

	<p>CCU Engineering Specifications</p> <p><b>Section 002540</b></p> <p><b>SUBMERSIBLE SEWAGE PUMP LIFT STATION STANDARD DESIGN</b></p>	<p>Effective Date: Nov. 1, 2011</p> <p>Rev#02</p> <p>Page 1 of 34</p>
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## **PART 1 - GENERAL**

### **1.1 SCOPE**

#### **1.1.1 General**

It is the intent of this specification to provide the requirements for use of the design, selection of materials, and construction of a standard submersible sewage pump lift station, hereinafter referred to as "standard lift station", and all appurtenances. All standard lift station installations shall also meet the requirements of the Florida Department of Environmental Protection (FDEP) permit and the Florida Administrative Code, as applicable.

The standard lift station has optional capabilities such as a standby generator, ~~Telemetry Control Unit (TCU)~~, an odor control system, Variable Frequency Drives (VFDs), a below ground vault, and other options as specified.

#### **1.1.2 Work Included**

The Contractor shall, unless specified otherwise, furnish all materials, equipment, tools, labor, and appurtenances necessary for site preparation, dewatering, construction, testing, and start-up that is necessary to accomplish the work required under the contract to include, but not limited to, furnishing and installing the standard lift station as described herein and as shown on the engineering drawings and CCU Standard Details.

The equipment shall form a completely operable non-clog submersible sewage pump system complete with pumps and rails, wet well liquid level sensors, wet well, hatch cover, valves, piping, water service(s), motor control center (MCC), grounding rods, all wiring and conduits, standard lift station concrete pad, fencing, driveway, landscaping and all associated appurtenances. The standard lift station shall include the following optional equipment as specified: standby generator, ~~telemetry system~~, odor control system, VFDs, below ground vault system, and other specified options.

The contractor shall install the Florida Power and Light meter can and install/connect the electrical service to the FPL service point at a hand hole for electrical service as shown on the engineering drawings and as defined in this specification.

#### **1.1.3 Location of the Work**

The construction shall be at the location shown on the engineering drawings.

The accessibility to the work sites shall vary, as the package lift station may be located in landscape areas, utility easements, residential and/or commercial backyards, and various

other locations. Damage to existing pavement surfaces, base courses and/or other surface improvements as a result of the contractor's activities shall be restored to like-new condition by the Contractor at provided for in the contract bid documents. The Contractor shall implement all required measures to provide CCU personnel and equipment with complete access to all work site areas during the entire course of performing this project.

#### 1.1.4 Coordination of Work

The contractor shall be responsible for the satisfactory coordination of the standard lift station construction with other construction and activities in the area. Delays in work resulting from lack of such harmony shall not in any way be a cause for extra compensation by any of the parties.

#### 1.1.5 Responsibilities

- a. Notice to Residents: The contractor shall be responsible for notifying affected residents by the means of door hangers, mailings and/or all other appropriate means to alert residents at various times of the different phases of the construction of the standard lift station. The notifications shall indicate the various work activities that the Contractor will be performing on their street and what they can expect as far as service outages, disruption of traffic, access inconvenience, unusual odors and other activities affecting residents.
- b. Licenses and Permits: The contractor shall be responsible for obtaining all licenses, permits, authorizations, approvals, access agreements, consent from utilities/persons/organizations upon whose property is impacted, written releases of responsibility and all other required documents.
- c. Work Access: The access to the site is shown on the contract documents. Additional accessibility to the site, as deemed necessary by the Contractor beyond what is shown on the engineering drawings, shall be the responsibility of the contractor, and all expenses associated with work site additional accessibility shall be taken into consideration as part of the contractor's bid unit prices. Written releases from the property owner impacted by additional accessibility obtained by the contractor shall be provided to CCU.
- d. Clearance of Blockages or Obstructions in the Sanitary Sewer System: The contractor shall be responsible for clearance of blockages or obstructions in the sanitary sewer system created by the contractor's construction methods.
- e. Location and Exposure of Manholes: The contractor shall expose only those sanitary sewer structures necessary to perform the work as shown on the engineering drawings.
- f. Existing Utility Operations: CCU shall shut down or manually operate all existing potable water, reclaimed water and sanitary sewer systems necessary for performance of the work. The Contractor shall submit a request to CCU for shut down or operational changes a minimum of 24 hours in advance.
- g. By-Pass Operations: The contractor shall be responsible for continuous maintenance of flow of all existing utilities at the project site, unless otherwise agreed to by CCU.

- h. **Water Access:** The contractor shall be responsible for obtaining water access necessary for performance of work under the contract from designated fire hydrants at the site of work or other suitable designated sources.
- i. **Disposal:** The contractor shall clean up and dispose of all waste materials from the construction activities including all materials removed from the sanitary sewer system in conformance with all laws, regulations and standard practices.
- j. **Secure Storage Area:** The contractor shall find secure storage areas of a size adequate to accommodate the required vehicles, equipment and materials for the period of performance of the contract. CCU will not provide any space or place to store materials.
- k. **Maintenance of Traffic:** The contractor shall be responsible for all maintenance of traffic and obtaining approval of a Maintenance of Traffic (MOT) Plan from the Charlotte County Community Development Engineering Department (CCCED) for work within the right-of-way of any County Road and from the FDOT for work within the right-of-way of any State Road.

#### 1.1.6 Working Hours

The contractor shall carry out work in accordance with local ordinance and not to cause any unreasonable nuisance to affected residents. Under emergency conditions, this limitation may be waived by the consent of CCU.

### 1.2 **METHOD OF MEASUREMENT & PAYMENT**

The work shall be measured and the compensation determined in the following manner including all labor, materials, equipment, installation, testing, startup, painting, training, technical support, operation and maintenance manuals and appurtenances necessary to complete all the work in accordance with the contract documents:

- **Note:** Measurement and payment provided in this standard lift station specification supersedes the measurement and payment provided in other specifications.

#### 1.2.1 Site Work:

Site work including satisfactory coordination of utility construction, project site clearing and grubbing, fence removal and restoration, removal and disposal of existing bituminous and/or concrete materials, existing structures, existing culvert or other pipe, furnishing and installing fill material, all necessary grading of the site and all other associated work required to complete the project in accordance with the contract documents shall be measured and paid for on a lump sum basis unless otherwise provided in the bid form.

#### 1.2.2 Wet Well, Access Hatch and Concrete Cover and Slab:

Wet well, access hatch and concrete cover and slab (\*) including excavation, dewatering, base materials, backfilling, external and internal coatings, provisions for pipe openings, joint sealing and wrapping, exfiltration testing of the wet well, and all other associated work required to complete the project in accordance with the contract documents shall be measured and paid for on a lump sum basis unless otherwise provided in the bid form.

(\*) If a valve vault is not required, the concrete slab under the above ground piping shall be included in this bid item and no separate bid item shall be provided.

### 1.2.3 Submersible Sewage Pumps:

Submersible sewage pumps including associated hardware, cables, guide rails, support brackets, chains, all electrical wiring to the Motor Control Center (MCC), conduits and all other associated appurtenances required to complete the project in accordance with the contract documents shall be measured and paid for on a per each basis per each submersible sewage pump size specified.

### 1.2.4 Main Power Electrical Services:

Main power electrical services including wiring and conduit from the service point in the FPL installed hand hole to the FPL meter can, wiring and conduit from the FPL meter can to the standard lift station MCC, the main power disconnect in the MCC, and all other associated appurtenances required to complete the project in accordance with the contract documents shall be measured and paid for on a lump sum basis.

### 1.2.5 Piping and Valves:

Piping and valves, located within the fenced in area limits of the standard lift station site, including fittings, flexible couplings, flange adaptors, flange connectors, gauges, pipe supports, brackets, vents, and all other associated appurtenances required to complete the project in accordance with the contract documents shall be measured and paid for on a lump sum basis.

All piping and appurtenances outside the fenced in area limits of the standard lift station site shall be measured and paid for within other bid items as provided in the bid form.

### 1.2.6 Motor Control Center (MCC):

MCC including the following general components: wet well liquid level sensors, electrical wiring and connectors, supports, switches, sensors, controllers, alarms, indicator lights, meters, electrical equipment, back-up battery, enclosure, panels, controls, indicators, terminal strips, terminal blocks, posts, motor starters, main circuit breaker, operating handles, magnetic contactor coils, seal leak probe, permanent labels, alternator relay, fused control circuit transformer, adjustable three phase power monitor, wiring diagram, grounding rods, explosion proof fittings, surge protector equipment, suppressors fittings, brackets, conduits, and all other associated appurtenances required to complete the project in accordance with the contract documents shall be measured and paid for on a lump sum basis.

Variable Frequency Drives (VFD), a standby generator and/or portable generator connector, ~~Telemetry Control Unit (TCU)~~ and odor control are optional equipment for each standard lift station and if required in the contract documents shall be measured and paid for as separate bid items as provided in the bid proposal.

### 1.2.7 Soft Starter

The soft starter including any additional wiring, separate panel, control logic, controller, input

circuit breaker, integrated motor and load protection, LCD screen, key pads, contactors, reactors, controls, switches, signals, relays, conduits, connectors and all other associated appurtenances required to complete the project in accordance with the contract documents shall be measured and paid for on a per each basis.

