

**Northwest Sewer Extension  
City of Hickory**

**ADDENDUM NO. 2**

September 9, 2026



Freese and Nichols, Inc  
North Carolina Registered Firm C-3916

**BID DATE:** Tuesday, September 15, 2026, 2:00 p.m.  
**TO:** Prospective Bidders and Other Plan Holders

***The following additions, deletions, modifications, or clarifications shall be made to the appropriate sections of the plans and specifications and shall become a part of the Contract Documents. Bidders shall acknowledge receipt of this Addendum in the space provided on the Bid form.***

**BIDDING AND CONTRACT REQUIREMENTS:**

None

**TECHNICAL SPECIFICATIONS:**

**Section 09 96 01 Concrete Protective Coatings**

- A2-1 Delete Paragraph 1.06 A and replace with the following:  
"A. The coating manufacturer must issue a 10-year warranty to the Owner for the coating materials and performance of the coatings applied from the date of final acceptance of the project. Coatings manufacturer's written warranty must be submitted and accepted by the Owner at the time of submittals. Within a reasonable time after receipt of written notice thereof, repair defects in materials which may develop during said 10-year period, and any damage to other work caused by such defects or the repairing of same, at his own expense and without cost to the Owner. If the manufacturer's standard warranty does not extend to 10 years, manufacturer will provide documentation of extended warranty."

**Section 26 36 23 Automatic Transfer Switches**

- A2-2 Delete Section 26 36 23 Automatic Transfer Switches in its entirety and replaced with the revised Section 26 36 23 Automatic Transfer Switches located in Attachment 1.

Section 44 42 56.04 Submersible Wastewater Pumps

A2-3 Delete Section 44 42 56.04 Submersible Wastewater Pumps in its entirety and replaced with the revised Section 44 42 56.04 Submersible Wastewater Pumps located in Attachment 2.

**DRAWINGS:**

None

**CONTRACTOR'S QUESTIONS:**

None

**ATTACHMENTS:**

- 1 Section 26 36 23 Automatic Transfer Switches
- 2 Section 44 42 56.04 Submersible Wastewater Pumps

**END OF ADDENDUM NO. 2**

## **Attachment 1**

### **Section 26 36 23 Automatic Transfer Switches**

## **26 36 23      AUTOMATIC TRANSFER SWITCHES**

### **1.00      GENERAL**

#### **1.01      WORK INCLUDED**

- A. Furnish labor, materials, equipment and incidentals necessary to install a transfer switch. Electrical work shall be in accordance with Section 26 05 00 "Common Work Results for Electrical."

#### **1.02      QUALITY ASSURANCE**

- A. Work shall be performed in accordance with quality commercial practices. The appearance of the finished work shall be of equal importance with its operation. Materials and equipment shall be installed based upon the actual dimensions and conditions at the project site. Locations for materials requiring an exact fit shall be measured.
- B. Obtain automatic transfer switch, remote annunciator and control panels through one source from a single manufacturer. Acceptable manufacturers are:
  - 1. Emerson; ASCO Power Technologies.
  - 2. GE Zenith Controls.
  - 3. Russelectric, Inc.

#### **1.03      SUBMITTALS**

- A. Submittals shall be in accordance with Section 01 33 00 "Submittal Procedures" and shall include:
  - 1. Shop Drawings: Dimensioned plans, elevation, section and details showing minimum clearances, conductor entry provisions, gutter space, installed features and devices and material lists for each switch.
  - 2. Field Quality-Control Test Reports.
    - a. Test data showing it can withstand fault currents of the magnitude and duration necessary to maintain the system integrity.
    - b. A dielectric test at the conclusion of the closing tests shall be performed.
  - 3. Operation and Maintenance Data: For each type of product to include:
    - a. Features and operating sequences, both automatic and manual.
    - b. List of all factory settings of relays; provide relay-setting and calibration instructions, including software where applicable.

