, including manpower records, equipment on site, weather, delays, major decisions, etc;

(b) Maintain a roster of companies on the Project with names and telephone numbers of key personnel;

(c) Establish and enforce job rules governing parking, clean-up, use of facilities, and worker discipline;

(d) Provide labor relations management and equal opportunity employment for a harmonious, productive Project;

(e) Provide and administer a safety program for the Project and monitor for subcontractor compliance without relieving them of responsibilities to perform Work in accordance with best acceptable practice;

(f) Provide a quality control program as provided under Section 2.4.C above;

(g) Provide miscellaneous office supplies that support the construction efforts which are consumed by its own forces;

(h) Provide for travel to and from its home office to the Project Site and to those other places within Manatee County as required by the Project;

(i) Verify that tests, equipment, and system start-ups and operating and maintenance instructions are conducted as required and in the presence of the required personnel and provide adequate records of same to the Architect/Engineer;

(j) Maintain at the job site orderly files for correspondence, reports of job conferences, shop drawings and sample submissions, reproductions of original Contract Documents including all addenda, change orders, field orders, additional drawings issued subsequent to the execution of the Agreement, Owner/Architect/Engineer's clarifications and interpretations of the Contract Documents, progress reports, as-built drawings, and other project related documents;

(k) Keep a diary or log book, recording hours on the job site, weather conditions, data relative to questions of extras or deductions; list of visiting officials and representatives or manufacturers, fabricators, suppliers and distributors; daily activities, decisions, observations in general and specific observations in more detail as in the case of observing test procedures, and provide copies of same to Owner/Architect/Engineer;

(l) Record names, addresses and telephone numbers of all Contractors, Subcontractors and major suppliers of materials and equipment;

(m) Furnish Owner/Architect/Engineer periodic reports, as required, of progress of the Work and Contractor's compliance with the approved progress schedule and schedule of shop drawing submissions;

(n) Consult with Owner/Architect/Engineer in advance of scheduling major tests, inspections or start of important phases of the Work;

(o) Verify, during the course of the Work, that certificates, maintenance and operations manuals and other data required to be assembled and furnished are applicable to the items actually installed, and deliver same to Owner/Architect/Engineer for review prior to final Acceptance of the Work; and

(p) Cooperate with Owner in the administration of grants.

(2) The Contractor shall provide personnel and equipment, or shall arrange for separate Subcontractors to provide each of the following as a Project Cost:

(a) Services of independent testing laboratories, and provide the necessary testing of materials to ensure conformance to contract requirements; and

(b) Printing and distribution of all required bidding documents and shop drawings, including the sets required by Permitting Authority inspectors.

DD. As-Built Drawings. The Contractor shall continuously review as-built drawings and mark up progress prints to provide as much accuracy as possible. Prior to, and as a requirement for authorizing final payment to the Contractor due hereunder, the Contractor shall provide to the Owner an original set of marked-up, as-built Project Plans and Specifications and an electronic format of those records showing the location and dimensions of the Project as constructed, which documents shall be certified as being correct by the Contractor and the Architect/Engineer. Final as-built drawings shall be signed and sealed by a registered Florida surveyor.

EE. Progress Reports. The Contractor shall forward to the Owner, as soon as practicable after the first day of each month, a summary report of the progress of the various parts of the Work under the Contract, in fabrication and in the field, stating the existing status, estimated time of completion and cause of delay, if any. Together with the summary report, the Contractor shall submit any necessary revisions to the original schedule for the Owner's review and approval. In addition, more detailed schedules may be required by the Owner for daily traffic control.

FF. Contractor's Warranty. The Contractor warrants to the Owner and Architect/Engineer that materials and equipment furnished under the Contract will be of good quality and new unless the Contract Documents require or permit otherwise. The Contractor further warrants that the Work will conform to the requirements of the Contract Documents and will be free from defects, except for those inherent in the quality of the Work the Contract Documents require or permit. Work, materials, or equipment not conforming to these requirements will be considered defective. The Contractor's warranty excludes remedy for damage or defect caused by abuse, alterations to the Work not executed by the Contractor, improper or insufficient maintenance, improper operation, or normal wear and tear and normal usage. If required by the Architect/Engineer, the Contractor shall furnish satisfactory evidence as to the kind and quality of materials and equipment.

(1) Contractor shall use its best efforts and due diligence to ensure that during the warranty period, those entities or individuals who have provided direct warranties to the Owner as required by the Contract Documents perform all required warranty Work in a timely manner and at the sole cost and expense of such warranty providers. Any such cost or expense not paid by the warranty providers shall be paid by the Contractor, to include any costs and attorney's fees incurred in warranty-related litigation between Contractor and any Subcontractors.

(2) The Contractor shall secure guarantees and warranties of Subcontractors, equipment suppliers and materialmen, and assemble and deliver same to the Owner in a manner that will facilitate their maximum enforcement and assure their meaningful implementation. The Contractor shall collect and deliver to the Owner any specific written guaranties or warranties given by others as required by subcontracts.

(3) At the Owner's request, the Contractor shall conduct, jointly with the Owner and the Architect/Engineer, no more than two (2) warranty inspections within three (3) years after the Substantial Completion Date.

GG. Apprentices. If Contractor employs apprentices, their performance of Work shall be governed by and comply with the provisions of Chapter 446, Florida Statutes.

HH. Schedule of Values. Unit prices shall be established for this Contract by the submission of a schedule of values within ten (10) days of receipt of the Notice to Proceed. The schedule shall include quantities and prices of items equaling the Contract Sum and will subdivide the Work into components in sufficient detail to serve as the basis for progress payments during construction. Such prices shall include an appropriate amount of

overhead and profit applicable to each item of Work. Upon request of the County, the Contractor shall support the values with data which will substantiate their correctness.

II. Other Contracts. The Owner reserves the right to let other Contracts in connection with this Work. The Contractor shall afford other contractors reasonable opportunity for the introduction and storage of their materials and execution of their Work, and promptly connect and coordinate the Work with theirs.

ARTICLE III
COMPENSATION

3.1 Compensation. The Contract Sum constitutes the total compensation (subject to authorized adjustments) payable to Contractor for performing the Work. All duties, responsibilities and obligations assigned to or undertaken by Contractor shall be at Contractor's expense without change in the Contract Sum.

A. Adjustments. The Contract Sum may only be changed by Change Order or by a written amendment. Any claim for an increase or decrease in the Contract Sum shall be based on written notice delivered by the party making the claim to the other party. Notice of the amount of the claim with supporting data shall be delivered within fifteen (15) days from the beginning of such occurrence and shall be accompanied by claimant's written statement that the amount claimed covers all known amounts (direct, indirect and consequential) to which the claimant is entitled as a result of the occurrence of said event. Failure to deliver a claim within the requisite 15–day period shall constitute a waiver of the right to pursue said claim.

B. Valuation. The value of any Work covered by a Change Order or of any claim for an increase or decrease in the Contract Sum shall be determined in one of the following ways (at Owner's discretion):

(1) In the case of Unit Price Work, in accordance with Section 3.1.C, below; or

(2) By mutual acceptance of lump sum; or

(3) On the basis of the cost of the Work, plus a negotiated Contractor's fee for overhead and profit. Contractor shall submit an itemized cost breakdown together with supporting data.

C. Unit Price Work. The unit price of an item of Unit Price Work shall be subject to re-evaluation and adjustment pursuant to a requested Change Order under the following conditions:

(1) If the total cost of a particular item of Unit Price Work amounts to 5% or more of the Contract Sum and the variation in the quantity of the particular item of Unit Price Work performed by Contractor differs by more than 15% from the estimated quantity of such item indicated in the Agreement; and

(2) If there is no corresponding adjustment with respect to any other item of Work; and

(3) If Contractor believes that it has incurred additional expense as a result thereof; or

(4) If Owner believes that the quantity variation entitles it to an adjustment in the unit price; or

(5) If the parties are unable to agree as to the effect of any such variations in the quantity of Unit Price Work performed.

3.2 Schedule of Compensation. All payments for services and material under the Contract Documents shall be made in accordance with the following provisions.

A. Periodic Payments for Services. The Contractor shall be entitled to receive payment for Construction Services rendered pursuant to Section 2.4 in periodic payments which shall reflect a fair apportionment of cost and schedule of values of services furnished prior to payment, subject to the provisions of this Section.

B. Payment for Materials and Equipment. In addition to the periodic payments authorized hereunder, payments may be made for material and equipment not incorporated in the Work but delivered and suitably stored at the Project Site, or another location, subject to prior approval and acceptance by the Owner on each occasion.

C. Credit toward Contract Sum. All payments for Construction Services made hereunder shall be credited toward the payment of the Contract Sum as Contractor's sole compensation for the construction of the Project.

3.3 Invoice and Payment. All payments for services and materials under the Contract Documents shall be invoiced and paid in accordance with the following provisions.

A. Invoices. The Contractor shall submit to the Owner periodic invoices for payment, in a form acceptable to the Owner, which shall include a sworn statement certifying that, to the best of the Contractor's knowledge, information and belief, the construction has progressed to the point indicated, the quality and the Work covered by the invoice is in accord with the Project Plans and Specifications, and the Contractor is entitled to payment in the amount requested, along with the cost reports required pursuant to Article II, showing in detail all monies paid out, Project Costs accumulated, or Project Cost incurred during the previous period. This data shall be attached to the invoice.

B. Additional Information; Processing of Invoices. Should an invoiced amount appear to exceed the Work effort believed to be completed, the Owner may, prior to processing of the invoice for payment, require the Contractor to submit satisfactory evidence to support the invoice. All progress reports and invoices shall be delivered to the attention of the Owner's Project Representative. Invoices not properly prepared (mathematical errors, billing not reflecting actual Work done, no signature, etc.) shall be returned to the Contractor for correction.

C. Architect/Engineer's Approval. Payment for Work completed shall be subject to the Architect/Engineer approving the payment requested by the Contractor and certifying the amount thereof that has been properly incurred and is then due and payable to the Contractor, and identifying with specificity any amount that has not been properly incurred and that should not be paid. .

D. Warrants of Contractor with Respect to Payments. The Contractor warrants that (1) upon payment of any retainage, materials and equipment covered by a partial payment request will pass to Owner either by incorporation in construction or upon receipt of payment by the Contractor, whichever occurs first; (2) Work, materials and equipment covered by previous partial payment requests shall be free and clear of liens, claims, security interests, or encumbrances, hereinafter referred to as "liens"; and (3) no Work, materials or equipment covered by a partial payment request which has been acquired by the Contractor or any other person performing Work at the Project Site, or furnishing materials or equipment for the Project, shall be subject to an agreement under which an interest therein or an encumbrance thereon is retained by the seller or otherwise imposed by the Contractor or any other person.