#### 1.2.8 Water Service

The water service including tap, piping, meter box assembly, backflow prevention device, spigot, hardware, fittings, brackets, supports and all other associated appurtenances required to complete the project in accordance with the contract documents shall be measured and paid for on a lump sum basis.

#### 1.2.9 Driveways

The driveways including removal of existing concrete/bituminous and aggregate base sections, saw cutting of existing concrete/bituminous edges, preparation of subgrade, placement of aggregate base, construction of concrete/bituminous surfacing and all other associated appurtenances required to complete the project in accordance with the contract documents shall be measured and paid for on a square yard basis.

#### 1.2.10 Culverts

The culvert pipe, end sections, base material and all other associated appurtenances required to complete the project in accordance with the contract documents shall be measured and paid for on a per linear foot basis per each size specified.

#### 1.2.11 Fence and Gates

The fence and gates including posts, pipes, fabric, bars and straps, fasteners, gate latches, coating, pig ring ties, hardware and accessories, concrete footings and all other associated appurtenances required to complete the project in accordance with the contract documents shall be measured and paid for on a lump sum basis.

#### 1.2.12 Flood Light

A weather-proof 300 W quartz flood light, 120 V GE qhf-300, suitable for mounting to TCU antenna tower or other structure as provided on the engineering drawings including posts, conduits, wiring, MCC switch, hardware and accessories, concrete footings and all other associated appurtenances required to complete the project in accordance with the contract documents shall be measured and paid for on a lump sum basis.

#### 1.2.13 Optional Equipment

##### 1.2.13.1 Variable Frequency Drive

The variable frequency drive including the wiring, separate panel, control logic, controller, input circuit breaker, harmonic suppression equipment, contactors, reactors, controls, conduits, connectors and all other associated appurtenances required to complete the project in accordance with the contract documents shall be measured and paid for on a

lump sum basis.

#### 1.2.13.2 Emergency Portable Generator Connection

The emergency portable generator connection including the receptacle, wiring, conduits, connectors and all other associated appurtenances required to complete the project in accordance with the contract documents shall be measured and paid for on a lump sum basis.

#### 1.2.13.3 Standby Generator

The standby generator including the Automatic Transfer Switch (ATS), standby generator concrete pad, wiring, conduits, connectors and all other associated appurtenances required to complete the project in accordance with the contract documents shall be measured and paid for on a lump sum basis.

#### 1.2.13.4 Odor Control System

The odor control system (biofilter unit only, biofilter unit with optional secondary activated carbon polishing unit or stand-alone activated carbon filter unit) including motors, enclosure, skids, wiring, valves, media, absorption material, absorber system, absorber vessel, VFD controlled centrifugal fan with sound attenuation enclosure, switches, control transformer, gauges, sample probes, screen, grates, ductwork, conduits, and connectors, piping, concrete pad, anchors all other associated appurtenances required to complete the project in accordance with the contract documents shall be measured and paid for on a lump sum basis.

#### ~~1.2.13.5 Telemetry Control Unit (TCU)~~

~~The Telemetry Control Unit (TCU) including concrete base, tower, enclosure, galvanized steel piping, tie wraps, antenna, coax cables, conduits, ground rod, default screen or indicating LED, site signal survey and all other associated appurtenances required to complete the project in accordance with the contract documents shall be measured and paid for on a lump sum basis.~~

#### 1.2.13.6 Valve Vault, Access Hatch and Concrete Cover

Valve vault, access hatch and concrete cover(\*) including excavation, dewatering, base materials, backfilling, external and internal coatings, provisions for pipe openings, joint sealing and wrapping, exfiltration testing of the valve vault, and all other associated appurtenances required to complete the project in accordance with the contract documents shall be measured and paid for on a lump sum basis.

(\*) If a valve vault is not required for the project, the concrete slab under the above ground piping shall be paid for as provided in measurement and payment item 1.2.2 (Wet Well, Access Hatch and Concrete Cover and Slab).

### 1.2.14 Miscellaneous:

All items required for the completion of the standard lift station and not included as a specific bid item shall be considered incidental to the project and no direct compensation will be made therefore.

## 1.3 **REFERENCED STANDARDS (LATEST REVISION)**

Wherever reference is made to any published standard, code, or standard specification, it shall mean the latest standard code, specification, or tentative specification of the technical society, organization, or body referred to which is in effect at the date of the opening of bids.

AWWA: C-153, C-900, C-905, C-909, C-906-90, C-151, C-153, C-111, C-600, C-651, and C-652, C913

ASTM: A-139, D-883, D-1785, D-1869, D-1120, D-2241, D-3350, D-1248-68, D-1598, D-1599, D-2583, D-2563, D-4097-82

PS 15-69: National Bureau of standards Voluntary Product Standard "Custom contact molded Reinforced Polyester Chemical Resistant Process Equipment".

ASME: PTC 8.2

FDEP: Wastewater Collection/Transmission System Requirements

AASHTO Code

Florida Administrative Code (FAC)

Recommended Standards for Wastewater Facilities

National Electrical Code (NEC)

NEMA

Underwriters Laboratories (UL)

Federal Communication Commission

Institute of Electrical and Electronics Engineers (IEEE)

Internal Corrosion Direct Assessment (ICDA)

National Fire Protection Association (NFPA)

National Bureau of Standards (NBS)

Air Movement and Control Association (AMCA)

The Contractor shall, when required, furnish evidence satisfactory to CCU that materials and methods are in accordance with these codes, specifications, standards, etc. where so specified. In the event any questions arise as to the application of these codes, specifications, standards etc., copies shall be supplied on site by the Contractor. In case of conflicting requirements between this specification and these referenced documents, this specification will govern.

#### **1.4 PARTIAL LISTING OF RELATED SECTIONS**

- 001760 – Surveying and Record Drawings
- 002310 – Pipe Removal, Disposal, Alteration, Modification or Pipe Abandonment
- 002320 – Gravity Sewer System
- 002325 – Force Mains
- 002340 – Valves
- 002240 – Dewatering
- 002742 – Sidewalks, Driveways, Streets
- 002920 – Landscaping
- 002930 – Grassing
- 003310 – Cast-in-Place Concrete
- 003300 – Pre-Cast Concrete Products
- 003600 – Grout
- 009900 – Surface preparation, painting and coating
- 009910 – Sanitary Sewer System Rehabilitation
- 009920 – Sanitary Sewer Structures Rehabilitation

Note: This is only a partial listing of related sections. The Contractor shall be responsible to review the entire contract documents.

#### **1.5 SUBMITTALS**

##### **1.5.1 General:**

The contractor shall include the statement that the submittals have been reviewed and the materials meet CCU specifications and/or Standard details.

The required shop drawings for the work included under this specification are listed in section “Required Shop Drawings”. The contractor shall submit four (4) signed copies of shop drawings for CCU review a minimum of 60 days prior to the start of construction for each particular item.

For materials that the contractor is requesting deviations from this specification and/or Standard details, the contractor shall submit in writing a minimum of 60 days prior to construction, documentation to justify approval of these materials by Charlotte County Utilities (CCU). The Contractor shall submit four (4) signed copies of the material submittals.

No fabrication/construction shall take place until the final shop drawings are reviewed by CCU. Final approval is at the discretion of CCU.

1.5.2 By-Pass Operations: The Contractor shall submit a by-pass plan to CCU for review a minimum of 20 days prior to the start of by-pass operations.

1.5.3 Shop Drawings:

1.5.3.1 Structure(s): The contractor shall provide shop drawings for the structure(s) certified by the manufacturer. The submittals shall include the specifics being proposed for the outside coatings, inside coatings of the wet well top, concrete and reinforcement, access hatch, structural loading, buoyance provisions, outside seam wrap, sealant between structure sections, invert and clocking of piping, size and location of openings, waterproof gaskets and any other appurtenances applicable to the structure(s).

1.5.3.2 Submersible Sewage Pumps: The contractor shall provide shop drawings for the submersible sewage pumps certified by the manufacturer. The submittals shall include at a minimum: pump characteristic curves showing capacity in GPM, NPSH, TDH, efficiency, pumping horsepower from 0 to 110 percent of design capacity, impeller type, discharge diameter, passible sphere size, design drawings, a written description of the interchangeability of rails and discharge between the supplied submersible sewage pump and all CCU acceptable manufacturers, and any other appurtenances applicable to the submersible sewage pumps. The shop drawings shall include certification data in the form of testing results indicating that all AWWA, state, federal, and engineering standards are met. If requested by CCU, the Contractor shall provide certified factory pump performance test data in the form of Section 6 of ASME PTC 8.2.

1.5.3.3 MCC: The contractor shall provide shop drawings for the MCC. The shop drawings shall include schematics, manufacturer brochures, and test results for pump settings, all MCC components, all other electrical components and appurtenances applicable to the MCC. The shop drawings shall include certification data in the form of testing results indicating that all NEMA, UL, AWWA, state, federal, and engineering standards are met.