#### **1.04      STANDARDS**

- A. The applicable provisions of the following standard shall apply as if written here in its entirety:
  - 1. National Electrical Manufacturer Association (NEMA) Standards:

|             |                              |
|-------------|------------------------------|
| NEMA ICS 10 | AC Transfer Switch Equipment |
|-------------|------------------------------|

2. National Fire Protection Association (NFPA) Standards:

|          |                                     |
|----------|-------------------------------------|
| NFPA 70  | National Electric Code              |
| NFPA 110 | Emergency and Standby Power Systems |

3. Underwriters Laboratories (UL) Standards:

|                      |                              |
|----------------------|------------------------------|
| UL Bulletin No. 1008 | Transfer Switches, Automatic |
|----------------------|------------------------------|

2.00 PRODUCTS

2.01 TRANSFER SWITCH

- A. Transfer switch shall combine all functions of an automatic transfer switch, a method for bypassing power from the live source to the load in the event the transfer switch is disabled, and a method for isolating the automatic transfer switch for servicing while the switch is in use. The switch shall be four-pole, rated for 480 V and be able to withstand and close into a fault current of 35,000 RMS symmetrical amps without any damage or contact welding according to UL-1008.
- B. The complete automatic load transfer control shall be rated for continuous duty and for all classes of load.
- C. Transfer switch shall be service rated for use as a service entrance.
  - 1. ~~The bypass handle shall have three positions: Normal; bypass to normal source; and bypass to emergency source.~~
  - 2. ~~The isolate handle shall have two positions: Normal; and isolated.~~
- ~~D. The switch shall provide a safe and convenient means for manually bypassing and isolating the automatic transfer switch (ATS) for maintenance or repair. Operation of the bypass isolation switch shall be assured regardless of the position of the ATS. Indicating lights shall be provided to show the bypass isolation switch in the bypass position, and in the fully isolated position. Positive sequencing of all contacts, with no possible intermediate position shall be accomplished through the manual operators from a dead front location.~~
- ~~E. Testing during maintenance of the ATS for normal electrical operation shall be possible with the bypass handle in the bypass position and the isolating handle in the normal position. Inherent double throw (break before make) operation shall provide positive assurance against accidental short-circuiting of the normal and emergency power sources. Arrangements utilizing interlocking of single throw devices are not acceptable. The operating speed of the contacts shall be independent upon electrical operators, relays, or interlocks for operation.~~
- ~~F. The main contacts and operating linkage shall be identical to the ATS except that the operation shall be manual. The switch shall have the same electrical ratings of ampacity, voltage, short circuit withstand, and temperature rise capability as the associated ATS, and shall be the load break type rated to interrupt the rated current of the switch. Inspection and replacement of the contacts shall be possible from the front of the panel without removal of the switch from its enclosure. The main contacts shall be mechanically locked in~~