E. All Compensation Included. Contractor's compensation includes full payment for services set forth in the Contract Documents, including but not limited to overhead, profit, salaries or other compensation of Contractor's officers, partners and/or employees, general operating expenses incurred by Contractor and relating to this Project, including the cost of management, supervision and data processing staff, job office equipment and supplies, and other similar items.

ARTICLE IV
SUBCONTRACTORS

4.1 Subcontracts. At the Owner's request, the Contractor shall provide Owner's Project Representative with copies of all proposed and final subcontracts, including the general and supplementary conditions thereof.

A. Subcontracts Generally. All subcontracts shall: (1) require each Subcontractor to be bound to Contractor to the same extent Contractor is bound to Owner by the terms of the Contract Documents, as those terms may apply to the portion of the Work to be performed by the Subcontractor, (2) provide for the assignment of the subcontracts from Contractor to Owner at the election of Owner, upon termination of Contractor, (3) provide that Owner will be an additional indemnified party of the subcontract, (4) provide that Owner will be an additional insured on all insurance policies required to be provided by the Subcontractor, except workers' compensation, (5) assign all warranties directly to Owner, and (6) identify Owner as an intended third-party beneficiary of the subcontract.

(1) A Subcontractor is a person or entity who has a direct contract with Contractor to perform a portion of the Work at the site. The term "Subcontractor" is referred to throughout the Contract Documents as if singular in number and means a Subcontractor or an authorized representative of the Subcontractor. The term "Subcontractor" does not include a separate contractor or subcontractors of a separate contractor.

(2) A Sub-subcontractor is a person or entity who has a direct or indirect contract with a Subcontractor to perform a portion of the Work at the site. The term "Sub-subcontractor" is referred to throughout the Contract Documents as if singular in number and means a Sub-subcontractor or an authorized representative of the Sub-subcontractor.

B. No Damages for Delay. Except when otherwise expressly agreed to by Owner in writing, all subcontracts shall provide:

> "LIMITATION OF REMEDIES – NO DAMAGES FOR DELAY. The Subcontractor's exclusive remedy for delays in the performance of the contract caused by events beyond its control, including delays claimed to be caused by the Owner or Architect/Engineer or attributable to the Owner or Architect/Engineer and including claims based on breach of contract or negligence, shall be an extension of its contract time and shall in no way involve any monetary claim."

Each subcontract shall require that any claims by the Subcontractor for delay must be submitted to the Contractor within the time and in the manner in which the Contractor must submit such claims to the Owner, and that failure to comply with the conditions for giving notice and submitting claims shall result in the waiver of such claims.

C. Subcontractual Relations. The Contractor shall require each Subcontractor to assume all the obligations and responsibilities which the Contractor owes the Owner pursuant to the Contract Documents, by the parties to the extent of the Work to be performed by the Subcontractor. Said obligations shall be made in writing and shall preserve and protect the rights of the Owner and Architect/Engineer, with respect to the Work to be performed by the Subcontractor, so that the subcontracting thereof will not prejudice such rights. Where appropriate, the Contractor shall require each Subcontractor to enter into similar agreements with its sub-subcontractor.

D. Insurance; Acts and Omissions. Insurance requirements for Subcontractors shall be no more stringent than those requirements imposed on the Contractor by the Owner. The Contractor shall be responsible to the Owner for the acts and omissions of its employees, agents, Subcontractors, their agents and employees, and all other persons performing any of the Work or supplying materials under a contract to the Contractor.

4.2 Relationship and Responsibilities. Except as specifically set forth herein with respect to direct materials acquisitions by Owner, nothing contained in the Contract Documents or in any Contract Document does or shall create any contractual relation between the Owner or Architect/Engineer and any Subcontractor. Specifically, the Contractor is not acting as an agent of the Owner with respect to any Subcontractor. The utilization of any Subcontractor shall not relieve Contractor from any liability or responsibility to Owner, or obligate Owner to the payment of any compensation to the Subcontractor or additional compensation to the Contractor.

4.3 Payments to Subcontractors; Monthly Statements. The Contractor shall be responsible for paying all Subcontractors from the payments made by the Owner to Contractor pursuant to Article III, subject to the following provisions:

A. Payment. The Contractor shall, no later than ten (10) days after receipt of payment from the Owner, out of the amount paid to the Contractor on account of such Subcontractor's Work, pay to each Subcontractor the amount to which the Subcontractor is entitled in accordance with the terms of the Contractor's contract with such Subcontractor. The Contractor shall, by appropriate agreement with each Subcontractor, require each Subcontractor to make payments to sub-Subcontractors in a similar manner. After receipt of payment from Owner, if the need should arise to withhold payments to Subcontractors for any reason, as solely determined by Contractor, the Contractor shall promptly restore such monies to the Owner, adjusting subsequent pay requests and Project bookkeeping as required.

B. Final Payment of Subcontractors. The final payment of retainage to Subcontractors shall not be made until the Project has been inspected by the Architect/Engineer or other person designated by the Owner for that purpose, and until both the Architect/Engineer and the Contractor have issued a written certificate that the Project has been constructed in accordance with the Project Plans and Specifications and approved Change Orders. Before issuance of final payment to any Subcontractor without any retainage, the Subcontractor shall submit satisfactory evidence that all payrolls, material bills, and other indebtedness connected with the Project have been paid or otherwise satisfied, warranty information is complete, as-built markups have been submitted, and instruction for the Owner's operating and maintenance personnel is complete. Final payment may be made to certain select Subcontractors whose Work is satisfactorily completed prior to the completion of the Project, but only upon approval of the Owner's Project Representative.

4.4 Responsibility for Subcontractors. As provided in Section 2.4.BB, Contractor shall be fully responsible to Owner for all acts and omissions of the Subcontractors, suppliers and other persons and organizations performing or furnishing any of the Work under a direct or indirect Contract with Contractor just as Contractor is responsible for Contractor's own acts and omissions.

4.5 Contingent Assignment of Subcontracts. Each subcontract agreement for a portion of the Work is assigned by the Contractor to the Owner, provided that:

(1) assignment is effective only after termination of the Contract by the Owner for cause pursuant to Article XIV and only for those subcontract agreements that the Owner accepts by notifying the Subcontractor and Contractor in writing; and

(2) assignment is subject to the prior rights of the surety, if any, obligated under bond relating to the Agreement.

When the Owner accepts the assignment of a subcontract agreement, the Owner assumes the Contractor's rights and obligations under the subcontract. Upon such assignment, if the Work has been suspended for more than thirty (30) days, the Subcontractor's compensation shall be equitably adjusted for increases in cost resulting from the suspension. Upon such assignment to the Owner, the Owner may further assign the subcontract to a successor contractor or other entity. If the Owner assigns the subcontract to a successor contractor or other entity, the Owner

shall nevertheless remain legally responsible for all of the successor contractor's obligations under the subcontract.

ARTICLE V
CHANGES IN WORK

5.1 General. Changes in the Work may be accomplished after execution of the Agreement, and without invalidating the Agreement, by Change Order, Work Directive Change or order for a minor change in the Work, subject to the limitations stated in this Article V and elsewhere in the Contract Documents. A Change Order shall be based upon agreement among the Owner, Contractor and Architect/Engineer; a Work Directive Change requires agreement by the Owner and Architect/Engineer and may or may not be agreed to by the Contractor; an order for a minor change in the Work may be issued by the Architect/Engineer alone. Changes in the Work shall be performed under applicable provisions of the Contract Documents, and the Contractor shall proceed promptly, unless otherwise provided in the Change Order, Work Directive Change or order for a minor change in the Work.

5.2 Minor Changes in the Work. The Owner or Architect/Engineer shall have authority to order minor changes in the Work not involving adjustment in the Contract Sum or extension of the Contract Time and not inconsistent with the intent of the Contract Documents. Such change will be effected by written order signed by the Architect/Engineer and shall be binding on the Owner and Contractor. The Contractor shall abide by and perform such minor changes. Such changes shall be effected by a Field Directive or a Work Directive Change. Documentation of changes shall be determined by the Construction Team, and displayed monthly in the Progress Reports. Because such changes shall not affect the Contract Sum to be paid to the Contractor, they shall not require a Change Order pursuant to Section 5.6.

5.3 Emergencies. In any emergency affecting the safety of persons or property, the Contractor shall act at its discretion to prevent threatened damage, injury, or loss. Any increase in the Contract Sum or extension of time claimed by the Contractor on account of emergency Work shall be determined as provided in Section 5.6. However, whenever practicable, the Contractor shall obtain verbal concurrence of the Owner's Project Representative and Architect/Engineer where the act will or may affect the Contract Sum or Contract Time.

5.4 Concealed Conditions. If the Contractor encounters conditions at the site that are (1) subsurface or otherwise concealed physical conditions that differ materially from those indicated in the Contract Documents or (2) unknown physical conditions of an unusual nature, that differ materially from those ordinarily found to exist and generally recognized as inherent in construction activities of the character provided for in the Contract Documents, the Contractor shall promptly provide notice to the Owner and the Architect/Engineer before conditions are disturbed and in no event later than ten (10) days after first observance of the conditions. The Architect/Engineer will promptly investigate such conditions and, if the Architect/Engineer determines that they differ materially and cause an increase or decrease in the Contractor's cost of, or time required for, performance of any part of the Work, will recommend an equitable adjustment in the Contract Sum or Contract Time, or both. If the Architect/Engineer determines that the conditions at the site are not materially different from those indicated in the Contract Documents and that no change in the terms of the Contract is justified, the Architect/Engineer

shall promptly notify the Owner and Contractor in writing, stating the reasons. If either party disputes the Architect/Engineer's determination or recommendation, that party may proceed as provided in Article VIII.