1.5.3.4 Standby Generator and ATS: The contractor shall provide shop drawings for the standby generator and ATS. The shop drawings shall include schematics, manufacturer brochures and test results for all standby generator and ATS components and appurtenances applicable to the proposed standby generator and ATS. The shop drawings shall include certification data in the form of testing results indicating that the contract requirements and all NEMA, UL, and engineering standards are met.

1.5.3.5 Odor Control:

a. General:

The odor control system shall be supplied by a manufacturer who has been regularly engaged in the design and manufacture of the equipment having a minimum of 5 years' experience in its design, fabrication, and testing of odor control systems of the type specified. The equipment supplier shall provide a list of a minimum of 10 identical installations of the type specified that have been in operation for a minimum of 5 years. Other manufacturers shall demonstrate to CCU its equipment is of equal quality of the manufacturer specifically named herein.

The contractor shall submit complete shop drawings for the odor control system, together with all piping, ductwork, valves, and control for review by CCU. The shop drawings shall include schematics, manufacturer brochures, and test results for all odor control components and appurtenances applicable to the proposed odor control. The shop drawings shall include certification data in the form of testing results indicating that the contract requirements and all NEMA, UL, and engineering standards are met.

The contractor shall complete the “TBDs” in table “A” below for the odor control system being proposed based on the size of the wet well, influent flows, inlet, outlet, standard lift station operational temperatures and the estimated inlet H<sub>2</sub>S concentration in ppm. The design documents shall be provided by the manufacturer to CCU certifying that the odor control system meets the contract requirements.

Table A

Air Flow Rate, cfm	TBD
Estimated Inlet H <sub>2</sub> S Concentration, ppm	TBD

The contractor shall submit the following information for review before the equipment is fabricated:

- 1) Letters of Certification of Compliance of materials, equipment, etc.
- 2) Final certified drawings showing outline dimensions, foundation layout or mounting information, and other pertinent dimensions.
- 3) Field assembly drawings and/or diagrams.
- 4) Schematic and wiring diagrams of power, control, and piping systems with all devices, terminal, and wires uniquely numbered and clearly indicating between factory and field wiring. All field wiring shall be included for each diagram to describe all modes of operation of the system indicated. Where the integrated system requires interlocking and control and other components in normal operation, these components shall be included in the description of operation.
- 5) Drawings of system showing assemblies, arrangements, piping, electrical, mounting details, equipment outline dimensions, fitting size and location, motor data, operating weights of all equipment and sufficient information to allow CCU to check clearances, connections, and conformance with the specifications .
- 6) Renewal parts list with diagrammatic or cross-section drawing showing part identification. Material analysis or trades designation for each significant part shall be noted on parts lists or on a separate sheet.
- 7) Materials of construction of all equipment.
- 8) Control panel drawings shall indicate all equipment installed inside and outside of the panel including the location of all alarms (for biofilter) ; lamps; complete instrumentation; and control, logic and power wiring diagrams.
- 9) Electrical equipment rating and data sheets for all devices.
- 10) Design calculations certified by a Registered Professional Engineer with demonstrated experience in the design of these systems.
- 11) Pump data and performance curves showing flow, pressure, and horsepower (for biofilter)
- 12) Specifications, performance data, and calibration curves for exhaust fan and auxiliary components

b. Biofilter:

Any manufacturer whose main business is Fiberglass Reinforced Plastic (FRP) manufacturing shall not be accepted as a supplier of the complete system.

c. Activated Carbon Adsorber:

Any manufacturer whose main business is HDPE manufacturing shall not be accepted as a supplier of the complete system.

~~1.5.3.6 TCU: The contractor shall provide shop drawings for the TCU. The shop drawings shall include schematics, manufacturer brochures, and test results for pump settings, flood light, antenna, tower, all other TCU components and appurtenances applicable to the TCU. The shop drawings shall include certification data in the form of testing results indicating that the contract requirements and all NEMA, UL, AWWA, state, federal, and engineering standards are met.~~

1.5.3.7 VFD: The contractor shall provide documentation with the material submittals on the experience of the VFD manufacturer and his interfacing with the submersible pump manufacturer.

The contractor shall also submit a manufacturer's statement that the variable frequency drive meets the requirements of Federal Communication Commission and IEEE. Adequate IC (inductance-capacitor) filters shall be provided as required to meet this criteria.

## PART 2 - PRODUCTS

### 2.1 GENERAL

All equipment and products shall be permanently identified with the model number and manufacture's nomenclature.

### 2.2 EQUIPMENT

The equipment used in this work shall be all new and conform to the requirements for class, kind, size and material as specified below and/or as provided in other sections of the contract documents.

#### 2.2.1 Submersible Sewage Pumps

##### 2.2.1.1 General

- a. The submersible sewage pumps covered by this specification are intended to be standard pumping equipment of proven ability as manufactured by Flygt Pumps, Hydromatic and ABS.

- b. The submersible sewage pumps shall be designed, constructed and installed in accordance with the best practices and methods and shall operate satisfactory when installed as shown on the engineering drawings and/or standard details.
- c. The submersible sewage pumps shall be heavy duty electric submersible, centrifugal non-clog units designed for handling raw and unscreened wastewater (minimum of 3" sphere). The submersible sewage pumps shall be capable of operating in a liquid temperature up to 115°F and to a depth of 65 feet.
- d. The submersible sewage pump and motor unit shall be suitable for continuous operation at full data plate load while the motor is completely submerged, partially submerged or totally non-submerged. The use of shower systems, secondary submersible sewage pumps or cooling fans to cool the motor shall not be acceptable. The submersible sewage pumps mechanical seals and motor units shall be from the same manufacturer to achieve standardization of operation, maintenance, spare parts, manufacturer's service, and warranty.
- e. The submersible sewage pump shall be tested and approved by Factory Mutual or U.L. as explosion proof for use in Class I, Groups C and D, Division 1 hazardous locations.
- f. The submersible sewage pump shall have a sliding bracket for connecting to the dual guide stainless steel rail system. The sliding bracket, either directly or with an adaptor, shall allow for the interchangeability of all CCU acceptable submersible sewage pump manufacturers at alternative locations.
- g. The submersible sewage pump shall have a manufactured sized electrical cable and shall be a minimum of 50 linear feet. The cable shall conform to NEC and ICDA Standards with P-MSHA approval. The cable shall be sealed with a protective covering prior to installation.
- h. The submersible sewage pump shall include a 316 stainless steel chain capable of supporting the weight of the submersible sewage pump for installation and removal of the submersible sewage pump. The chain shall be connected to the submersible sewage pump bail using a 316 stainless steel clevis. The length of the chain shall be equivalent to the depth of the wet well plus additional 6 feet.
- i. The submersible sewage pump discharge diameter shall be as specified on the engineering drawings and/or CCU standard details. For discharge diameters 4" or larger, the manufacturer supplied submersible sewage pump discharge shall be compatible among all CCU acceptable manufacturers' submersible sewage pump discharge base elbows.
- j. The submersible sewage pump shall be cast iron with appropriate coating to protect submersible sewage pump from corrosive properties of wastewater.
- k. The impeller shall be mounted directly on the motor shaft extension in such a manner that it shall not become detached if the submersible sewage pump is operated in the wrong direction. The impeller shaft shall be 420 stainless steel or greater and shall extend from the motor to the impeller cap nut.

- l. All submersible sewage pump mated surfaces shall be machine fitted for watertight sealing.
- m. A 316 stainless steel lifting bail handle shall be provided on the submersible sewage pump housing suitable for lifting the entire submersible sewage pump assembly and attaching the lift chain.
- n. The submersible sewage pump shall operate to a maximum submergence of 65 feet including electrical cable entry.
- o. All electrical parts shall be housed in an air or oil filled cast iron, water-tight casing.
- p. All external hardware shall be 316 stainless steel.
- q. The motor shall be designed to allow a minimum of 15 starts per hour.
- r. The motors shall include thermal and moisture protection to shut down the motor due to high operational temperatures or infiltration of moisture. The motor shall be automatic restarted once the operational temperature is achieved.
- s. All other components and appurtenances shall be as specified on the engineering drawings and in the CCU standard details.

#### 2.2.1.2 Approved Products:

The following submersible sewage pump manufacturers are approved:

- ▶ ABS
- ▶ Hydromatic
- ▶ Flygt

#### 2.2.2 Motor Control Center (MCC)

##### 2.2.2.1 General

The submersible sewage pump motor control elements shall be installed in a 316 stainless steel NEMA 4X enclosure and include the following equipment:

- a. The panel shall be constructed of a heavy-duty box frame of all welded construction, utilizing specially formed #12-gauge 316 stainless steel angle and channel members.
- b. The dead front interior panel(s) for instrument mounting shall be constructed of a minimum of #11-gauge aluminum.
- c. The interior panel(s) for instrument mounting shall be constructed of a minimum of #14-gauge epoxy coated steel.
- d. Panel mounted controls and indicators shall maintain panel integrity. Suitable stiffness shall be provided when required to maintain flatness and provide extra rigidity.