- ~~both the normal and bypass positions without the use of hooks, latches, magnets, or springs, and shall be silver tungsten alloy protected by arcing contacts with magnetic blowouts on each pole. The switching mechanism shall provide "quick make" and "quick break" operation of the contacts.~~
- ~~G. Necessary controls shall be provided to assure that the engine run circuit remains closed when the switch is in the bypass to emergency position, even though the associated transfer switch is in the normal position or completely removed from the enclosure.~~
  - H. The transfer switch shall be double throw, actuated by a single electrical operator, momentarily energized, and connected to the transfer mechanism by a simple overcenter type linkage with a total transfer time not to exceed 1/2 second. The transfer switch shall be capable of transferring successfully in either direction with 70 percent of rated voltage applied to the switch terminals.
  - I. The normal and emergency contacts shall be positively interlocked mechanically and electrically to prevent simultaneous closing. Main contacts shall be mechanically locked in position in both the normal and emergency positions without the use of hooks, latches, magnets or springs; and shall be silver-tungsten alloy. Separate arching contacts with magnetic blowouts shall be provided on transfer switches. Interlocked molded case circuit breakers or contactors are not acceptable.
  - J. The transfer switch shall be equipped with a safe manual operator designed to prevent injury to operating personnel. The manual operator shall provide the same contact-to-contact transfer speed as the electrical operator to prevent a flashover from switching the main contacts slowly. Main contacts shall be capable of carrying the rated current of the switch continuously and shall be capable of opening at the switch's rated current.
  - K. Engine starting contacts shall be provided to start the generating plant should the voltage of the normal source drop below 70 percent on any of the two phases, or 80 percent on the third phase, after a non-adjustable time delay of 3 seconds to allow for momentary dips. The transfer switch shall transfer to emergency when 90 percent of rated voltage and frequency has been reached. After restoration of normal power on all phases to 90 percent of rated voltage, an adjustable time delay period of 0 to 30 minutes shall delay retransfer to allow stabilization of normal power. If the emergency power source should fail during this time delay period, the switch shall automatically return to the normal source.
  - L. After retransfer to normal, the engine-generator shall be allowed to operate at no load for an adjustable period of time (0 to 5 minutes) for cool-down of engine generator. A test switch shall be included to simulate normal power failure, and pilot lights shall be mounted on the cabinet door to indicate the switch position. Two auxiliary contacts rated 25 amps, 120 volts, shall be mounted on the main shaft; one closed on normal, the other closed on emergency. In addition, one set of relay contacts shall be provided to open upon loss of the normal power supply. Relays, timer control wiring and accessories shall be front accessible. Control wire terminations shall be identified by tubular sleeve-type markers.
  - M. Neutral Connection: Where four-pole switches are indicated, provide neutral pole switched simultaneously with phase poles.
  - N. The transfer switch shall be equipped with a microprocessor-based control panel. The control panel shall perform the operational and display functions of the transfer switch. The display functions of the control panel shall include ATS position and source availability.

- O. The transfer switch shall be capable of detecting if the source switch was successful and if the pump station is receiving power. It shall also be capable of transmitting a failure signal if it was not successful in switching sources and the pump station is not receiving power.
- P. The automatic transfer switch manufacture shall certify sufficient arc interrupting capabilities for 50 cycles of operation between a normal and emergency source that are 120 degrees out of phase at 480 volts, 600% of rated current at 0.50 power factor. This certification is to ensure that there will be no current flow between the two isolated sources during switching.
- Q. If the engine generator should fail while carrying load, retransfer to the normal source shall be made instantaneously upon restoration of proper voltage (90%) on the normal source.
- R. The contact structure shall consist of a main current carrying contact, which is a silver alloy with a minimum of 50% silver content. The current carrying contacts shall be protected by silver tungsten arcing contacts on all sizing above 400 amps.
- S. All relays shall be continuous duty industrial type with wiping contacts. Customer interface contacts shall be rated 10 amperes minimum. Coils, fuses, relays, timers and accessories shall be readily front accessible. The control panel and power section shall be interconnected with a harness and keyed disconnect plugs for maintenance.
- T. Main and arcing contacts shall be visible without major disassembly to facilitate inspection and maintenance.
- U. A manual handle shall be provided for maintenance purpose with the switch de-energized. An operator disconnect switch shall be provided to defeat automatic operation during maintenance, inspection, or manual operation.
- V. The switch shall be mounted in a NEMA 3R or NEMA 4X enclosure unless otherwise indicated on the plans.

## 2.02 AUTOMATIC TRANSFER SWITCH FEATURES

- A. Undervoltage Sensing for each Phase of Normal Source: Sense low phase-to-ground voltage on each phase. Pickup voltage shall be adjustable from 85 to 100 percent of nominal, and dropout voltage shall be adjustable from 75 to 98 percent of pickup value. Factory set for pickup at 90 percent and dropout at 85 percent.
- B. Adjustable Time Delay: For override of normal-source voltage sensing to delay transfer and engine start signals. Adjustable from zero to 6 seconds and factory set for 1 second.
- C. Voltage/Frequency Lockout Relay: Prevent premature transfer to generator. Pickup voltage shall be adjustable from 85 to 100 percent of nominal. Factory set for pickup at 90 percent. Pickup frequency shall be adjustable from 90 to 100 percent of nominal with a factory set for pickup at 95 percent.
- D. Time Delay for Retransfer to Primary Source, adjustable from 0 to 30 minutes, and factory set for 10 minutes to automatically defeat relay on loss of voltage or sustained under-voltage of emergency source, provided normal supply has been restored.
- E. Test Switch: Simulate normal source failure.
- F. Source Available Indicating Lights: Green light engrave "Normal Source Available" and red light engraved "Emergency Source Available."