5.5 Hazardous Materials. In the event the Contractor encounters on the Project Site material reasonably believed to be hazardous, petroleum or petroleum related products, or other hazardous or toxic substances, except as provided in Section 2.4.U, the Contractor shall immediately stop Work in the area affected and report the condition to the Owner and the Architect/Engineer in writing. The Work in the affected area shall not thereafter be resumed except by written amendment, if in fact the material or substance has not been rendered harmless. The Work in the affected area shall be resumed when the Project Site has been rendered harmless, in accordance with the final determination by the Architect/Engineer or other appropriate professional employed by Owner. The Contractor shall not be required to perform without its consent any Work relating to hazardous materials, petroleum or petroleum related products, or other hazardous or toxic substances. In the event the Contractor encounters on the Project Site materials believed in good faith to be hazardous or contaminated material, and the presence of such hazardous or contaminated material was not known and planned for at the time the Contractor submitted its Bid, and it is necessary for the Contractor to stop Work in the area affected and delays Work for more than a seven (7) day period, adjustments to the Contract Sum and/or Contract Time shall be made in accordance with this Article V.

5.6 Change Orders; Adjustments to Contract Sum.

A. Change Orders Generally. The increase or decrease in the Contract Sum resulting from a change authorized pursuant to the Contract Documents shall be determined:

(1) By mutual acceptance of a lump sum amount properly itemized and supported by sufficient substantiating data, to permit evaluation by the Architect/Engineer and Owner; or

(2) By unit prices stated in the Agreement or subsequently agreed upon; or

(3) By any other method mutually agreeable to Owner and Contractor.

If Owner and Contractor are unable to agree upon increases or decreases in the Contract Sum and the Architect/Engineer certifies that the work needs to be commenced prior to any such agreement, the Contractor, provided it receives a written Change Order signed by or on behalf of the Owner, shall promptly proceed with the Work involved. The cost of such Work shall then be determined on the basis of the reasonable expenditures of those performing the Work attributed to the change. However, in the event a Change Order is issued under these conditions, the Owner, through the Architect/Engineer, will establish an estimated cost of the Work and the Contractor shall not perform any Work whose cost exceeds that estimated without prior written approval by the Owner. In such case, the Contractor shall keep and present in such form as the Owner may prescribe an itemized accounting, together with appropriate supporting data of the increase in overall costs of the Project. The amount of any decrease in the Contract Sum to be allowed by the Contractor to the Owner for any deletion or change which results in a net decrease in costs will be the amount of the actual net decrease.

5.7 Unit Prices. If unit prices are stated in the Contract Documents or subsequently agreed upon, and if the quantities originally contemplated are so changed in a proposed Change Order that application of the agreed unit prices to the quantities of Work proposed will cause substantial inequity to the Owner or Contractor, the applicable unit prices and Contract Sum shall be equitably adjusted.

5.8 Owner-Initiated Changes. Without invalidating the Agreement and without notice to any Surety, Owner may, at any time, order additions, deletions or revisions in the Work. These will be authorized by a written amendment, a Field Directive, a Change Order, or a Work Directive Change, as the case may be. Upon receipt of any such document, Contractor shall promptly proceed with the Work involved which will be performed under the applicable conditions of the Contract Documents (except as otherwise specifically provided). A Work Directive Change may not change the Contract Sum or the Contract Time; but is evidence that the parties expect that the change directed or documented by a Work Directive Change will be incorporated in a subsequently issued Change Order following negotiations by the parties as to its effect, if any, on the Contract Sum or Contract Time.

5.9 Unauthorized Work. Contractor shall not be entitled to an increase in the Contract Sum or an extension of the Contract Time with respect to any Work performed that is not required by the Contract Documents.

5.10 Defective Work. Owner and Contractor shall execute appropriate Change Orders (or written amendments) covering changes in the Work which are ordered by Owner, or which may be required because of acceptance of defective Work, without adjustment to the Contract Sum.

5.11 Estimates for Changes. At any time Architect/Engineer may request a quotation from Contractor for a proposed change in the Work. Within twenty-one (21) calendar days after receipt, Contractor shall submit a written and detailed proposal for an increase or decrease in the Contract Sum or Contract Time for the proposed change. Architect/Engineer shall have twenty one (21) calendar days after receipt of the detailed proposal to respond in writing. The proposal shall include an itemized estimate of all costs and time for performance that will result directly or indirectly from the proposed change. Unless otherwise directed, itemized estimates shall be in sufficient detail to reasonably permit an analysis by Architect/Engineer of all material, labor, equipment, subcontracts, overhead costs and fees, and shall cover all Work involved in the change, whether such Work was deleted, added, changed or impacted. Notwithstanding the request for quotation, Contractor shall carry on the Work and maintain the progress schedule. Delays in the submittal of the written and detailed proposal will be considered non-prejudicial.

5.12 Form of Proposed Changes. The form of all submittals, notices, Change Orders and other documents permitted or required to be used or transmitted under the Contract Documents shall be determined by the Owner. Standard Owner forms shall be utilized.

5.13 Changes to Contract Time. The Contract Time may only be changed pursuant to a Change Order or a written amendment to the Contract Documents. Any claim for an extension or shortening of the Contract Time shall be based on written notice delivered by the party making the claim to the other party. Notice of the extent of the claim with supporting data shall be delivered within fifteen (15) days from detection or beginning of such occurrence and

shall be accompanied by the claimant's written statement that the adjustment claimed is the entire adjustment to which the claimant has reason to believe it is entitled as a result of the occurrence of said event. The Contract time will be extended in an amount equal to time lost due to delays beyond the control of Contractor. Such delays shall include, but not be limited to, acts or neglect by Owner or others performing additional Work; or to fires, floods, epidemics, abnormal weather conditions or acts of God. Failure to deliver a written notice of claim within the requisite 15-day period shall constitute a waiver of the right to pursue said claim.

ARTICLE VI
ROLE OF ARCHITECT/ENGINEER

6.1 General.

A. Retaining. The Owner shall retain an Architect/Engineer (whether an individual or an entity) lawfully licensed to practice in Florida. That person or entity is identified as the Architect/Engineer in the Agreement and is referred to throughout the Contract Documents as if singular in number.

B. Duties. Duties, responsibilities and limitations of authority of the Architect/Engineer as set forth in the Contract Documents shall not be restricted, modified or extended without written consent of the Owner and Architect/Engineer. Consent shall not be unreasonably withheld.

C. Termination. If the employment of the Architect/Engineer is terminated, the Owner shall employ a successor Architect/Engineer as to whom the Contractor has no reasonable objection and whose status under the Contract Documents shall be that of the Architect/Engineer.

6.2 Administration. The Architect/Engineer will provide administration of the Agreement as described in the Contract Documents and will be an Owner's representative during construction until the date the Architect/Engineer approves the final Application for Payment. The Architect/Engineer will have authority to act on behalf of the Owner only to the extent provided in the Contract Documents.

A. Site Visits. The Architect/Engineer will visit the site at intervals appropriate to the stage of construction, or as otherwise agreed with the Owner, to become generally familiar with the progress and quality of the portion of the Work complete, and to determine in general if the Work observed is being performed in a manner indicating that the Work, when fully completed, will be in accordance with the Contract Documents. Unless specifically instructed by Owner, the Architect/Engineer will not be required to make exhaustive or continuous on-site inspections to check the quality or quantity of the Work. The Architect/Engineer will not have control over, charge of, or responsibility for, the construction means, methods, techniques, sequences or procedures, or for the safety precautions and programs in connection with the Work, since these are solely the Contractor's rights and responsibilities under the Contract Documents.

B. Reporting. On the basis of the site visits, the Architect/Engineer will keep the Owner reasonably informed about the progress and quality of the portion of the Work completed, and report to the Owner (1) known deviations from the Contract Documents and from the most recent construction schedule submitted by the Contractor, and (2) defects and deficiencies observed in the Work. The Architect/Engineer will not be responsible for the Contractor's failure to perform the Work in accordance with the requirements of the Contract Documents. The Architect/Engineer will not have control over or charge of and will not be responsible for acts or omissions of the Contractor, Subcontractors, or their agents or employees, or any other persons or entities performing portions of the Work.

6.3 Interpretation of Project Plans and Specifications. The Architect/Engineer will be the interpreter of the requirements of the Project Plans and Specifications. Upon receipt of comments or objections by Contractor or Owner, the Architect/Engineer will make decisions on all claims, disputes, or other matters pertaining to the interpretation of the Project Plans and Specifications.

6.4 Rejection of Non-Conforming Work. Upon consultation with Owner, the Architect/Engineer shall have the authority to reject Work which does not conform to the Project Plans and Specifications.

6.5 Correction of Work. The Contractor shall promptly correct all Work rejected by the Architect/Engineer for being defective or as failing to conform to the Project Plans and Specifications, whether observed before or after the Substantial Completion Date and whether or not fabricated, installed, or completed. The Contractor shall bear all costs of correcting such rejected Work, including compensation for Architect/Engineer's additional services made necessary thereby.

6.6 Timely Performance of Architect/Engineer. The Contractor shall identify which requests for information or response from the Architect/Engineer have the greatest urgency and those items which require prioritizing in response by the Architect/Engineer. The Contractor shall also identify the preferred time period for response and shall request a response time which is reasonably and demonstrably related to the needs of the Project and Contractor. In the event that Architect/Engineer claims that Contractor's expectations for a response are unreasonable, Owner shall require Architect/Engineer to communicate such claim to Contractor in writing together with the specific time necessary to respond and the date upon which such response will be made. In the event that Contractor believes that Architect/Engineer is not providing timely services or responses, Contractor shall notify Owner of same in writing not less than two (2) weeks before Contractor believes performance or response time from Architect/Engineer is required without risk of delaying the Project.

ARTICLE VII
OWNER'S RIGHTS AND RESPONSIBILITIES

7.1 Project Site; Title. The Owner shall provide the lands upon which the Work under the Contract Documents is to be done, except that the Contractor shall provide all necessary additional land required for the erection of temporary construction facilities and storage of his materials, together with right of access to same. The Owner hereby represents to the Contractor that it currently has and will maintain up through and including the Substantial Completion Date, good title to all of the real property constituting the Project Site. Owner agrees to resolve, at its expense, any disputes relating to the ownership and use of the Project Site which might arise during the course of construction.

7.2 Project Plans and Specifications; Architect/Engineer. The parties hereto acknowledge and agree that Owner has previously entered into an agreement with Architect/Engineer. Pursuant to the terms of such agreement, the Architect/Engineer, as an agent and representative of Owner, is responsible for the preparation of Project Plans and Specifications which consist of drawings, specifications, and other documents setting forth in detail the requirements for the construction of the Project. All of such Project Plans and Specifications shall be provided either by Owner or the Architect/Engineer, and Contractor shall be under no obligation to provide same and shall be entitled to rely upon the accuracy and completeness of the Project Plans and Specifications provided by the Architect/Engineer and all preliminary drawings prepared in connection therewith. The Contractor will be furnished a reproducible set of all drawings and specifications reasonably necessary for the performance of Contractor's services hereunder and otherwise ready for printing. The Contractor shall be notified of any written modification in the agreement between Owner and Architect/Engineer.