- e. All panels wiring to external equipment shall be terminated on screw-type terminal strips.
- f. Terminal blocks shall be separated into groups (power, AC control, DC signal, data, etc.). All terminals shall be shall be marked with legible permanent labels or otherwise identified.
- g. The MCC shall be mounted on 4" tubular top capped aluminum posts installed in concrete above the 100 year flood plain in accordance with the engineering drawings and standard details.
- h. All circuit breakers shall be accessible without opening the MCC dead front door(s).
- i. The MCC shall include at a minimum the following for each submersible sewage pump: a motor starter, a HOA switch, a circuit breaker mounted with the operating handles through the dead front door(s), a leak seal indicating light, and an elapsed time meter.
- j. The MCC shall contain a manual pump control operated by a manual Hand/Off/Auto (HOA) by-pass switch located in the main MCC which is NOT an automatic redundant switch.
- k. The MCC shall include at a minimum: a 24-volt AC wet well liquid level sensors control circuit, 120-volt AC audio and visual alarms, an emergency generator receptacle with circuit breaker, a main circuit breaker, a control circuit breaker, and a 12-volt DC audio and visual battery backup alarm system.
- l. All power shall be disconnected from the control elements when the standard lift station main disconnect is in the "OFF" position.
- m. In each motor, a heat sensor thermister and a seal leak probe shall be wired to a red warning signal light on the dead front door and shall be marked with legible permanent labels.
- n. An alternator relay shall be supplied to alternate the individual submersible sewage pump on each successive cycle.
- o. A fused wet well liquid level sensors control circuit transformer shall be supplied to operate controls.
- p. In 480-volt AC applications, a fused control circuit transformer shall be supplied to provide 120-volts AC auxiliary equipment power.
- q. An adjustable single or three phase power monitor shall be provided to indicate and protect the pump via the control circuit in the event of loss of any phase, low and high voltage on any or all phases, and phase reversal with automatic reset and built-in time delay on trip.
- r. Audio and visual alarms shall be installed for monitoring high water levels, system equipment failures, and main input power levels failures. Audio and visual alarms shall be wired to sensors provided for a high water levels. Water level and system equipment failure alarms shall be powered directly from the main power supply to the MCC. The audio alarm shall be disabled by a manual silence switch; however, the visual alarm shall remain on until the alarm condition is corrected. If the alarm is a result of a loss of power to the

standard lift station, the alarms shall automatically reset with the restoration of land line power or from a portable generator set. The loss of power audio and visual alarms shall be connected to a continually charged 24 hour back-up 12 volt battery.

- s. The panels shall be wired and assembled per UL 508 Standards. All electrical components and materials shall be listed by UL and shall bear the appropriate UL listing mark or classification. Each panel shall be listed and labeled as UL 508 Industrial MCC. Panels shall comply with NFPA 79 - Industrial Machinery. A permanent, non-paper wiring diagram shall be mounted on the inside of the cabinet door.
- t. A 120 VAC time delay relay (0 to 60 second adjustable on delay) to re-energize control circuit of lag submersible sewage pump after power restoration shall be provided for step loading on submersible sewage pumps over 20 HP. VFDs or soft starts shall be provided for submersible sewage pumps over 20 HP as approved by CCU.
- u. All MCCs shall include a grounding rod with 10-gauge wire that is installed in accordance with current local, state and national codes.
- v. 316 Stainless steel and schedule 80 polyvinyl chloride conduit piping shall be provided and installed as shown on the CCU design detail for connections between the MCC and the wet well structure, ~~the MCC and the TCU (if required)~~, the MCC and the standby generator (if required), the MCC and the odor control (if required), the MCC and the ground rod, and the MCC and the FPL service point. Explosion proof fittings shall be provided and installed on the conduit as shown on the CCU design detail for connections between the MCC and the wet well structure.
- w. A trouble light including switches shall be mounted in the MCC.
- x. Surge protector equipment in accordance with UL 1449 Standards shall be installed on the load side of the MCC main circuit breaker for protection of all AC electrical equipment in the MCC and the motors from the effects of lightning induced currents, substation switching transients, and internally generated transients.
- y. All other components and appurtenances shall be as specified on the engineering drawings and in the CCU standard details.

#### 2.2.2.2 Approved Products:

All electrical and accessories shall meet CCU standard details and specifications and shall be reviewed by CCU with the standard lift station submittals except as noted below.

- ▶ Emergency Generator Connector: Pyle National MFG JRE 4100 PR.
- ▶ Trouble Light: Leviton 9880
- ▶ 120 Volt Alarm Light: Ingram LXR-40 or Ohio Electric RL-3K
- ▶ 120 Volt Alarm Horn: Edwards ALA-896-N5
- ▶ 12 Volt Alarm Light: Ingram SLR-123
- ▶ 12 Volt Alarm Horn: Ingram AH-122DG
- ▶ Elapsed Time Meter: ETMAC 200-10NG7 Round Mount
- ▶ Surge Suppressor: Current Technology Transguard 150

## 2.2.3 Soft Starter

### 2.2.3.1 General

- a. A dedicated soft starter for each submersible sewage pump and connecting wiring shall be supplied by the submersible sewage pump manufacturer for all motors equal to or greater than twenty (20) horsepower unless a VFD is required as per the Special Provisions. The soft starter shall be installed in a separate MCC, if required in the Special Provisions. No supplementary cooling in the form of an air conditioning unit shall be used, unless required in the Special Provisions.
- b. All of the components shall be a complete unit, factory wired, and tested as a complete system. Each soft starter shall operate as a stand-alone unit with no interaction with each other.
- c. The soft starter is a function control integrated in the lift station control panel sized to operate a variable torque load at the rated pump horsepower. The speed range shall be from a minimum speed of 0.5 Hz to a maximum speed of 60 Hz with an input voltage frequency range between 47.5 to 63 Hz.
- d. The soft starter shall be adjustable between 30-70% of the normal line voltage and shall be adjustable between 200 and 500% of the soft starter's full load current.
- e. The ramp time between initial torque and full load torque shall be adjustable between 1 and 120 seconds in increments of one second. The soft start shall include a jog function initialized directly from the keypad.
- f. The soft starter shall have Deceleration Control (soft stop) as a standard feature with an adjustable deceleration time from 1 to 120 seconds in increments of one second.
- g. The soft starter shall include the following integrated motor and load protection:
  - 1) Overload protection based on dynamic thermal register retained in the memory even upon loss of power.
  - 2) A manual reset and an automatic reset for unattended remote applications.
  - 3) Phase imbalance protection - adjustable sensitivity of two phases between 10% to 80% of the rated current.
  - 4) Phase reversal protection - motor will not run the inappropriate direct.
  - 5) High current protection - unit shall trip if the current exceeds eight times the set rated current.
  - 6) Under load protection - trip level shall be programmable from 40 to 100% of the full load motor current.
  - 7) Fault detection - all fault signals are to be reported to the LCD screen and the system shall not be disabled with a minimum recording of the last 20 events.
- h. Two programmable input signals shall be available, and each input shall have the capability of being programmed for None, Reset, Jog, and Enable Motor.
- i. All input and control devices shall be rated for 24 VDC control.

- j. Three physical signal relays and one virtual relay for communication shall be provided and individually programmed for Run, Top of Ramp, and Event listing.
- k. The soft starter shall be provided with a 2-line 20 character per line LCD display screen that does not use any type of code to allow for operator interface.
- l. Serial communications shall be a built-in function as a standard feature and shall include MODBUS, DeviceNet, Profibus DP, and ASI as the communication protocol available through the Field Bus Plug.
- m. The soft starter shall be programmable with a keypad and display that can be viewed/operated from the inside dead-front panel.
- n. Internal calibration adjustments are as follows:
  - 1) Minimum speed.
  - 2) Maximum speed.
  - 3) DC boost.
  - 4) Acceleration/deceleration rates.
  - 5) Stop mode (ramp or coast).
  - 6) Automatic restart after fault trip with lockout after five attempts to restart.
  - 7) Anti-wind milling adjustable brake time.
  - 8) Adjustable volts/Hertz.
- o. Unit mounted operator controls are as follows:
  - 1) Drive keypad display and a keypad Control Panel with a setting dial for each drive.
  - 2) PID values (optional).
  - 3) Speed – manually adjustable.
  - 4) Indicating speed meter.
  - 5) Power ON light.
  - 6) Alarm reset switch.
- ~~p. The soft starter shall include the following standard features which shall be enabled if a TCU unit is specified:
  - 1) Built-in communication via a cable connection or terminal block.
  - 2) Built-in Modbus-TCU communications via a terminal block connection.
  - 3) One (1) connector slot for internally mounting plug-in options.
  - 4) Removable control terminal block.
  - 5) Sink/source selectable control logic.~~
- ~~q. The soft starter shall include the following provisions for remote external controls, if a TCU is specified:
  - 1) Two (2) wire ON-OFF control.
  - 2) One (1) analog input for speed set point.
  - 3) Two (2) analog outputs: one for motor current and one optional for motor speed tied to PLC.
  - 4) Two (2) digital outputs: one for drive running and one for drive fault.
  - 5) Four (4) digital inputs: one for start/stop, one for enable (trips, low wet well level, and emergency stop push button), one for auxiliary for high motor winding temperature, and one for speed select signal for Hand-Off-Auto.
  - 6) One (1) hand-off auto switch.~~

## 2.2.4 Wet Well Liquid Level Sensors

### 2.2.4.1 General

- a. The wet well liquid level sensors shall be operated by reduced voltage, intrinsically safe mercury switch sealed in a solid polyurethane float ball.
- b. The wet well liquid level sensors cords shall be suspended from a 316 stainless steel bracket attached to the lip of the access hatch at the depth specified as shown on the CCU design detail.