- G. Switch-Position Pilot Light: Indicate source to which load is connected.
- H. Unassigned Auxiliary Contacts: Two Normally Open and Two Normally Closed contacts for each switch rated 10 A at 240 VAC.
- I. Generator Starting Contacts: One isolated and normally closed, and one isolated and normally open contact; rated 10 A at 32 VDC minimum.
- J. The front panel display shall include indicators for timing functions, capability to bypass the time delay on transfer or retransfer, and an ATS test switch and afford on-board diagnostic capability.
- K. The control panel shall be provided with calibrated pots (accessible only by first opening the lockable cabinet door) to set time delays, voltage and frequency sensors. Designs which make use of DIP switches to render such adjustments are not acceptable. The ATS shall be capable of being adjusted while the controls are energized and the unit in automatic mode. Designs which force a "programming mode" or require the controls be de-energized during adjustment are unacceptable.
- L. The control panel shall be opto-isolated from its inputs to reduce susceptibility to electrical noise and provided with the following inherent control functions and capabilities:
  - 1. An LED Display for continuous monitoring of the ATS functions.
  - 2. Built-in diagnostic display.
  - 3. Capability to support external communication and network interface through an optional RS 485 port.
  - 4. Mechanical test switch to simulate a normal source failure.
  - 5. Time delay to override momentary normal source failure prior to engine start. Field programmable 0-10 minutes (continuously adjustable via a calibrated potentiometer factory set at 3 minutes)
  - 6. Time delay on retransfer to normal source, continuously adjustable 0-30 minutes, factory set at 15 minutes. If the emergency source fails during the retransfer time delay, the transfer switch controls shall automatically bypass the time delay and immediately retransfer to the normal position.
  - 7. Time delay on transfer to emergency, continuously adjustable 0-15 minute, factory set at 1 minute.
  - 8. An in-phase monitor shall be provided. The monitor shall compare the phase angle difference between the normal and emergency sources and be programmed to anticipate the zero crossing point to minimize switching transients.
  - 9. An interval-type automatic clock exerciser shall be incorporated within the microprocessor.
  - 10. Provide a momentary pushbutton to bypass the time delays on transfer and retransfer.

### **3.00 EXECUTION**

#### **3.01 INSTALLATION**

- A. Make electrical connections to specified equipment. Install equipment in accordance with the Manufacturer's recommendations and the plans. If neither is available, install the equipment using recognized practices of the electrical industry.
  - 1. Mounting: Each switch shall be mounted on equipment rack, anchored by bolting. Provide 4-inch high concrete base, reinforced with chamfered edges. Extend base 4 inches in all directions beyond the maximum dimensions of the switch, unless indicated otherwise.
  - 2. Set field adjustable intervals, delays, and relays.

### 3.02 CONNECTIONS

- A. Wiring to Remote Components: Match type and number of cables and conductors to control and communication requirements of transfer switches as recommended by manufacturer. Increase raceway sizes at no additional cost to the Owner if necessary to accommodate required wiring.