7.3 Surveys; Soil Tests and Other Project Site Information. Owner shall be responsible for providing a legal description and certified land survey of the Project Site in a form and content and with such specificity as may be required by the Architect/Engineer and Contractor to perform their services. To the extent deemed necessary by Owner and Architect/Engineer, and solely at Owner's expense, Owner may engage the services of a geotechnical consultant to perform test borings and other underground soils testing as may be deemed necessary by the Architect/Engineer or the Contractor. Contractor shall not be obligated to provide such surveys or soil tests and shall be entitled to rely upon the accuracy and completeness of the information provided; subject, however, to the provisions of Section 2.4.S hereof. Owner shall provide Contractor, as soon as reasonably possible following the execution of the Contract Documents, all surveys or other survey information in its possession describing the physical characteristics of the Project Site, together with soils reports, subsurface investigations, utility locations, deed restrictions, easements, and legal descriptions then in its possession or control. Upon receipt of all surveys, soils tests, and other Project Site information, Contractor shall promptly advise Owner of any inadequacies in such information and of the need for any additional surveys, soils or subsoil tests. In performing this Work, Contractor shall use the standard of care of experienced contractors and will use its best efforts timely to identify all problems or omissions. Owner shall not be responsible for any delay or damages to the Contractor for any visible or disclosed site conditions or disclosed deficiencies in the Project Site which should have been identified by Contractor and corrected by Owner prior to the execution of the Contract Documents.

7.4 Information; Communication; Coordination. The Owner's Project Representative shall examine any documents or requests for information submitted by the Contractor and shall advise Contractor of Owner's decisions pertaining thereto within a reasonable period of time to avoid unreasonable delay in the progress of the Contractor's services. Contractor shall indicate if any such documents or requests warrant priority consideration. However, decisions pertaining to approval of the Project Schedule as it relates to the date of Substantial Completion, the Project Cost, Contractor's compensation, approving or changing the Contract Sum shall only be effective when approved by Owner in the form of a written Change Order or amendment to the Contract Documents. Owner reserves the right to designate a different Owner's Project Representative provided Contractor is notified in writing of any such change. Owner and Architect/Engineer may communicate with Subcontractors, materialmen, laborers, or suppliers engaged to perform services on the Project, but only for informational purposes. Neither the Owner nor the Architect/Engineer shall attempt to direct the Work of or otherwise interfere with any Subcontractor, materialman, laborer, or supplier, or otherwise interfere with the Work of the Contractor. Owner shall furnish the data required of Owner under the Contract Documents promptly.

7.5 Governmental Body. The Contractor recognizes that the Owner is a governmental body with certain procedural requirements to be satisfied. The Contractor has and will make reasonable allowance in its performance of services for such additional time as may be required for approvals and decisions by the Owner and any other necessary government agency.

7.6 Pre-Completion Acceptance. The Owner shall have the right to take possession of and use any completed portions of the Work, although the time for completing the entire Work or such portions may not have expired, but such taking possession and use shall not be deemed an acceptance of any Work not completed in accordance with the Contract Documents.

7.7 Ownership and Use of Drawings, Specifications and Other Instruments of Service.

(1) The Architect/Engineer and the Architect/Engineer's consultants shall be deemed the authors and owners of their respective instruments of service, including the Project Plans and Specifications, and will retain all common law, statutory and other reserved rights, including copyrights. The Contractor, Subcontractors, Sub-subcontractors, and material or equipment suppliers shall not own or claim a copyright in the instruments of service. Submittal or distribution to meet official regulatory requirements or for other purposes in connection with this Project is not to be constructed as publication in derogation of the Architect/Engineer's or Architect/Engineer's consultants' reserved rights.

(2) The Contractor, Subcontractors, Sub-subcontractors and material or equipment suppliers are authorized to use and reproduce the drawings and specifications provided to them solely and exclusively for execution of the Work. All copies made under this authorization shall bear the copyright notice, if any, shown on the Project Plans and Specifications or other instruments of service. The Contractor, Subcontractors, Sub-subcontractors, and material or equipment suppliers may not use the

drawings or specifications on other projects or for additions to this Project outside the scope of the Work without the specific written consent of the Owner, Architect/Engineer and the Architect/Engineer's consultants.

7.8 Owner's Project Representative. Owner's Project Representative is Owner's Agent, who will act as directed by and under the supervision of the Owner, and who will confer with Owner/Architect/Engineer regarding his actions. The Owner's Project Representative's dealings in matters pertaining to the on-site Work shall, in general, be only with the Owner/Architect/Engineer and Contractor and dealings with Subcontractors shall only be through or with the full knowledge of Contractor.

A. Responsibilities. Except as otherwise instructed in writing by Owner, the Owner's Project Representative will:

(1) Attend preconstruction conferences; arrange a schedule of progress meetings and other job conferences as required in consultation with Owner/Architect/Engineer and notify those expected to attend in advance; and attend meetings and maintain and circulate copies of minutes thereof;

(2) Serve as Owner/Architect/Engineer's liaison with Contractor, working principally through Contractor's superintendent, to assist in understanding the intent of the Contract Documents. As requested by Owner/Architect/Engineer, assist in obtaining additional details or information when required at the job site for proper execution of the Work;

(3) Report to Owner/Architect/Engineer whenever he believes that any Work is unsatisfactory, faulty or defective or does not conform to the Contract Documents;

(4) Accompany visiting inspectors representing public or other agencies having jurisdiction over the project; record the outcome of these inspections and report to Owner/Architect/Engineer;

(5) Review applications for payment with Contractor for compliance with the established procedure for their submission and forward them with recommendations to Owner/Architect/Engineer; and

(6) Perform those duties as set forth elsewhere within the Contract Documents.

B. Limitations. Except upon written instructions of Owner, Owner's Project Representative shall not:

(1) Authorize any deviation from the Contract Documents or approve any substitute materials or equipment;

(2) Exceed limitations on Owner/Architect/Engineer's authority as set forth in the Contract Documents;

(3) Undertake any of the responsibilities of Contractor, Subcontractors or Contractor's superintendent, or expedite the Work;

(4) Advise on or issue directions relative to any aspect of the means, methods, techniques, sequences or procedures of construction unless such is specifically called for in the Contract Documents;

(5) Advise on or issue directions as to safety precautions and programs in connection with the Work;

(6) Authorize Owner to occupy the project in whole or in part; or

(7) Participate in specialized field or laboratory tests.

ARTICLE VIII
RESOLUTION OF DISAGREEMENTS; CLAIMS FOR COMPENSATION

8.1 Owner to Decide Disputes. The Owner shall reasonably decide all questions and disputes, of any nature whatsoever, that may arise in the execution and fulfillment of the services provided for under the Contract Documents, in accordance with the Procurement Ordinance.

8.2 Finality. The decision of the Owner upon all claims, questions, disputes and conflicts shall be final and conclusive, and shall be binding upon all parties to the Contract Documents, subject to judicial review as provided in Section 8.5 below.

8.3 No Damages for Delay. If at any time Contractor is delayed in the performance of Contractor's responsibilities under the Contract Documents as the result of a default or failure to perform in a timely manner by Owner or Owner's agents or employees, Contractor shall not be entitled to any damages except for compensation specifically authorized in Article III. Contractor's sole remedy will be a right to extend the time for performance. Nothing herein shall preclude Contractor from any available remedy against any responsible party other than Owner. Contractor shall be responsible for liquidated damages for delay pursuant to Section 3 of the Agreement.

8.4 Permitted Claims Procedure. Where authorized or permitted under the Contract Documents, all claims for additional compensation by Contractor, extensions of time affecting the Substantial Completion Date, for payment by the Owner of costs, damages or losses due to casualty, Force Majeure, Project Site conditions or otherwise, shall be governed by the following:

(1) All claims must be submitted as a request for Change Order in the manner as provided in Article V.

(2) The Contractor must submit a notice of claim to Owner's Project Representative and to the Architect/Engineer within fifteen (15) days of when the Contractor was or should have been aware of the fact that an occurrence was likely to cause delay or increased costs. Failure to submit a claim within the requisite 15-day period shall constitute a waiver of the right to pursue said claim.

(3) Within twenty (20) days of submitting its notice of claim, the Contractor shall submit to the Owner's Project Representative its request for Change Order, which shall include a written statement of all details of the claim, including a description of the Work affected.

(4) After receipt of a request for Change Order, the Owner's Project Representative, in consultation with the Architect/Engineer, shall deliver to the Contractor, within twenty (20) days after receipt of request, its written response to the claim.

(5) In the event the Owner and Contractor are unable to agree on the terms of a Change Order, the Owner shall have the option to instruct the Contractor to proceed with the Work. In that event, the Owner shall agree to pay for those parts of the Work, the scope and price of which are not in dispute. The balance of the disputed items in the order to proceed will be resolved after completion of the Work, based upon completed actual cost.

(6) The rendering of a decision by Owner with respect to any such claim, dispute or other matter (except any which have been waived by the making or acceptance of final payment) will be a condition precedent to any exercise by Owner or Contractor of such right or remedies as either may otherwise have under the Contract Documents or by laws or regulations in respect of any such claim, dispute or other matter.

8.5 Contract Claims and Disputes. After completion of the process set forth in Section 8.4 above, any unresolved dispute under this Agreement shall be decided by the Purchasing Official in accordance with Section 2-26-63 of the Manatee County Code of Laws, subject to an administrative hearing process as provided in Section 2-26-64. The decision of the Board of County Commissioners in accordance with Section 2-26-64 of the Manatee County Code of Laws shall be the final and conclusive County decision subject to exclusive judicial review in circuit court by a petition for certiorari.

8.6 Claims for Consequential Damages. The Contractor and Owner waive claims against each other for consequential damages arising out of or relating to this Contract. This mutual waiver includes:

(1) damages incurred by the Owner for rental expenses, for losses of use, income, profit, financing, business and reputation, and for loss of management or employee productivity or of the services of such persons; and

(2) damages incurred by the Contractor for principal office expenses including the compensation of personnel stationed there, for losses of financing, business and reputation, and for loss of profit except anticipated profit arising directly from the work.

This mutual waiver is applicable, without limitation, to all consequential damages due to either party's termination in accordance with Article XIV. Nothing contained in this Section 8.6 shall be deemed to preclude an award of liquidated direct damages, when applicable, in accordance with the requirements of the Contract Documents.