### 2.2.4.2 Approved Products:

All mercury wet well liquid level sensors and accessories shall meet CCU standard details and specifications.

The following mercury wet well liquid level sensors manufacturer is approved:

- ▶ Roto-Float Type S Liquid Level Sensor

## 2.2.5 Telemetry Control Unit (TCU) (if required)

### 2.2.5.1 General

- a. ~~The TCU transmits analog signals from the lift station MCG to the CCU central monitoring location and from the CCU central monitoring location to the lift station MCG.~~
- b. ~~The TCU includes a grounding rod with 10-gauge wire and shall be installed in accordance with current local, state and national codes.~~
- c. ~~The TCU data shall be displayed continuously at the TCU by a default screen and indicating LED and shall indicate, at a minimum:~~
  - 1) ~~Operating status of each submersible sewage pump~~
  - 2) ~~Operating mode of the standard lift station~~
  - 3) ~~Wet well liquid level sensors status~~
- d. ~~All other components and appurtenances including tower, antenna, control box, conduits, etc. shall be as specified on the engineering drawings and in the CCU standard details.~~
- e. ~~CCU will provide the TCU frequency to the contractor.~~

### 2.2.5.2 Approved Products:

~~The TCU and accessories shall meet CCU standard details and specifications as determined by CCU.~~

The following TCU manufacturer is approved:

▶ ~~Data Flow Systems, Inc.~~

## 2.2.6 Variable Frequency Drive (VFD) (if required)

### 2.2.6.1 General

- a. A dedicated VFD for each submersible sewage pump and connecting wiring shall be supplied by the submersible sewage pump manufacturer. The VFDs shall be installed in a separate MCC, if required. No supplementary cooling in the form of an air conditioning unit shall be used.
- b. The VFD shall consist of a variable frequency controller, input circuit breaker, harmonic suppression equipment, output isolation contactor, input and output line reactors, and controls. All of the components shall be a complete unit, factory wired, and tested as a complete system. Each VFD shall operate as a stand-alone unit with no interaction with the other VFDs.
- c. The VFD shall maintain a .95 minimum true power factor though out the entire speed range and shall be used with any standard NEMA-B squirrel-cage induction motor having a 1.15 service factor.
- d. Additional specific requirements are stipulated in the contract Special Provisions.

## 2.2.7 Standby Generator and Automatic Transfer Switch (ATS) (if required)

### 2.2.7.1 General

- a. A standby generator shall be diesel powered and shall provide the same kW as the land line power source with a maximum voltage dip of 15% if the rated load is applied in three steps with 15 second increments.
- b. A standby generator shall be permanently connected to the lift station MCC via an ATS supplied by the generator manufacturer.
- c. The standby generator shall be provided with a non-rusting weather housing; a 500 gallon sub-base fuel tank; a 316 stainless steel NEMA 3R enclosure for the ATS; water and temperature gauges; a factory compatible DC battery charger including ammeter; an AC voltage regulator; a voltage adjusting rheostat; start-stop and VM-AM phase selector switches; an AC voltmeter and ammeter; frequency and elapsed time meters; two (2) dry contacts closure rated for 10 amperes at 120 volts; an automatic start/stop control with fault indication lights and corresponding safety switches for pre-warn and shut down low oil pressure; and a pre-warn and shutdown high water temperature, low water temperature, over-speed, over-crank, battery charger malfunction and selection switch (off, auto, manual) with light.
- d. The standby generator shall automatically start and attain the rated kW and frequency upon the closing of a remote starting contact with the ATS within 10 seconds.

- e. The standby generator shall be mounted on a structural steel sub-base designed to maintain proper alignment of the unit and shall be installed on a concrete pad as detailed in the contract documents using properly sized epoxy HILTI anchors.
- f. The standby generator shall include all required components to allow pre-programmed self-operation under load in compliance with manufacturer's recommendations.
- g. The standby generator shall include a grounding rod with 10-gauge wire and installed in accordance with current local, state and national codes.
- h. All other components and appurtenances shall be as specified on the engineering drawings.

#### 2.2.7.2 Approved Products:

The following ATS manufacturer is approved:

- ▶ KCS

#### 2.2.8 Emergency Generator Connector (if required)

##### 2.2.8.1 General

- a. An emergency generator connector with a switching device shall be provided.
- b. All other components and appurtenances shall be as specified on the engineering drawings and on the CCU standard details.

##### 2.2.8.2 Approved Products:

The following manufacturer is approved:

- ▶ Pyle National

#### 2.2.9 Odor Control (if required)

##### 2.2.9.1 General

- a. The odor control system shall be a primary biofilter unit including a built-in carbon filter stage and, if required, an optional secondary activated carbon polishing unit connected to the biofilter unit; a VFD controlled centrifugal fan installed in a with sound attenuation enclosure; interconnecting ductwork; electrical wiring and conduit; and appurtenances for a complete operating system.
- b. The odor control system shall treat in a single pass odorous air from the wet well. The system shall be designed for manual and continuous automatic operation. Access man ways shall be provided to allow access to the internals of the system. The system shall be designed to withstand a temperature up to 120 degrees F. The module and all accessories

shall be factory mounted, piped, and wired to the maximum extent possible. The system shall be installed on the lift station pad with stainless steel fasteners.

- c. The odor control system shall be skid mounted and designed to maintain proper alignment of the installed unit on a concrete pad as detailed on the engineering drawings using properly sized epoxy HILTI anchors. The controls shall be attached to the skid assembly and shall be housed in a waterproof NEMA 4X enclosure.
- d. The overall system size, including the fan, controls, and appurtenances shall not exceed the dimensions shown on the engineering drawings. At a minimum, access man ways shall be provided between the treatment stages. A portion of the system top shall be removable for access to the top of the second stage.
- e. The odor control system shall meet the following performance when operating:

<u>INLET</u>	<u>OUTLET</u>
1-10 ppm H <sub>2</sub> S	0.1 ppm H <sub>2</sub> S
Greater than 10 ppm H <sub>2</sub> S	1.0% of inlet (99.0% removal)

#### 2.2.9.2 Biofilter

- a. The biofilter odor control unit shall be a two-stage, biological absorption/adsorption system that shall include but not be limited to a fiberglass reinforced plastic (FRP) vessel, nozzles, two independent stages of inorganic treatment media (biological and built-in carbon polishing), moisture controls, nutrient supply system, VFD controlled air supply fan, ductwork, dampers, and all necessary accessories. The biological treatment stage shall utilize a granular inorganic media to facilitate absorption and adsorption of odor compounds designed to remove minimum of 99% of H<sub>2</sub>S vapor in a single pass. The polishing stage shall utilize a granular media designed to adsorb odorous compounds with the ability to support biological degradation of the compounds. The first stage shall operate from an independent water distribution system to irrigate the top of the first media bed with complete and even coverage via spray nozzles to maintain optimum wetted conditions to support unique microbial growth for biological destruction of the odorous compounds and removal of toxic metabolites. Biofilter odor control units using any type of organic media and biofilter odor control units using a single inorganic media shall not be acceptable. The complete treatment vessel shall be fabricated of premium grade FRP.
  - 1) The air enters the vessel through the humidification section. After humidification, the first treatment stage contains media specifically designed to support biological growth for degradation of odor compounds. This stage absorbs odors from the air stream. The second polishing stage contains media specifically designed to adsorb odor compounds and to support biological degradation of those compounds. This stage provides final removal of odors to the specified level. Overall media depth shall be a minimum of 48 inches.
  - 2) The first stage of media shall be wetted with fresh potable or re-use make-up water.

- b. The system shall include all piping, valves, control panel and internals pre-mounted and piped on the unitary constructed system. The material of construction of internals shall be as follows:

Packing Media Support	HDPE and FRP
Liquid Distributor	PVC
Spray Nozzles	PVC
Humidifier Nozzles	316 SS

- c. The multi-stage packaged FRP unit shall be of unitary construction. The system shall be shipped as a single piece.

- d. Design and Performance Criteria:

- 1) Criteria: The biofilter odor control unit shall be capable of removing foul air at a rate no lower than the rate shown on the following table.

INLET	OUTLET
1-10 ppm H <sub>2</sub> S	0.1 ppm H <sub>2</sub> S
Greater than 10 ppm H <sub>2</sub> S	1% of inlet

- 2) System Performance: The biofilter odor control unit shall demonstrate the following performance when operating under design flow conditions listed above:

Maximum Pressure Drop: The pressure drop across the odor control unit shall not exceed 5.0 in. w.c. at the maximum air flow rate specified above.