### 3.03 FIELD QUALITY CONTROL

- A. Upon completion of the installation, perform continuity tests and functional checkout to assure the proper operation of equipment.
- B. Manufacturer's Field Service: Engage a factory-authorized service representative to inspect, test and adjust components, assemblies, and equipment installations, including connections. Report results in writing.
- C. Perform tests and inspections and prepare test reports.
  - 1. After installing equipment and after electric circuitry has been energized, test for compliance with requirements.
  - 2. Perform each visual and mechanical inspection and electrical test stated in NETA Acceptance Testing Specification. Comply with test parameters.
  - 3. Measure insulation resistance phase-to phase and phase-to-ground with insulation-resistance tester. Include external annunciation and control circuits. Use test voltages and procedure recommended by manufacturer. Comply with manufacturer's specified minimum resistance.
    - a. Check for electrical continuity of circuits and for short circuits.
    - b. Inspect for physical damage, proper installation and connection, and integrity of barriers, covers and safety features.
    - c. Verify manual transfer warnings are properly placed.
    - d. Perform manual transfer operation.
  - 4. At a minimum, the main power supply from the commercial power grid shall be cut and the switch shall automatically properly transfer the power feed to the standby generator.
  - 5. After energizing circuits, demonstrate interlocking sequence and operational function for each switch at least three times.

**END OF SECTION**

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## **Attachment 2**

### **Section 44 42 56.04 Submersible Wastewater Pumps**

## **44 42 56.04 SUBMERSIBLE WASTEWATER PUMPS**

### **1.00 GENERAL**

#### **1.01 WORK INCLUDED**

- A. Furnish labor, materials, equipment and incidentals necessary to install 2 new submersible sewage pumps as indicated on the plans. Coordinate wet well access doors with the slide rails. Test equipment in accordance with Paragraph 1.02 of this Section.
- B. The pump supplier shall furnish pump discharge elbows, guiderails, brackets, anchor bolts and anchor bolt layouts and bases, lifting chains and gripping systems, and power cables.
- C. Provide safety grate at each of the access doors to the wet well at the lift station. Verify actual size of the access doors. Installation of the safety grate shall be in accordance with the manufacturer's recommendations and the manufacturer shall provide an Equipment Installation Report certifying that it was installed properly. The manufacturer shall furnish brackets, anchor bolts and anchor bolt layouts and appurtenances required for the installation of the safety grate.

#### **1.02 QUALITY ASSURANCE**

- A. Acceptable Manufacturers:
  - 1. KSB.
  - 2. Fairbanks Nijuis.
  - 3. Wilo.
  - 4. Hydromatic.
  - 5. Pre-approved equal.
- B. Manufacturer's Representative for Startup and Testing: The services of the Manufacturer's technical representative shall be provided for pre-startup installation checks, startup assistance, training of Owner's operating personnel, troubleshooting and other services as required by the Owner and Section 01 75 00 "Starting and Adjusting."
- C. The pump supplier shall also provide all of the maintenance required for the first year of operation including the following as a minimum:
  - 1. After 60 days operation, run each pump and record voltage and amperage, pull each pump, open the volute and examine the condition of the volute, impeller, and wear rings. Check condition of oil in seal chambers and condition of coating system on motor housing. Inspect the condition of the seal failure system by ohming the circuit. Check the cable and motor insulation condition by Polarization Index (megger reading ratio 10-minute/1-minute). Perform any necessary repair under terms of the warranty. Prepare a field service report.
  - 2. After 12 months operation, repeat procedure described above for 60 days. Change oil in the seal chambers.
- D. Testing:

1. Each pump and motor shall be performance tested at the factory. All pumps shall be tested with motor cables to be supplied with the pumps. Three copies of certified test reports, including actual test records, shall be submitted and approved by the Engineer prior to shipment of the equipment.
2. Each pump shall be tested for performance at the factory to determine the head vs. capacity, and motor input power for the full speed at which the pumps are specified and shown on a certified performance test curve as continuous functions throughout the pump's performance range. Tests of models, prototypes or similar units will not be acceptable. All tests shall be run in accordance with the test code for centrifugal pumps of the Standards of Hydraulic Institute, latest edition. Performance test Acceptance Grade: 1U. The motor and cable on each pump shall be tested for moisture content or insulation defects. After the test, the pump cable end shall be fitted with a shrink-fit rubber boot to protect it from moisture or water.