ARTICLE IX
INDEMNITY

9.1 Indemnity.

A. Indemnification Generally. To the fullest extent permitted by law, the Contractor shall indemnify and hold harmless the Owner, Architect/Engineer, Architect/Engineer's consultants, and agents and employees of any of them from and against claims, damages, losses and expenses, including but not limited to attorney's fees, arising out of or resulting from performance of the Work, provided that such claim, damage, loss or expense is attributable to bodily injury, sickness, disease or death, or to injury to or destruction of tangible property (other than the Work itself), but only to the extent caused by the negligent acts or omissions of the Contractor, a Subcontractor or anyone directly or indirectly employed by them or anyone for whose acts they may be liable, regardless of whether such claim, damage, loss or expense is caused in part by a party indemnified hereunder. Such obligation shall not be construed to negate, abridge, or reduce other rights or obligations of indemnity which would otherwise exist as to a party or person described in this Section 9.1.

B. Claims by Employees. In claims against any person or entity indemnified under this Section 9.1 by an employee of the Contractor, a Subcontractor, anyone directly or indirectly employed by them or anyone for whose acts they may be liable, the indemnification obligation under Section 9.1.A. shall not be limited by a limitation on amount or type of damages, compensation or benefits payable by or for the Contractor or a Subcontractor under workers' compensation acts, disability benefit acts or other employee benefit acts.

9.2 Duty to Defend. The Contractor shall defend the Owner in any action, lawsuit mediation or arbitration arising from the alleged negligence, recklessness or intentionally wrongful conduct of the Contractor and other persons employed or utilized by the Contractor in the performance of the Work. So long as Contractor, through its own counsel, performs its obligation to defend the Owner pursuant to this Section, Contractor shall not be required to pay the Owner's costs associated with the Owner's participation in the defense.

ARTICLE X
ACCOUNTING RECORDS; OWNERSHIP OF DOCUMENTS

10.1 Accounting Records. Records of expenses pertaining to all services performed shall be kept in accordance with generally accepted accounting principles and procedures.

10.2 Inspection and Audit. The Contractor's records shall be open to inspection and subject to examination, audit, and/or reproduction during normal working hours by the Owner's agent or authorized representative to the extent necessary to adequately permit evaluation and verification of any invoices, payments or claims submitted by the Contractor or any of its payees during the performance of the Work. These records shall include, but not be limited to, accounting records, written policies and procedures, Subcontractor files (including proposals of successful and unsuccessful bidders), original estimates, estimating worksheets, correspondence, Change Order files (including documentation covering negotiated settlements), and any other supporting evidence necessary to substantiate charges related to the Contract Documents. They shall also include, but not be limited to, those records necessary to evaluate and verify direct and indirect costs (including overhead allocations) as they may apply to costs associated with the Contract Documents. For the purpose of such audits, inspections, examinations and evaluations, the Owner's agent or authorized representative shall have access to said records from the effective date of the Contract Documents, for the duration of Work, and until three (3) years after the date of final payment by the Owner to the Contractor pursuant to the Contract Documents.

10.3 Access. The Owner's agent or authorized representative shall have access to the Contractor's facilities and all necessary records in order to conduct audits in compliance with this Article. The Owner's agent or authorized representative shall give the Contractor reasonable advance notice of intended inspections, examinations, and/or audits.

10.4 Ownership of Documents. Upon completion or termination of the Contract Documents, all records, documents, tracings, plans, specifications, maps, evaluations, reports, transcripts and other technical data, other than working papers, prepared or developed by the Contractor under the Contract Documents shall be delivered to and become the property of the Owner. The Contractor at its own expense may retain copies for its files and internal use.

ARTICLE XI
PUBLIC CONTRACT LAWS

11.1 Equal Opportunity Employment.

A. Employment. The Contractor shall not discriminate against any employee or applicant for employment because of race, creed, sex, color, national origin, disability or age, and will take affirmative action to insure that all employees and applicants are afforded equal

employment opportunities without discrimination because of race, creed, sex, color, national origin, disability or age. Such action will be taken with reference to, but shall not be limited to, recruitment, employment, job assignment, promotion, upgrading, demotion, transfer, layoff or termination, rates of training or retraining, including apprenticeship and on-the-job training.

B. Participation. No person shall, on the grounds of race, creed, sex, color, national origin, disability or age, be excluded from participation in, be denied the proceeds of, or be subject to discrimination in the performance of the Agreement.

11.2 Immigration Reform and Control Act of 1986. Contractor acknowledges that it is responsible for complying with the provisions of the Immigration Reform and Control Act of 1986, located at 8 U.S.C. Section 1324, et seq., and regulations relating thereto. Failure to comply with the above statutory provisions shall be considered a material breach and shall be grounds for immediate termination of this Agreement.

11.3 No Conflict of Interest. The Contractor warrants that it has not employed or retained any company or person, other than a bona fide employee working solely for the Contractor to solicit or secure the Contract Documents, and that it has not paid or agreed to pay any person, company, corporation, individual, or firm other than a bona fide employee working solely for the Contractor, any fee, commission, percentage, gift or any other consideration, contingent upon or resulting from the award or making of the Contract Documents.

A. No Interest in Business Activity. By accepting award of this Contract, the Contractor, which shall include its directors, officers and employees, represents that it presently has no interest in and shall acquire no interest in any business or activity which would conflict in any manner with the performance of services required hereunder, including without limitation as described in the Contractor's own professional ethical requirements. An interest in a business or activity which shall be deemed a conflict includes but is not limited to direct financial interest in any of the material and equipment manufacturers, suppliers, distributors, or contractors who will be eligible to supply material and equipment for the Project for which the Contractor is furnishing its services required hereunder.

B. No Appearance of Conflict. The Contractor shall not knowingly engage in any contractual or professional obligations that create an appearance of a conflict of interest with respect to the services provided pursuant to the Contract Documents. The Contractor has provided the Affidavit of No Conflict, incorporated into the Contract Documents as Exhibit "C", as a material inducement for Owner entering into the Contract Documents. If, in the sole discretion of the County Administrator or designee, a conflict of interest is deemed to exist or arise during the term of the County Administrator or designee may cancel this Agreement, effective upon the date so stated in a written notice of cancellation, without penalty to the Owner.

11.4 Truth in Negotiations. By execution of the Contract Documents, the Contractor certifies to truth-in-negotiations and that wage rates and other factual unit costs supporting the compensation are accurate, complete and current at the time of contracting. Further, the original Contract Sum and any additions thereto shall be adjusted to exclude any significant sums where the Owner determines the Contract Sum was increased due to inaccurate, incomplete or non-current wage rates and other factual unit costs. Such adjustments must be made within one (1) year after final payment to the Contractor.

11.5 Public Entity Crimes. The Contractor is directed to the Florida Public Entity Crimes Act, Section 287.133, Florida Statutes, specifically section 2(a), and the Owner's requirement that the Contractor comply with it in all respects prior to and during the term of the Agreement.

ARTICLE XII
FORCE MAJEURE, FIRE OR OTHER CASUALTY

12.1 Force Majeure.

A. Unavoidable Delays. Delays in any performance by any party contemplated or required hereunder due to fire, flood, sinkhole, earthquake or hurricane, acts of God, unavailability of materials, equipment or fuel, war, declaration of hostilities, revolt, civil strife, altercation or commotion, strike, labor dispute, or epidemic, archaeological excavation, lack of or failure of transportation facilities, or any law, order, proclamation, regulation, or ordinance of any government or any subdivision thereof, or for any other similar cause to those enumerated, beyond the reasonable control and which with due diligence could not have been reasonably anticipated, shall be deemed to be events of Force Majeure and any such delays shall be excused. In the event such party is delayed in the performance of any Work or obligation pursuant to the Contract Documents for any of the events of Force Majeure stated in this Section 12.1, the date for performance required or contemplated by the Contract Documents shall be extended by the number of calendar days such party is actually delayed

B. Concurrent Contractor Delays. If a delay is caused for any reason provided in 12.1.A. or as a result of an extension of time provided by Change Order, and during the same time period a delay is caused by Contractor, the date for performance shall be extended as provided in 12.1.A. but only to the extent the time is or was concurrent.

C. Notice; Mitigation. The party seeking excuse for nonperformance on the basis of Force Majeure shall give written notice to the Owner, if with respect to the Contractor, or to the Contractor if with respect to the Owner, specifying it's actual or anticipated duration. Each party seeking excuse from nonperformance on the basis of Force Majeure shall use its best efforts to rectify any condition causing a delay and will cooperate with the other party, except that neither party shall be obligated to incur any unreasonable additional costs and expenses to overcome any loss of time that has resulted.

12.2 Casualty; Actions by Owner and Contractor. During the construction period, if the Project or any part thereof shall have been damaged or destroyed, in whole or in part, the Contractor shall promptly make proof of loss; and Owner and Contractor shall proceed promptly to collect, or cause to be collected, all valid claims which may have arisen against insurers or others based upon such damage or destruction. The Contractor shall diligently assess the damages or destruction and shall prepare an estimate of the cost, expenses, and other charges, including normal and ordinary compensation to the Contractor, necessary for reconstruction of the Project substantially in accordance with the Project Plans and Specifications. Within fifteen (15) days following satisfaction of the express conditions described in subsections (1), (2) and (3) below, the Contractor covenants and agrees diligently to commence reconstruction and to

complete the reconstruction or repair of any loss or damage by fire or other casualty to the Project to substantially the same size, floor area, cubic content, and general appearance as prior to such loss or damage:

(1) Receipt by the Owner or the trustee of the proceeds derived from collection of all valid claims against insurers or others based upon such damage or destruction, and receipt of other sums from any source such that the funds necessary to pay the Project Cost and any additions to the Project Cost necessitated for repair or reconstruction are available;

(2) Written agreement executed by the Contractor and the Owner, by amendment to the Contract Documents or otherwise, authorizing and approving the repair or reconstruction and any additions to the Project Cost necessitated thereby, including any required adjustment to the Contract Sum; and

(3) Final approval by the Owner of the Project Plans and Specifications for such repair or reconstruction and issuance of any required building permit.