- e. Miscellaneous Material of Construction

- 1) The vessel and accessories shall be contact molded manufactured in accordance with NBS PS 15-69, ASTM D 4097 for contact molding. Any material of construction other than FRP with premium grade resin will not be allowed.
- 2) Resin used in the system liner shall be a premium vinyl ester type such as Hetron 922 by Ashland Chemicals, Derakane 411 by Dow Chemical, Vipel F010 by AOC, or CCU approved equal. The resin shall be reinforced with an inner veil of a suitable synthetic organic fiber such as Nexus 111-00010.
- 3) Glass fiber reinforcement used shall be commercial grade corrosion resistance borosilicate glass. All glass fiber reinforcement shall be Type C, chemical grade, Type E electrical grade. Surfacing veil shall be 10 mil Nexus 111-00010 or equal. Mat shall be Type "E" (electrical grade) glass, 1 1/2 oz. per sq. ft with a nominal fiber length of 1.25 + 0.25 inches, with a silane finish and styrene soluble binder. Continuous glass roving, used in chopper gun spray-up applications shall be type "E" grade with chrome or silane coupling agent. Alternate layers of mat and woven roving shall be used for reinforcement.

- 4) Unless otherwise specified, all fasteners, and metal attachments such as anchors, brackets etc. shall be ANSI 316 SS. Unless otherwise specified, all gaskets shall be EPDM.

f. Fabrication:

- 1) Fabrication shall be in accordance with NBS PS 15-69, ASTM D 3299, and ASTM D-4097. All non-molded surfaces shall be resin incorporating paraffin coated to facilitate a full cure of the surface. All cut edges, bolt holes, and secondary bonds shall be sealed with a resin coat prior to the final resin paraffin resin coat. All voids shall be filled with a resin paste.
- 2) The inner surface of all laminates shall be resin rich and reinforced with one layer of NEXUS 111-00010 with a minimum thickness of 10 mils. The interior corrosion liner shall consist of two layers of 1 and 1/2 oz. per sq. ft. chopped strand mat. If the application is by chopper gun, the spray up glass fiber shall be 1/2 in. to 2 in. long. The total corrosion liner thickness shall be a minimum of 100 mils and have a resin to glass ratio of 80/20. All edges of reinforcement to be lapped a minimum of one (1) inch.
- 3) Structural laminates shall consist of alternating layers of 1 and 1/2 oz. per sq. ft. mat or chopped glass and 24 oz. per sq. yard woven roving applied to reach the designed thickness. The exterior surface shall be relatively smooth and shall have no exposed glass fibers. The exterior shall be surface coated with gel coat containing ultra violet light inhibitors.
- 4) Accessories: Air inlet, air outlet, spray headers, baffles, media support, drain, and all connections shall be provided by the manufacturer. Tie down lugs shall be integrally molded into the walls of the vessel. All external bolts shall be 316 SS and designed for the specified loads. Interior fasteners shall be of corrosion resistant materials such as PVC or FRP.

- g. Neoprene Pad: A 1/4 inch thick, 60 durometer neoprene rubber sheet shall be placed underneath the vessel before installation on lift station pad.

h. Exhaust Fan

- 1) The exhaust fan shall be centrifugal design manufactured of FRP with a statically and dynamically balanced radial blade wheel. The fan inlet shall be slip type, and the fan outlet shall have a flanged nozzle. The fan shall have a neoprene shaft seal.
- 2) Fan shall be supplied with a TEFC motor with 1.15 service factor suitable for three-phase, 60 Hz, 480 volt service and rated for Class 1, Div. 2, Group D installation. The fan shall be direct driven. The motor shall be inverter-duty and controlled by a VFD.
- 3) The fan shall be tested and rated in accordance with AMCA and bear the AMCA seal.

- i. One of the two mineral vessels shall be fitted with a top-mounted, five-cycle multiport control valve to operate the backwash, brining, slow rinse, fast rinse, and refill cycles. An additional piston assembly shall be included to control the duty/standby status of the two vessels. A brass control valve including fixed and self-adjusting flow regulators shall be provided. A hydraulically balanced Teflon coated piston shall be provided to perform the cycles of regeneration.
- j. Instrumentation and System Controls
- 1) The electrical control panel shall provide electrical control for the exhaust fan and water addition system. A 3-phase power supply shall be supplied to the panel from the MCC to power the system.
  - 2) The control panel enclosure shall be rated NEMA 4X. The panel shall be remote-mounted by the contractor next to the system assembly at least 3 feet away to comply with requirements of a Class 1, Division 2, and Group D installation. The Contractor shall install and wire the local control panel to the bio filter mounted fan, metering pump, and solenoid valve. The control panel shall be factory tested to full operation with all other components prior to shipment.
  - 3) The panel shall have the following components or capabilities:
    - i Fan switch (ON-OFF).
    - ii Push-to-test button for water valve.
    - iii Timer relay for on/off control of water valve.
    - iv Blower VFD
    - v Nutrient Pump (ON-OFF-AUTO)
  - 4) The water control cabinet shall be constructed from a NEMA 12 rated FRP cabinet with all internal piping SCH 80 PVC. The cabinet shall be mounted to the system assembly. The cabinet shall contain the following components:
    - I Pressure reducing valve
    - ii Nutrient Pump (rated for installation in a Class 1, Division 2, Group D area)
    - iii Irrigation solenoid valve (Explosion-proof rating)
    - iv Valve for pre-humidification
    - v Irrigation system pressure gauge
  - 5) Water pressure regulator, solenoid valve, and Rota meter shall be provided for control of water application rates. These components shall be mounted in the water control cabinet.
- k. Accessories
- 1) The direct reading Rota meter shall be a variable area type with a Teflon float, EPR "O" rings, and PVC fittings. The Rota meter shall be sized to the pipe and have a direct reading scale.

- 2) A nutrient containment and metering system shall be provided with the system. Nutrients supplied as a coating to the support media shall not be allowed.
- 3) All water and drain piping shall be SCH 80 PVC.

#### I. Nutrient Reservoir

The nutrient reservoir shall be integrated into the system sump. No loose external tanks shall be provided with the system.

#### 2.2.9.3 Carbon Media Odor Control Unit

##### 2.2.9.3.1 Stand Alone Activated Carbon Unit

- a. If required, the Contractor shall install a carbon media odor control unit in accordance with the engineering plans. The carbon media odor control unit shall meet the requirements of this specification.
- b. The unit shall have an AMCA certified centrifugal industrial fiberglass reinforced V-belt Arrangement No. 10 driven plastic fan equipped with undrilled inlet flange, outlet flange, Viton shaft seal, fan guard, and motor enclosure. Each fan and drive motor shall be mounted on a common base assembly designed for mounting on a concrete pad. The fan motor shall be high efficiency type, TEFC, and a with a 1.15 service factor and matched to the electrical service at the standard lift station. Accommodation to accept a hand-held tachometer shall be available for each fan. Each fan shall have a drain with plug. The fan shall include graphite impregnation for grounding.
- c. The contractor shall complete the “TBDs” for the unit fan being proposed for the following maximum operating conditions:

Air Flow Rate, cfm	TBD
S.P. up to Fan Inlet, in WC	TBD
Adsorbed Pressure Drop, in WC	TBD
Total S.P., in WC	TBD
Minimum Motor HP	3.0

- d. The unit shall have a fan sound attenuation package capable of reducing the sound level by a minimum of 25 dB which shall be placed over the fan and motor assembly. The doors shall be equipped with heavy duty hardware and with seals to minimize noise leakage. Stainless steel sheet flashing shall be provided to enclose the penetrations in the enclosure for the fan inlet and outlet ducting. The enclosure shall be fitted with louvered vents as required for heat dissipation/ventilation.
- e. The fan shall be factory wired to a stainless steel NEMA 4X panel. The panel shall have a fan control switch with a pilot lamp to indicate the fan running status. The power supplied to the panel shall be matched to the electrical service at the standard lift station. The panel shall be provided with a power disconnect switch, VFD, and control transformer. The fan speed shall be manually adjusted by the operating the VFD.