### 1.03 SUBMITTALS

- A. Submittals shall be in accordance with Section 01 33 00 "Submittal Procedures" and shall include:
  1. Shop Drawings:
    - a. Shop drawings shall include a complete description of the equipment offered including control and mounting system. Shop drawings shall include catalog cuts and pertinent engineering data required to fully evaluate the equipment. Characteristic curves shall be submitted with the shop drawings showing the capacity, head, efficiency, and brake horsepower throughout the full operating range of the pump. Complete specifications on the control equipment including a list of optional features shall be submitted with the shop drawings. Submittal data shall be in such form and so presented that the Engineer may readily review the data.
    - b. The Equipment Manufacturer shall submit with the shop drawings a list of 20 similar installations in North Carolina which have been in satisfactory operation for at least two years. Shop drawings not including this required information will not be accepted. Also, manufacturer must furnish evidence of having an authorized fully staffed and stocked service facility within 100-mile radius of the jobsite as well as having 24-hour parts availability.
    - c. Data sheets supplying the following information for the pumping units shall be submitted with the shop drawings.

1). Pump:

|                          |         |
|--------------------------|---------|
| Make and type of pump    |         |
| Speed                    | ___ rpm |
| Horsepower at rated head | ___ HP  |

2). Pump:

|                                       |         |
|---------------------------------------|---------|
| Total weight (pump and motor)         | ___ lb. |
| Rated capacity and head on pump curve |         |

3). Motor:

|                                                              |           |
|--------------------------------------------------------------|-----------|
| Make and type of motor                                       |           |
| Brake horsepower of motor                                    | ___ HP    |
| Locked Rotor Current at full nameplate voltage               | ___ amps  |
| Motor Voltage Phase                                          | ___ phase |
| Motor service factor                                         |           |
| Insulation class and temperature rise at service factor load |           |

- d. Shop drawings shall be supplied to insure successful installation and operation of the control system and shall consist of all of the following:

- 1). Sufficient detail to evaluate compliance with these specifications.
- 2). A detailed component list including manufacturer and catalog number.
- 3). A custom wiring diagram for this specific application to facilitate and insure accurate field connections to the control panel by electrical installation personnel.
- 4). A description of operation for the control system.
- 5). An enclosure dimension print.

2. Operation and Maintenance Manuals:

- a. Manuals shall be prepared by the equipment Manufacturer and shall incorporate storage and installation instructions and operation and maintenance procedures, appropriate final certified shop drawings, performance curves, and test data. Manuals may be Manufacturer's standard instructions, but shall be supplemented as necessary to cover any special feature not included in standard material. Manuals shall be in accordance with Section 01 33 04 "Operation and Maintenance Data." Submit preliminary manuals for review prior to delivery of the equipment.

1.04 STANDARDS

- A. The applicable provisions of the following standards (latest edition unless otherwise indicated) apply as if written here in their entirety:

1. American Water Works Association (AWWA):

|           |                              |
|-----------|------------------------------|
| AWWA C210 | Liquid Epoxy Coating Systems |
|-----------|------------------------------|

2. American National Standards Institute (ANSI):

|            |                                     |
|------------|-------------------------------------|
| ANSI B16.1 | Cast Iron Pipe Flanges and Fittings |
|------------|-------------------------------------|

3. ASTM International (ASTM):

|           |                                                                                                          |
|-----------|----------------------------------------------------------------------------------------------------------|
| ASTM A48  | Standard Specification for Gray Iron Castings                                                            |
| ASTM A479 | Standard Specification for Stainless Steel Bars and Shapes for Use in Boilers and Other Pressure Vessels |
| ASTM A532 | Standard Specification for Abrasion-Resistant Cast Irons                                                 |
| ASTM A536 | Standard Specification for Ductile Iron Castings                                                         |

|           |                                                                |
|-----------|----------------------------------------------------------------|
| ASTM A582 | Standard Specification for Free-Machining Stainless Steel Bars |
|-----------|----------------------------------------------------------------|