12.3 Approval of Plans and Specifications. The Owner agrees to approve the plans and specifications for such reconstruction or repair if the reconstruction or repair contemplated by such plans and specifications is economically feasible, and will restore the Project, or the damaged portion thereof, to substantially the same condition as prior to such loss or damage, and such plans and specifications conform to the applicable laws, ordinances, codes, and regulations. The Owner agrees that all proceeds of any applicable insurance or other proceeds received by the Owner or the Contractor as a result of such loss or damage shall be used for payment of the costs, expenses, and other charges of the reconstruction or repair of the Project.

12.4 Notice of Loss or Damage. The Contractor shall promptly give the Owner written notice of any significant damage or destruction to the Project, defined as loss or damage which it is contemplated by Contractor will increase the Contract Sum or extend the Substantial Completion Date, stating the date on which such damage or destruction occurred, the then expectations of Contractor as to the effect of such damage or destruction on the use of the Project, and the then proposed schedule, if any, for repair or reconstruction of the Project. Loss or damage which the Contractor determines will not affect the Contract Sum or Substantial Completion Date will be reported to Owner and Architect/Engineer immediately, and associated corrective actions will be undertaken without delay.

ARTICLE XIII
REPRESENTATIONS, WARRANTIES AND COVENANTS

13.1 Representations and Warranties of Contractor. The Contractor represents and warrants to the Owner that each of the following statements is presently true and accurate:

A. The Contractor is a construction company, organized under the laws of the State of _____, authorized to transact business in the State of Florida, with _____ as the primary qualifying agent. Contractor has all requisite power and authority to carry on its business as now conducted, to own or hold its properties, and to enter into and perform its obligations hereunder and under each instrument to which it is or will be a party, and is in good standing in the State of Florida.

B. Each Contract Document to which the Contractor is or will be a party constitutes, or when entered into will constitute, a legal, valid, and binding obligation of the Contractor enforceable against the Contractor in accordance with the terms thereof, except as such enforceability may be limited by applicable bankruptcy, insolvency, or similar laws from time to time in effect which affect creditors' rights generally and subject to usual equitable principles in the event that equitable remedies are involved.

C. There are no pending or, to the knowledge of the Contractor, threatened actions or proceedings before any court or administrative agency, within or without the State of Florida, against the Contractor or any partner, officer, or agent of the Contractor which question the validity of any document contemplated hereunder, or which are likely in any case, or in the aggregate, to materially adversely affect the consummation of the transactions contemplated hereunder, or materially adversely affect the financial condition of the Contractor.

D. The Contractor has filed or caused to be filed all federal, state, local, or foreign tax returns, if any, which were required to be filed by the Contractor, and has paid, or caused to be paid, all taxes shown to be due and payable on such returns or on any assessments levied against the Contractor.

E. Neither Contractor nor any agent or person employed or retained by Contractor has acted fraudulently or in bad faith or in violation of any statute or law in the procurement of this Agreement.

F. The Contractor shall timely fulfill or cause to be fulfilled all of the terms and conditions expressed herein which are within the control of the Contractor or which are the responsibility of the Contractor to fulfill. The Contractor shall be solely responsible for the means and methods of construction.

G. It is recognized that neither the Architect/Engineer, the Contractor, nor the Owner has control over the cost of labor, materials, or equipment, over a Subcontractor's methods of determining bid prices, or over competitive bidding, market, or negotiating conditions.

H. During the term of the Contract Documents, and the period of time that the obligations of the Contractor under the Contract Documents shall be in effect, the Contractor shall cause to occur and to continue to be in effect those instruments, documents, certificates, and events contemplated by the Contract Documents that are applicable to, and the responsibility of, the Contractor.

I. The Contractor shall assist and cooperate with the Owner and shall accomplish the construction of the Project in accordance with the Contract Documents and the

Project Plans and Specifications, and will not knowingly violate any laws, ordinances, rules, regulations, or orders that are or will be applicable thereto.

J. Contractor warrants and guarantees to Owner that all Work will be in accordance with the Contract Documents and will not be defective, and that Owner, representatives of Owner, governmental agencies with jurisdictional interests will have access to the Work at reasonable time for their observation, inspecting and testing. Contractor shall give Architect/Engineer timely notice of readiness of the Work for all required approvals and shall assume full responsibility, including costs, in obtaining required tests, inspections, and approval certifications and/or acceptance, unless otherwise stated by Owner.

K. If any Work (including Work of others) that is to be inspected, tested, or approved is covered without written concurrence of Architect/Engineer, it must, if requested by Architect/Engineer, be uncovered for observation. Such uncovering shall be at Contractor's expense unless Contractor has given Architect/Engineer timely notice of Contractor's intention to cover the same and Architect/Engineer has not acted with reasonable promptness in response to such notice. Neither observations by Architect/Engineer nor inspections, tests, or approvals by others shall relieve Contractor from Contractor's obligations to perform the Work in accordance with the Contract Documents.

L. If the Work is defective, or Contractor fails to supply sufficient skilled workers, or suitable materials or equipment, or fails to furnish or perform the Work in such a way that the completed Work will conform to the Contract Documents, Owner may order Contractor to stop the Work, or any portion thereof and terminate payments to the Contractor until the cause for such order has been eliminated. Contractor shall bear all direct, indirect and consequential costs for satisfactory reconstruction or removal and replacement with non-defective Work, including, but not limited to fees and charges of Architect/Engineers, architects, attorneys and other professionals and any additional expenses experienced by Owner due to delays to other Contractors performing additional Work and an appropriate deductive change order shall be issued. Contractor shall further bear the responsibility for maintaining schedule and shall not be entitled to an extension of the Contract time and the recovery of delay damages due to correcting or removing defective Work.

M. If Contractor fails within seven (7) days after written notice to correct defective Work, or fails to perform the Work in accordance with the Contract Documents, or fails to comply with any other provision of the Contract Documents, Owner may correct and remedy any such deficiency to the extent necessary to complete corrective and remedial action. Owner may exclude Contractor from all or part of the site, take possession of all or part of the Work, Contractor's tools, construction equipment and machinery at the site or for which Owner has paid Contractor but which are stored elsewhere. All direct and indirect costs of Owner in exercising such rights and remedies will be charged against Contractor in an amount approved as to reasonableness by Architect/Engineer and a Change Order will be issued incorporating the necessary revisions.

N. If within three (3) years after the Substantial Completion Date or such longer period of time as may be prescribed by laws or regulations or by the terms of any applicable special guarantee required by the Contract Documents, any Work is found to be defective, Contractor shall promptly, without cost to Owner and in accordance with Owner's

written instructions, either correct such defective Work or if it has been rejected by Owner, remove it from the site and replace it with non-defective Work. If Contractor does not promptly comply with the terms of such instruction, Owner may have the defective Work corrected/removed and all direct, indirect and consequential costs of such removal and replacement will be paid by Contractor. Failing payment by the Contractor and notwithstanding any other provisions of the Contract Documents to the contrary, Owner shall have the right to bring a direct action in the Circuit Court to recover such costs.

13.2 Representations of the Owner. To the extent permitted by law, the Owner represents to the Contractor that each of the following statements is presently true and accurate:

A. The Owner is a validly existing political subdivision of the State of Florida.

B. The Owner has all requisite corporate or governmental power and authority to carry on its business as now conducted and to perform its obligations under the Contract Documents and each Contract Document contemplated hereunder to which it is or will be a party.

C. The Contract Documents and each Contract Document contemplated hereby to which the Owner is or will be a party has been duly authorized by all necessary action on the part of, and has been or will be duly executed and delivered by, the Owner, and neither the execution and delivery thereof nor compliance with the terms and provisions thereof or hereof: (a) requires the approval and consent of any other person or party, except such as have been duly obtained or as are specifically noted herein; (b) contravenes any existing law, judgment, governmental rule, regulation or order applicable to or binding on the Owner; or (c) contravenes or results in any breach of, default under, or result in the creation of any lien or encumbrance upon the Owner under any indenture, mortgage, deed of trust, bank loan, or credit agreement, the charter, ordinances, resolutions, or any other agreement or instrument to which the Owner is a party, specifically including any covenants of any bonds, notes, or other forms of indebtedness of the Owner outstanding on the date of the Contract Documents.

D. The Contract Documents and each document contemplated hereby to which the Owner is or will be a party constitutes, or when entered into will constitute, a legal, valid, and binding obligation of the Owner enforceable against the Owner in accordance with the terms thereof, except as such enforceability may be limited by applicable bankruptcy, insolvency, or similar laws from time to time in effect which affect creditors' rights generally, and subject to usual equitable principles in the event that equitable remedies are involved.

E. There are no pending or, to the knowledge of the Owner, threatened actions or proceedings before any court or administrative agency against the Owner which question the validity of the Contract Documents or any document contemplated hereunder, or which are likely in any case or in the aggregate to materially adversely affect the consummation of the transactions contemplated hereunder or the financial or corporate condition of the Owner.

F. The Owner shall use due diligence to timely fulfill or cause to be fulfilled all of the conditions expressed in the Contract Documents which are within the control of the Owner or which are the responsibility of the Owner to fulfill.

G. During the pendency of the Work and while the obligations of the Owner under the Contract Documents shall be in effect, the Owner shall cause to occur and to continue to be in effect and take such action as may be necessary to enforce those instruments, documents, certificates and events contemplated by the Contract Documents that are applicable to and the responsibility of the Owner.

H. The Owner shall assist and cooperate with the Contractor in accomplishing the construction of the Project in accordance with the Contract Documents and the Project Plans and Specifications, and will not knowingly violate any laws, ordinances, rules, regulations, orders, contracts, or agreements that are or will be applicable thereto or, to the extent permitted by law, enact or adopt any resolution, rule, regulation, or order, or approve or enter into any contract or agreement, including issuing any bonds, notes, or other forms of indebtedness, that will result in the Contract Documents or any part thereof, or any other instrument contemplated by and material to the timely and effective performance of a party's obligations hereunder, to be in violation thereof.

ARTICLE XIV
TERMINATION AND SUSPENSION

14.1 Termination for Cause by Owner. This Agreement may be terminated by Owner upon written notice to the Contractor should Contractor fail substantially to perform a material obligation in accordance with the terms of the Contract Documents through no fault of the Owner. In the event Owner terminates for cause and it is later determined by a court of competent jurisdiction that such termination for cause was not justified, then in such event such termination for cause shall automatically be converted to a termination without cause pursuant to Section 14.2.