- f. The contractor shall provide the necessary ductwork between the fan ductwork and the adsorber vessel. The ductwork shall include a volume control damper with lockable louver for flow adjustment. The material of construction shall be same as that of adsorber vessel.
- g. The carbon adsorber vessel shall be constructed of non-corrosive polypropylene with a minimum thickness of 1/8" is required for a vessel diameter between 18" and 24" and a 1/4" thickness for vessel diameter up to 60" and designed for the following criteria:

Vessel Diameter, ft	TBD
Vessel Straight Side Height, ft	TBD
Internal Positive Pressure, in. WC	+15
Maximum Operating Temperature, °F	150
Carbon Bed Depth, ft.	3.0

- h. The carbon adsorber vessel shall have a differential pressure gauge to continuously monitor the pressure drop across the carbon bed. The differential pressure gauge shall be isolated with isolation valves and mounted on the vessel.
- i. The carbon absorber vessel shall have three (3) one (1) inch diameter sample probes per bed extending into the bed a minimum of twelve (12) inches. The sample probes shall be blocked off with a PVC ball valve.
- j. The carbon absorber vessel shall accommodate a single bed of activated carbon having an average depth of three (3) feet. The carbon bed shall be supported on a polypropylene screen through an FRP support grating system. The screen and the support system shall be removable through the top cover. The top cover shall use quick release tie downs that are integral to the cover and not require the use of separate tools for the removal of the cover. The support system shall consist of removable grating. NOTE: Pall rings or other dumped packing media as a means of carbon support shall not be used. The support system shall be designed to withstand a load of at least 150 lbs/ft<sup>2</sup> with a minimum deflection of 1/4" under all conditions.
- k. The carbon absorber vessel shall have a "gooseneck" type outlet to prevent rainwater from entering into the system.
- l. The activated carbon media shall be virgin, pelletized, and derived from high grade bituminous coal vapor phase type suitable for the control of sewage odors. The carbon shall have the following specifications:

Iodine Number, mgI <sub>2</sub> /g	1050 min
MPD,mm	3.9-4.1
Apparent Density, g/cc	0.46-0.52
Hardness No.	95 min
Butane Activity	26 min
H <sub>2</sub> S Capacity, gH <sub>2</sub> S/cc*	0.30 min

\* The H<sub>2</sub>S breakthrough capacity is determined using ASTM standard method D6646-01. Prior to testing, the test sample shall be completely humidified by exposing the sample to a flow of humid air (>85% RH) for at least 4 hours. Testing shall be accomplished by passing a moist (85% RH) stream of air containing 1 vol. % H<sub>2</sub>S and the selected concentration of CO<sub>2</sub> through a 1 inch diameter tube with a nine-inch deep bed of closely packed carbon at a rate of 1,450 cc/min and monitoring to a 50 ppmv H<sub>2</sub>S breakthrough. The results shall be reported as grams of H<sub>2</sub>S adsorbed per cc of carbon.

- m. All steel hardware shall be 316 stainless steel unless stipulated in this specification or on the engineering drawings. Gaskets shall be full face with a minimum of 1/8" thickness and made of EPDM or neoprene suitable for the intended service.
- n. The unit shall include a grounding rod with 10-gauge wire in accordance with current local, state and national codes.
- o. All other components and appurtenances shall be as specified on the engineering drawings and in the CCU standard details.

#### 2.2.9.3.2 Optional secondary activated carbon polishing unit

If the optional secondary activated carbon polishing unit is required, the contractor shall provide, as a minimum, the major components as specified under the stand-alone unit section including the concrete pad, the vessel, the carbon media, the connecting duct work and all other appurtenances necessary for a fully operational odor control system in accordance with this specification.

#### 2.2.9.4 Approved Products:

The following manufacturer is approved:

- ▶ Odor Control units shall be Siemens, or CCU approved equal.

## 2.3 MATERIAL

The materials used in this work shall be all new and conform to the requirements for class, kind, size and material as specified below and/or as provided in other sections of the contract documents.

All stainless steel shall be 316 austenitic, non-magnetic unless otherwise required.

### 2.3.1 Wet Well, Access Hatch and Concrete Cover and Slab

#### 2.3.1.1 General

- a. Pre-cast circular concrete wet wells and the wet well concrete cover shall comply with the structural requirements of ASTM C478, Type II, acid resistant cement and shall attain a minimum compressive strength of 4000 pounds per cubic foot in 28 days. The wet well pre-cast base section shall be monolithic with the bottom section of the wet well. The pre-cast wetwell top shall include the access cover frame.

- b. The wet well design shall assume a soil density of 130 pounds per cubic foot and a concrete density of 150 pounds per cubic foot and shall resist flotation under the conditions of an empty wet well and a groundwater level from the wet well base to the finished grade including a safety factor of 1.5.
- c. Cast in place concrete slab shall comply with ACI and ASTM standards. Concrete shall be ASTM C-150 Portland Type II 3,500 psi air entrained at 6% plus or minus 1% unless otherwise noted on the engineering plans. Fine aggregate shall be ASTM C33 and coarse aggregate ASTM C33  $\frac{3}{4}$ " maximum size. Reinforcing shall be ASTM A615 Grade 60 deformed bars and stirrups and Grade 40 ties, welded wire fabric shall meet the requirements of ASTM A185, and fabricated reinforcing steel shall be in accordance with ACI 315. Form lumber shall be in accordance with ACI 347 and shall be used with removable metal form ties, non-staining and moisture absorbing form release agents, and stainless steel dovetail anchor slots, and water stops as shown on the engineering drawings.
- d. The wet well shall be set on a number 57 stone base in accordance with section 901 "Coarse Aggregate" of the latest revision Florida Department of Transportation Standard Specifications for Road and Bridge Construction.
- e. The individual wet well sections shall fit together with interlocking tongue and groove joints. Four (4) foot diameter wet wells shall be sealed with a R-4 rubber gasket and six (6) foot or larger diameter wet wells shall be sealed with two (2) 1- $\frac{1}{2}$ " butyl rubber or plastic wet wells joint seal squeezed in and out to verify sealing. The outside of the groove joints for all wet wells shall be covered with a continuous overlapping butyl rubber wrap a minimum of eight (8) inches wide.
- f. The wet well shall include elastomeric gasket(s) for all piping. The gasket(s) shall have a stainless steel adjustable strap to seal the gasket to the pipe. An elastomeric gasket(s) with a stainless steel adjustable strap to seal the gasket to the pipe shall be installed in all on site core bored holes.
- g. The outside surface of the wet well shall be covered with 3 coats (black/red/black or color changes to allow CCU to verify multiple coats) of coal tar epoxy coating with a minimum dry film thickness of 10 mils per coat for a total of 30 mils dry film thickness. Subsequent coats shall be applied within 48 hours of the previous coat. The coal tar epoxy coating shall be Koppers Bitumastic No. 300m or CCU approved equal.
- h. The internal wet well coatings (including cover) shall be a polymorphic resin, a calcium aluminate mortar, an epoxy coating, or a polyurethane coating. Coatings shall be installed in accordance with the manufacturer's specifications.
- i. The wet well access hatches and frames shall be compatible with the lift-out rail system in accordance with the engineering drawings and approved shop drawings. The wet well access hatch and frame shall be aluminum with 316 stainless steel hinges, handles, and associated hardware in accordance with CCU standard details.
- j. The standard lift station influent piping inverts shall be a minimum of sixty (60) inches above the base invert.

### 2.3.1.2 Approved Products:

The following access hatch and frame is approved:

- ▶ Halliday S1R aluminum access cover with standard locking bar and frame

### 2.3.2 Valve Vault, Access Hatch and Concrete Cover (if required)

#### 2.3.2.1 General

- a. A valve vault, access hatch and concrete cover and all other components and appurtenances shall be as specified on the engineering drawings and in the CCU standard details.
- b. Pre-cast rectangular concrete valve vault and the valve vault concrete cover shall comply with the structural requirements of ASTM C913, Type II, acid resistant cement and shall attain a minimum compressive strength of 4000 pounds per cubic foot in 28 days. The valve vault pre-cast base section shall be monolithic with the bottom section of the valve vault. The pre-cast valve vault cover shall include a cast-in-place access hatch frame.
- c. The valve vault design shall assume a soil density of 130 pounds per cubic foot and a concrete density of 150 pounds per cubic foot and shall resist flotation under the conditions of an empty valve vault and a groundwater level from the valve vault base to finished grade, including a safety factor of 1.5.
- d. The valve vault shall be set on a number 57 stone base in accordance with section 901 "Coarse Aggregate" of the latest revision Florida Department of Transportation Standard Specifications for Road and Bridge Construction.
- e. The individual valve vault sections shall fit together with interlocking tongue and groove joints. The valve vault precast top and walls shall be sealed with a R-4 rubber gasket or with two (2) 1-½" butyl rubber or plastic valve vaults joint seal squeezed in and out to verify sealing. The outside of the groove joints for all valve vaults shall be covered with a continuous overlapping butyl rubber wrap a minimum of eight (8) inches wide.
- f. The outside and inside surfaces (including cover) of the valve vault shall be covered with 3 coats (black/red/black or color changes to allow CCU to verify multiple coats) of coal tar epoxy coating with a minimum dry film thickness of 10 mils per coat for a total of 30 mils dry film thickness. Subsequent coats shall be applied within 48 hours of the previous coat. The coal tar epoxy coating shall be Koppers Bitumastic No. 300m or CCU approved equal.
- g. The valve vault access hatch and frame shall be aluminum with 316 stainless steel hinges, handles, and associated hardware in accordance with CCU standard details.
- h. The valve vault piping inverts shall be a minimum of eighteen (18) inches above the base invert. The valve vault cover shall be minimum thirty six (36) inches from the top of the pipe to the finished grade.