4. American Iron and Steel Institute (AISI) Steel Designations.
5. Hydraulic Institute Standards (ANSI/HI):
  - a. All applicable sections for Centrifugal and Rotodynamic Pumps.
6. National Electrical Manufacturers Association (NEMA).
7. National Electric Code (NEC).
8. Institute of Electrical and Electronic Engineers (IEEE).
9. Underwriters Laboratories (UL).
10. International Standards Organization (ISO):

|               |                                           |
|---------------|-------------------------------------------|
| ISO 9001:2015 | Quality Management systems – Requirements |
|---------------|-------------------------------------------|

#### 1.05 DESIGN CONDITIONS

- A. The pumps shall be designed to handle raw unscreened sewage on a continuous duty basis and shall be capable of passing a 3-inch non-compressible sphere. Pumps shall be guaranteed free from excessive cavitation and/or vibration throughout the system performance range. The pumps shall meet the operating conditions as specified and shall be designed to operate on a continuous duty basis. Design conditions for the pumps at each lift station shall be as specified.
- B. The presence of abrasives, rags, large solids and stringy materials shall not be considered as abnormal, unanticipated or abusive with regard to the equipment operation or warranty.
- C. Pump manufacturer must review pump station configuration and make comments prior to bid on any design modifications required to the wet well to accommodate the supplied pumps dimensionally and hydraulically.

#### 1.06 DELIVERY AND STORAGE

- A. The Vendor shall be responsible for delivery of the pump, motor, and accessories, f.o.b. to the job site or to such storage site as may be designated by the Owner or Construction Contractor, in good condition and undamaged.
- B. Unloading and storage of the equipment shall be the responsibility of the Construction Contractor who shall inspect the equipment for apparent damage. Equipment which is found to be damaged shall not be accepted until properly repaired or replaced by the Vendor.
- C. The pumps, motors, and accessories shall be stored indoors. When this equipment is stored indoors, it shall never be in direct sunlight and the indoor temperature shall be maintained at a level satisfactory to the Owner. The Contractor is responsible for providing the indoor storage facility or enclosure.

#### 1.07 WARRANTY

- A. Guarantee: The equipment supplier shall furnish a warranty for all equipment provided by the equipment supplier for a period of 1 year from date of Owner's final inspection and

acceptance but not longer than 30 months from date of equipment delivery. All equipment shall be guaranteed against defects in material and workmanship to the effect that any defective equipment shall be repaired or replaced without cost or obligation to the Owner.

## **2.00 PRODUCTS**

### **2.01 SUBMERSIBLE SEWAGE PUMP**

- A. Each pump, motor, and cable assembly shall be furnished in one integral unit, factory assembled by the Pump Manufacturer. Pump shall be listed as explosion proof by Underwriter Laboratories (U.L.), Factory Mutual (FM), or by Canadian Standards Association (C.S.A.).
- B. The pump design shall be such that the pumping unit will be automatically and firmly connected to the discharge piping when lowered into place on its mating discharge connection. The discharge connection shall be permanently installed in the wet well. The pump shall be easily removable for inspection or service, requiring no bolts, nuts or other fastenings to be disconnected. The guide mechanism shall be a non-sparking design and U.L., FM, or C.S.A. listed. Connection and disconnection of the pumping unit from the discharge piping shall not require personnel to enter the wet well. Sealing of the pumping unit to the discharge connection elbow shall be accomplished by a simple linear downward motion of the pump. A sliding guide bracket shall be an integral part of the pump unit.
- C. The pump assembly shall also be capable of running dry or partially submerged for at least 15 minutes without any damage to the pump, motor, seals, or accessories.
- D. Major parts, such as the stator casing, oil casing, sliding bracket, volute, impeller, and base coupling shall be constructed of cast iron or bronze. Surfaces coming into contact with the pumped liquid shall be protected by a factory-applied epoxy coating or shall be stainless steel. External bolts, nuts, and fastening hardware shall be a minimum 300 series stainless steel.