A. Nonperformance. If the Contractor fails to timely perform any of his obligations under the Contract Documents, including any obligation the Contractor assumes to perform Work with his own forces, or if it persistently or repeatedly refuses or fails, except in case for which extension of time is provided, to supply enough properly skilled workmen or proper materials, or fails, without being excused, to maintain an established schedule (failure to maintain schedule shall be defined as any activity that falls thirty (30) days or more behind schedule) which has been adopted by the Construction Team, or it fails to make prompt payment to Subcontractors for materials or labor, or disregards laws, rules, ordinances, regulations, or orders of any public authority having jurisdiction, or otherwise is guilty of substantial violations of the Agreement the Owner may, after seven (7) days written notice, during which period the Contractor fails to perform such obligation, make good such deficiencies and perform such actions. The Contract Sum, or the actual Cost of the Project, whichever is less, shall be reduced by the cost to the Owner of making good such deficiencies, and the Contractor's compensation shall be reduced by an amount required to manage the making good of such deficiencies. Provided, however, nothing contained herein shall limit or preclude Owner from pursuing additional damages from Contractor as a result of its breach.

B. Insolvency. If the Contractor is adjudged bankrupt, or if it makes a general assignment for the benefit of its creditors, or if a receiver is appointed on account of its

insolvency, then the Owner may, without prejudice to any other right or remedy, and after giving the Contractor and its surety, if any, fourteen (14) days written notice, and during which period the Contractor fails to cure the violation, terminate the Agreement. In such case, the Contractor shall not be entitled to receive any further payment. Owner shall be entitled to recover all costs and damages arising as a result of failure of Contractor to perform as provided in the Contract Documents, as well as reasonable termination expenses, and costs and damages incurred by the Owner may be deducted from any payments left owing the Contractor.

C. Illegality. Owner may terminate the Agreement if Contractor disregards laws or regulations of any public body having jurisdiction.

D. Rights of Owner. The Owner may, after giving Contractor (and the Surety, if there is one) seven (7) days written notice, terminate the services of Contractor for cause; exclude Contractor from the Project site and take possession of the Work and of all Contractor's tools, construction equipment and machinery at the Project site and use the same to the full extent they could be used (without liability to Contractor for trespass or conversion); incorporate in the Work all materials and equipment stored at the Project site or for which Owner has paid Contractor but which are stored elsewhere, and finish the Work as Owner may deem expedient. In such case, Contractor shall not be entitled to receive any further payment beyond an amount equal to the value of material and equipment not incorporated in the Work, but delivered and suitably stored, less the aggregate of payments previously made. If the direct and indirect costs of completing the Work exceed the unpaid balance of the Contract Sum, Contractor shall pay the difference to Owner. Such costs incurred by Owner shall be verified by Owner in writing; but in finishing the Work, Owner shall not be required to obtain the lowest quote for the Work performed. Contractor's obligations to pay the difference between such costs and such unpaid balance shall survive termination of the Agreement. In such event and notwithstanding any other provisions of the Contract Documents to the contrary, Owner shall be entitled to bring a direct action in the Circuit Court to recover such costs.

14.2 Termination without Cause by Owner. The Owner, through its County Administrator or designee, shall have the right to terminate the Agreement, in whole or in part, without cause upon sixty (60) calendar days written notice to the Contractor. In the event of such termination for convenience, the Owner shall compensate Contractor for payments due through the date of termination, and one subsequent payment to cover costs of Work performed through the date of termination, subject to the terms and conditions of Section 3.1. The Contractor shall not be entitled to any other further recovery against the Owner, including, but not limited to, anticipated fees or profit on Work not required to be performed, or consequential damages or costs resulting from such termination.

A. Release of Contractor. As a condition of Owner's termination rights provided for in this subsection, Contractor shall be released and discharged from all obligations arising by, through, or under the terms of the Contract Documents, and the Payment and Performance Bond shall be released. Owner shall assume and become responsible for the reasonable value of Work performed by Subcontractors prior to termination plus reasonable direct close-out costs, but in no event shall Subcontractors be entitled to unabsorbed overhead, anticipatory profits, or damages for early termination.

B. Waiver of Protest. Contractor hereby waives any right to protest the exercise by Owner of its rights under this Section that may apply under the Procurement Ordinance.

14.3 Suspension without Cause. Owner may, at any time and without cause, suspend the Work or any portion thereof for a period of not more than ninety (90) days by written notice to Contractor, which will fix the date on which Work will be resumed. Contractor shall be allowed an increase in the Contract Sum or an extension of the Contract Time, or both, directly attributable to any suspension if Contractor makes an approved claim therefor.

14.4 Termination Based Upon Abandonment, Casualty or Force Majeure. If, after the construction commencement date (i) Contractor abandons the Project (which for purposes of this paragraph shall mean the cessation of all construction and other activities relating to the Project, excluding those which are necessary to wind down or otherwise terminate all outstanding obligations with respect to the Project, and no recommencement of same within one hundred twenty (120) days following the date of cessation), or (ii) the Project is stopped for a period of thirty (30) consecutive days due to an instance of Force Majeure or the result of a casualty resulting in a loss that cannot be corrected or restored within one hundred twenty (120) days (excluding the time required to assess the damage and complete the steps contemplated under Section 12.2), the Owner shall have the right to terminate the Agreement and pay the Contractor its compensation earned or accrued to date.

14.5 Vacation of Project Site; Delivery of Documents. Upon termination by Owner pursuant to Section 14.2 or 14.4, Contractor shall withdraw its employees and its equipment, if any, from the Project Site on the effective date of the termination as specified in the notice of termination (which effective date shall not be less than two (2) working days after the date of delivery of the notice), regardless of any claim the Contractor may or may not have against the Owner. Upon termination, the Contractor shall deliver to the Owner all original papers, records, documents, drawings, models and other material set forth and described in the Contract Documents.

14.6 Termination by the Contractor. If, through no act or fault of Contractor, the Work is suspended for a period of more than ninety (90) consecutive days by Owner or under an order of court or other public authority, or Owner fails to act on any Application for Payment or fails to pay Contractor any sum finally determined to be due; then Contractor may, upon fourteen (14) days written notice to Owner terminate the Agreement and recover from Owner payment for all Work executed, any expense sustained plus reasonable termination expenses. In lieu of terminating the Agreement, if Owner has failed to act on any Application for Payment or Owner has failed to make any payment as aforesaid, Contractor may upon fourteen (14) days written notice to Owner stop the Work until payment of all amounts then due.

Exhibit A
Title(s) of Drawings

General

1.	G-1	Cover Sheet
2.	G-2	Sheet Index
3.	G-3	General Notes
4.	G-4	Legend and Abbreviations
5.	G-5	Erosion Control Details and Notes
6.	G-6	Process Schematic
7.	G-7	Overall Project Area

Site Civil

1.	C-1	Existing Site and Erosion Control Plan
2.	C-2	Site Layout and Facilities Pay Items Plan
3.	C-3	Proposed Site Plan
4.	C-4	Paving and Grading Plan
5.	C-5	Plant Drain Piping Plan
6.	C-6	Site Drainage Basins
7.	C-7	Concrete Construction Joint Plan
8.	C-8	Pavement Replacement Markings and Signage Plan
9.	C-9	Civil Details (1)
10.	C-10	Civil Details (2)
11.	C-11	Civil Details (3)
12.	C-12	Civil Details (4)

Mechanical

1.	M-1	Yard Piping Key Sheet
2.	M-2	Over All Yard Piping
3.	M-3	Yard Piping (1)
4.	M-4	Yard Piping (2)
5.	M-5	Yard Piping (3)
6.	M-6	Septage Receiving Station Plan and Section
7.	M-7	Grease Receiving Station Plan and Section
8.	M-8	Wet Well and Valve Vault Plan and Section
9.	M-9	Pump Station Details
10.	M-10	Storage Tanks Elevation and Connection Details
11.	M-11	Storage Tank Details
12.	M-12	Vacuum Truck Receiving Ramp Plan and Sections
13.	M-13	Mechanical Standard Details

Exhibit A
Title(s) of Drawings (page 2)

Structural

1. S-1 General Structural Notes
2. S-2 Septage / Grease Station Canopy Foundation Plan
3. S-3 Septage / Grease Station Canopy Slab-On-Grade Plan
4. S-4 Septage / Grease Station Canopy Sections
5. S-5 Screw Press Canopy Plan and Sections
6. S-6 Roll-Off Filter Canopy Plan and Section
7. S-7 Roll-Off Filter Canopy Sections and Details
8. S-8 Septage / Grease Receiving Station Plans and Sections
9. S-9 Structural Details

Electrical

1. E-1 Electrical Legend and Abbreviations
2. E-2 Electrical Site Plan
3. E-3 Septage Receiving Electrical Site Plan
4. E-4 West Septage Receiving Station Electrical Plan
5. E-5 West Septage Receiving Station Equipment Elevations
6. E-6 Grease Receiving Septage List Station Electrical Site Plan
7. E-7 Septage Receiving Station Electrical Equipment Diagram
8. E-8 Septage Receiving and Vacuum Truck Rack Lighting Plan
9. E-9 MCC-Blower Building No. 2 Floor Plan
10. E-10 Septage Receiving Station Administration Building Floor Plan
11. E-11 Septage Receiving Station MCC Elevation
12. E-12 Septage Receiving Station One Line Diagram
13. E-13 Septage Receiving Station Typical Transfer Pump Wiring Schematic
14. E-14 Septage Receiving Station Grease Pump and Mixer Wiring Schematic
15. E-15 Septage Receiving Station Details and Panel Schedule

Instrumentation

1. I-1 Instrumentation and Controls Legend
2. I-2 Septage Station PLC Control Cabinet Details
3. I-3 Septage Station PLC Control Cabinet Discrete Wiring Diagrams
4. I-4 Septage Station PLC Control Cabinet Analog Wiring Diagrams
5. I-5 Septage Station and Admin Fiber Optic Cabinet Details
6. I-6 Scada Panel 2 Control Cabinet Details
7. I-7 Proposed Scada System Fiber Optic Communication Topology
8. I-8 Fiber Optic Connection Diagrams
9. I-9 Connection Diagram and Communication Riser

All drawings have been signed and sealed by Cardno dated 3/10/2015

All noted drawings are one page each

Exhibit B
Title(s) of Specifications

1. Contract Documents and Technical Specifications for Southeast Water Reclamation Facility (SEWRF) Septage / Grease Receiving Station prepared by Cardno dated April 2015.....662 pages

2. FDEP Stormwater Permit.....2 pages

EXHIBIT "C"
AFFIDAVIT OF NO CONFLICT

COUNTY OF _____,

STATE OF _____,

BEFORE ME, the undersigned authority, this day personally appeared, _____, a principal with full authority to bind _____hereinafter the "Lessee"), who being first duly sworn, deposes and says:

(a) is not currently engaged or will not become engaged in any obligations, undertakings or contracts that will require the Lessee to maintain an adversarial role against the County or that will impair or influence the advice, recommendations or quality of work provided to the County; and

(b) has provided full disclosure of all potentially conflicting contractual relationships and full disclosure of contractual relationships deemed to raise a question of conflict(s); and

(c) has provided full disclosure of prior work history and qualifications that may be deemed to raise possible question of conflict(s).