### 2.3.2.2 Approved Products:

The following access hatch manufacturer is approved:

- ▶ Halliday S2R aluminum access cover with standard locking bar and frame

### 2.3.3 Discharge Piping and Valves

#### 2.3.3.1 General

- a. The discharge piping and valves shall be designed, constructed and installed in accordance with the best practices and methods and shall operate satisfactory when installed as shown on the drawings. The piping and valves shall be supported to the wetwell walls and above ground as shown on the engineering drawings and the CCU standard details.
- b. The piping and valves shall be furnished and installed in accordance with CCU Specification Section# 002325 “Force Mains” and CCU Specification Section# 002340 “Valves”.

#### 2.3.3.2 Approved Products:

The following aluminum clean-out coupler with cap and chain manufacturer is approved:

- ▶ Kamlock

### 2.3.4 Water Service

The contractor shall provide a water service as shown on the engineering drawings and CCU standard details. The service shall include the labor and materials for the tap at the water main source, polyethylene piping, meter box, fittings, backflow prevention device, spigot, mounting brackets and connectors, etc. CCU will provide and install the water meter.

A separate water service is required for the odor control.

### 2.3.5 Fence and Gates

The contractor shall provide and install fence and double eight (8) foot gates (total sixteen (16) foot width) with hold-backs, and wheels in accordance with the engineering drawings and CCU standard details. All the fencing and gate components shall be adequate to meet the required wind resistance loading.

### 2.3.6 Driveways

The contractor shall construct a sixteen (16) foot minimum concrete driveway as shown on the engineering drawings and CCU standard details and CCCDED Specifications. The driveway shall include right-of-way culverts, if required, and drainage shall be in accordance with Charlotte County Building Department specifications.

### 2.3.7 Landscaping

The contractor shall provide landscaping, if required, in accordance with CCU Specification Section 002920 “Landscaping”.

## **PART 3 - EXECUTION**

### **3.1 GENERAL**

- a. The contractor shall prepare the standard lift station site for construction. This shall include the establishing of maintenance of traffic, surveying, site clearing, installation of silt fence, exposure of existing underground utilities, and notification of residences that may be impacted by the construction. The standard lift station wetwell and concrete cover and slab, valves, piping, pump/motor assemblies and rails, MCC, water service(s), electrical wiring/conduit, pad, fencing and gates, access panel and frame, driveway/culverts, optional equipment, and accessories shall be installed in accordance with the contract documents.
- b. Installation shall be made by skilled and licensed technicians and coordinated with other trades as necessary.
- c. The standard lift station receives wastewater flows continuously at varying rates and the level of the flow in the wet well is monitored by liquid level sensors. The wet well liquid level sensors shall be suspended at various levels in the wet well and transmit the level of the wastewater in the wet well directly to the MCC. The level sensors shall be set for the following conditions in coordination with CCU operational personnel:
  - ▶ Pump off
  - ▶ Pump on
  - ▶ Lag pump on
  - ▶ High liquid level alarm
- d. The MCC is an integrated system. The contractor shall furnish and install the MCC as one complete package to include all equipment and appurtenances regardless of the manufacturer and shall be responsible for the MCC to perform as a fully integrated operable system.

The MCC shall be designed to provide the following functions:

- ▶ Turns pump off
- ▶ Turns pump on
- ▶ Turns lag pump on
- ▶ Provides for alternate pumps operation
- ▶ Activates the audio and visual alarms in the event of high liquid wet well levels
- ▶ Activates the battery backup high liquid level alarm in event of power loss and resets the alarm when the power is restored
- ▶ Allows for the manual connection to a portable generator
- ▶ Provides phase monitoring and protection
- ▶ Monitor and indicates pump seal failures

~~If a TCU is required, the applicable MCC functions shall be transferred to the TCU/PLC unit to control as outlined in the TCU section.~~

~~e. The TCU shall be designed to provide the following functions:~~

- ~~▶ Lead/Lag: One pump operates as the lead or in-service pump and one acts as the lag or backup pump. The PLC alternates the lead and lag pump at operator settable intervals as required.~~
- ~~▶ Monitors lift station operational status and notifies County Central Control of normal and abnormal operations such as, but not limited to: status of power, generator operations, pump trip, high/low alarm levels in the wet well discharge flow, and records pump run time and pump starts.~~
- ~~▶ Pump on, Pump off~~
- ~~▶ High level, Low level~~
- ~~▶ Phase Voltage~~
- ~~▶ Liquid Level Control Sequence~~

~~Refer to CCU standard details for the complete list of the functions~~

- f. The contractor shall coordinate the work of all of the sub-contractors, suppliers, manufacturers, etc. for the complete installation, integration, interconnection, testing, calibration, and startup of the instruments, sensors, controls, and related accessories.
- g. The contractor shall provide for all temporary utilities and services required for his operations including but not limited to electrical power, water, sanitary facilities, etc. The contractor shall furnish, install, and maintain all temporary utilities and services during the contract period including removal and restoration of disturbed areas upon completion of the work. Such facilities shall comply with regulations and requirements of the National Electrical Code, OSHA, Florida Power and Light, and applicable Federal, State, and Local codes, rules, regulations and in accordance with CCU Specification Section 009910 – Sanitary Sewer System Rehabilitation.
- h. The contractor shall be prepared to maintain wastewater flow as a part of his operations and provide all pumps, piping, and other equipment to accomplish this task, perform all construction, obtain all permits, pay all costs, and perform complete restoration of all existing facilities to equal or better condition to the satisfaction of CCU in accordance with CCU Specification Section 009910 – Sanitary Sewer System Rehabilitation.

## 3.2 INSTALLATION

- a. Grounding rods shall be provided to adequately and independently ground the MCC, standby generator, TCU, and odor control in accordance with the contract documents. A grounding loop with a single ground rod may be substituted if approved by CCU.

- b. The contractor shall connect the biofilter unit to the lift station water supply in accordance with the engineering drawings.
- c. All wire ends shall be identified with wire markers at both ends.
- d. All instrumentation wiring shall be shielded from a continuous source to destination and shall be grounded in accordance with the manufacture's recommendation.

### **3.3 BEDDING, BACKFILL, AND COMPACTION**

- a. All bedding, backfill and compaction shall meet the requirements of CCU Standard details and CCCDED specifications.

### **3.4 CALIBRATION**

The contractor shall ensure the following:

- a. The instruments shall be calibrated by the manufacturer in accordance with the contract documents.
- b. A calibration sticker noting the date, calibration data and the technician's initials shall be affixed to the instrument. A calibration data sheet and log shall be prepared for CCU.

### **3.5 TESTING**

- a. The contractor shall not initially energize the equipment without the approval of CCU.
- b. After installation and calibration, the contractor shall functionally test the major equipment and electrical components to verify their compliance with the manufacturers recommended specifications and the contract documents.
- c. The contractor shall not activate or turn on any equipment until each control circuit has been red-lined for completeness and functionality and safety interlocks are tested.
- d. The contractor shall document site testing activities by written test procedures and a testing log shall be maintained at the project site or given to CCU.
- e. Wet well and valve vault exfiltration test shall consist of plugging all inlets and outlets, filling the wet well or valve vault with water to the rim of the structure, and letting the water remain for 24 hours. The water level is returned to the top of the rim and let stand for two (2) hours. No leakage shall be allowed for the test to pass.

### **3.6 STARTUP OPERATIONS**

- a. The system integrator/supplier shall provide equipment startup services for the project.
- b. The system integrator/supplier shall be responsible for providing factory trained representatives for the startup of equipment requiring factory assistance during startup.

- c. The system integrator/supplier shall coordinate with CCU to assist with the startup activities and provide necessary training of CCU personnel in the operation and maintenance of the system.
- d. Upon construction installation of CCU -maintained sewer lift stations, startup operations and testing shall be conducted prior to final acceptance and release of sewer flows under the supervision of the CCU Engineering Department. At a minimum, a representative of the pump Supplier, a representative of the Contractor, and a representative of CCU-Wastewater Resources Department's Lift Station Maintenance Division will be present for startup testing. A "CCU Lift Station Startup Check List", as provided in CCU Standard Details, shall be completed and signed off in entirety before a facility shall be accepted by CCU.

### **3.7 SPARE PARTS**

Per each lift station, the Contractor shall provide on or before final inspection:

- a. one spare submersible pump identical to the one(s) being placed

Plus the following additional items:

- b. two seal assemblies: top and bottom at impeller and at winding of motor
- c. bearings: one complete set of bearings for each pump
- d. O-ring and gasket kit for pump motor and impeller housing

In addition, the contractor shall provide level switches, one additional float (normally open type) with 50-ft of cable.

### **3.8 TECHNICAL MANUALS**

- a. The contractor shall provide operation and maintenance data in the form of an instructional manual. The manual shall be in a three ring binder and be arranged in sections and include a table of contents. The manual shall include appropriate drawings, schematics, pictures, sketches, specifications, flow diagrams, manufacturer's documents, etc. required to operate and maintain the individual standard lift station functions and the overall standard lift station as a system.
- b. Two (2) copies of the O&M manuals shall be made available to CCU 30 days prior to the standard lift station start-up for review prior to start up. Upon CCU validation, the contractor shall provide two (2) hard copies and one electronic copy of the approved O&M manuals including copies of certified tests and inspection data.

**END OF SECTION**