Affiant makes this affidavit for the purpose of inducing Manatee County, a political subdivision of the State of Florida, to enter into this Agreement for

_____
Signature

_____
Print Name

SUBSCRIBED to and sworn before me this _____ day of _____, 20__.

[Notary Seal]

Notary Public

My commission expires: _____

_____
Notary Signature

_____
Print Name

Personally Known _____or Produced Identification
Type of Identification Produced _____

Exhibit E

Contractor's Payment and Performance Bond

Exhibit F
Standard Forms

Application for Payment

Certificate of Substantial Completion

Final Reconciliation / Warranty / Affidavit

Change Order

Public Construction Bond Form

APPLICATION FOR PAYMENT

Request No.: ___ Project No.: _____
Purchase Order No.: _____
County Bid No.: _____
Consultant: _____

Project: _____
From: _____ To: _____

CONTRACT PAYMENT SUMMARY

Original Contract Amount:			$ -
Change Order(s):			$ -
Change order summary:			
Number	Date Approved	Additive	Deductive
SUBTOTALS:		$ -	$ -
Net change order subtotal (Additive less Deductive):			$ -
Current Contract Amount (CCA): (Original Amount + Change Order(s))			$ -
	Previous Status	Total WIP	
Value of the Work in Place (WIP)	$ -	$ -	
Value of Stored Materials	$ -	$ -	
Total Earned ($ and % of CCA)	$ -	$ -	
Retainage ($ and % of CCA)	$ -	$ -	
Net Earned (Total earned minus retainage)			$ -
TOTAL PREVIOUS PAYMENTS			$ -
AMOUNT DUE THIS PAYMENT (Net Earned minus Previous Payments)			$ -

CONTRACTOR'S AFFIDAVIT OF NOTICE

CERTIFICATE: The undersigned CONTRACTOR certifies that all items and amounts shown on this Application for Payment are on account of work performed, materials supplied and/or materials stored on site and paid for by Contractor in accordance with the Contract Documents with due consideration for previous Payment(s), if any, received by the Contractor from the County, and that the Amount Due this Payment shown is now due.

NOTARY:

State of Florida, County of _____

Sworn to (or affirmed) and subscribed before me this _____ day of _____ by

_____
(Name of person giving notice)

_____
(Signature of Notary Public - State of Florida)
Print, Type or Stamp Commissioned Name of Notary Public:

Personally Known ___ or Produced Identification ___
Type of Identification Produced: _____

CONTRACTOR:

_____
Name of person authorized to sign Affidavit of Notice

_____
TITLE

Contractor name, address and telephone no.:

_____
_____
_____
_____
_____

VERIFICATION, RECOMMENDATION, CONCURRENCES AND APPROVALS

	(Signatures)	(Date)
Quantities verified by:	_____	_____
Consultant/Engineer:	_____	_____
Project Management:	_____	_____
Department Head:	_____	_____
Payment approved by the Board of County Commissioners:	_____	_____
Attested to by the Clerk of Circuit Court:	_____	_____

CERTIFICATE OF SUBSTANTIAL COMPLETION (S.C.)	CHECK ONE: Partial	Total
Project Title:	Date Submitted:	
Contractor Data: Name: Address: City/State/Zip:	Project No: S. C. Date (Proposed)	

If the "Partial" completion box above is checked, the following description applies to the work for which substantial completion is being sought. Otherwise, the work described in the Contract including approved changes, if any, is certified to be substantially complete:
(Description of the portion of work substantially completed):

(USE CONTINUATION SHEETS IF NECESSARY)

A tentative list of items to be completed or corrected is attached hereto. This list may not be all-inclusive, and the failure to include an item does not alter the Contractor's responsibility to complete all of the contract work in accordance with the Contract Documents. The items in the tentative list shall be completed or corrected by the Contractor within _____ days of substantial completion. The approved substantial completion date is: _____

Contractor Signature	Date	Engineer's Approval	Date
Printed Name and Title		Printed Name and Title	

The Contractor shall be responsible for security, operation, safety, maintenance, HVAC, insurance and warranties in accordance with the Contract. The County will assume the responsibility for paying the cost of electrical power from midnight of the date of Engineer's approval as indicated above.

ATTACH THE INSPECTOR'S FINAL WALKTHROUGH LIST OF DEFICIENCIES.

FINAL RECONCILIATION, WARRANTY PERIOD DECLARATION AND CONTRACTOR'S AFFIDAVIT

Project Title:	Date Submitted:
Contractor Data: Name: Address: City/State/Zip:	Project No: Warranty (months):

This Final Reconciliation is for the work performed for Manatee County by the above named contractor, hereinafter called CONTRACTOR, pursuant to the contract dated _____ as amended, and acts as an addendum thereto.

It is agreed that all quantities and prices in the attached Final Pay Estimate No. _____ are correct and that the amount of $_____ including retainage is due to the CONTRACTOR, that no claims are outstanding as between the parties, and that the above stated sum represents the entirety of monies owed the CONTRACTOR.

It is further agreed that the warranty period for CONTRACTOR'S work pursuant to the Contract is from _____ to _____

As (title) _____ for CONTRACTOR, I have authority to bind said CONTRACTOR, and as such make this final reconciliation, declaration and affidavit for the purpose of inducing Manatee County to make final payment to CONTRACTOR for work done at/upon _____ under said contract:

CONTRACTOR has paid all social security and withholding taxes accrued in connection with the construction project.

CONTRACTOR has paid all workers' compensation and other insurance premiums incurred in connection with this construction project.

CONTRACTOR has paid for all required permits in connection with this construction project.

All laborers, material, men, suppliers, subcontractors and service professionals who worked for and/or supplied materials, equipment and/or services to the CONTRACTOR under this construction contract have been paid in full.

_____
(Affiant Signature)

NOTARY:
State of Florida, County of _____ , Sworn to (or affirmed) and subscribed before me this _____ day of _____ , ____, by _____ (person giving notice).

Signature of Notary Public - State of Florida: _____
Print, Type or Stamp Commissioned Name of Notary Public:

Personally Known ☐ or Produced Identification ☐
Type of Identification Produced _____

CONTRACT CHANGE ORDER

(For Adjustment Amounts Less Than $1,000,000.)

PROJECT:

Change Order No.:

Contract Amount:
(Present Value)

Project Number:

NO. OF ITEM	DESCRIPTION OF ITEM AND CHANGE	DECREASE	INCREASE
1	BY EXECUTION OF THIS CHANGE ORDER THE CONTRACTOR AGREES THAT ALL CLAIMS FOR ADDITIONAL CONTRACT TIME AND FEES FOR THE ITEMS IN THIS CHANGE ORDER HAVE BEEN SATISFIED.		
		TOTAL DECREASE:	TOTAL INCREASE:

Contractor:
Address:
City / State:

Contractor
Signature: _____ Date _____

THE NET CHANGE OF
ADJUSTS THE CURRENT CONTRACT AMOUNT FROM
TO

___ CALENDAR DAYS ARE ADDED TO THE SCHEDULE WHICH CHANGES THE FINAL COMPLETION DATE TO
MONTH, DAY, YEAR.

RECOMMENDATION, CONCURRENCES AND APPROVALS

	SIGNATURES	DATE
Consultant / Engineer:	_____	_____
Project Manager:	_____	_____
Division Manager:	_____ Joe Streitmatter III, P.E., Project Management Division Manager	_____
Manatee County Purchasing	_____ Melissa M. Wendel, CPPO, Purchasing Official Authority to execute this contract per Manatee County Code, Chapter 2-26, and per the delegation by the County Administrator effective 1/25/2009	_____

MANATEE COUNTY GOVERNMENT
PUBLIC CONSTRUCTION BOND

Bond No. _____
(Enter bond number)

BY THIS BOND, We _____, located at _____, as
(Name of Contractor) (Address)

Principal and _____, a corporation, whose address is
(Name of Surety)

_____

are bound to Manatee County, a political subdivision of the State of Florida, herein called County, in the sum of $ _____, for payment of which we bind ourselves, our heirs, personal representatives, successors, and assigns, jointly and severally.

WHEREAS, the Contractor has entered into Contract No. 15-1058-DS with the County for the project titled Southeast Water Reclamation Facility (SEWRF) Septage / Grease Receiving Station Project, with conditions and provisions as are further described in the aforementioned Contract, which Contract is by reference made a part hereof for the purposes of explaining this bond.

THE CONDITION OF THIS BOND is that if Principal:

1. Performs Contract No. 15-1058-DS, between Principal and County for construction of

Southeast Water Reclamation Facility (SEWRF) Septage / Grease Receiving Station Project,
(Title of Project)

the Contract being made a part of this bond by reference, at the times and in the manner prescribed in the Contract; and

2. Promptly makes payments to all claimants, as defined in Section 255.05(1), Florida Statutes, supplying Principal with labor, materials, or supplies, used directly or indirectly by Principal in the prosecution of the Work provided for in the Contract; and

3. Pays County all losses, damages, expenses, costs, and attorney's fees, including appellate proceedings, that County sustains because of a default by Principal under the Contract; and

4. Performs the guarantee of all Work and materials furnished under the Contract for the time specified in the Contract, then this bond is void; otherwise it remains in full force.

Any action instituted by a claimant under this bond for payment must be in accordance with the notice and time limitation provisions in Section 255.05(2), Florida Statutes.

Any changes in or under the Contract documents and compliance or noncompliance with any formalities connected with the Contract or the changes does not affect Surety's obligation under this bond.

DATED ON _____.

CONTRACTOR AS PRINCIPAL	**SURETY**
_____	_____
Company Name	Company Name
_____	_____
Signature	Signature
_____	_____
Print Name & Title	Print Name & Title
(Corporate Seal)	*(Corporate Seal)*

AGENT or **BROKER**

_____
Company Name

_____
Address

_____

_____
Telephone

Licensed Florida Insurance Agent? ☐ **Yes** ☐ **No**

License #: _____

State of: _____

County of: _____

City of: _____