### **2.02 PUMP CONSTRUCTION**

- A. Pump Volute: The pump volute shall be constructed of cast iron. A wear ring shall be provided in the volute which is constructed of 304 stainless steel with a minimum Brinell hardness of 300.
- B. Impeller: The impeller shall be constructed of cast iron and shall be of the enclosed, non-clogging, dynamically balanced, one-, two- or three-vane design capable of passing 3-inch diameter spherical solids. The impeller shall have a slip fit onto the motor shaft and drive key and shall be fastened using the manufacturer's standard technique. The impeller wear ring shall be 304 stainless steel, with a minimum Brinell hardness of 350.
- C. Shaft: The pump shaft shall be series 400 stainless steel. Carbon steel shafts or shafts with sleeves of any type are not acceptable. The shaft shall be one piece construction without joints or stubs attached. All shafts shall be dynamically balanced and shall be amply sized to minimize shaft deflection. Shaft overhang shall not exceed 2.5 times the shaft diameter.
- D. Mechanical Seals: Each pump shall be equipped with a double mechanical seal of the cartridge type or a balanced tandem-type design, running in an oil reservoir. The upper and

lower faces of the rotating portion of the seal shall be made of tungsten carbide or a high quality silicon carbide. The two faces shall be held in contact by multiple springs or bellows to insure uniform face following of the rotating faces against the stationary faces. The entire seal shall be mounted within the oil chamber. The lower stationary seal face shall be made of tungsten carbide or a high quality silicon carbide. The seals shall require neither routine maintenance, nor adjustment, and shall not be damaged when the pump is run dry. When required, seal oil inspection shall be achieved without disassembly of the pump. The seal shall not require the pumped liquid as a lubricant. All metal parts shall be 316 stainless steel.

- E. O-Rings and Fasteners: All mating surfaces of the pump and motor shall be machined and fitted with Viton or Buna-N O-rings where watertight sealing is required. Sealing shall be accomplished by the proper fitting of the parts and not be compression or special torque requirements. All external screws and fasteners shall be made of 316 stainless steel.
- F. Bearings: The impeller and motor shaft for each pump shall be suspended on two permanently lubricated ball bearings that are designed by the manufacturer for minimum 50,000-hour L10 bearing life under the design conditions. Maximum shaft runout at the mechanical seals shall not exceed 2 mils at any point in the operating head range.

## 2.03 MOTOR AND CABLE

- A. The motor shall be housed in either an air or oil filled chamber, watertight enclosure. The motor shall conform to NEMA design Class B, and incorporate minimum Class F insulation material to withstand a continuous operating temperature of 155 deg C (311 deg F). The pump and motor shall be capable of handling liquids with a maximum temperature of 40 deg C (104 deg F). The motor shall be capable of sustaining up to 10 evenly spaced starts per hour. The motor shall be capable of operating in dry or partially submerged conditions for at least 24 hours without damage. If the motor is expected to be exposed for longer than 15 minutes, furnish air filled motors with a water jacket if required. The nameplate motor service factor shall be at least 1.15. The motor shaft shall be 400 series stainless steel. The motors shall be 460-volt, 3-phase, 60-cycle. Lead wires shall be suitable for operation in oil. The motor shall be provided with Klaxon motor thermal switches embedded in the windings to protect the motor from burnout due to excessive heating. Inrush on starting shall be no more than allowed by NEC Code Letter F for motors 50 HP and larger, and no more than allowed by NEC Code Letter G for motors less than 50 HP. Each motor shall be suitable for use in a NEC Class 1, Division 1, Group D location and be FM, U.L. or C.S.A. listed.
- B. Motor shall be rated inverter duty for operation on a variable frequency drive and shall comply with NEMA MG-1. The Motor Manufacturer shall provide a letter certifying that the motor is compatible with the variable speed drive.
- C. The electrical cable entrance to the motor shall be provided with positive strain relief to prevent leakage or pullout of the cable in the event that a force is accidentally placed on the cable during the raising or lowering of the pump. The design of cable entry shall preclude specific torque requirements to insure a watertight and submersible seal. Cable entry shall consist of a single cylindrical elastomer or Buna-N grommet, flanked by stainless steel washers all having a close tolerance fit against the cable's outside diameter and the entry inside diameter and compressed by the body containing the strain relief function separate

from the function of sealing the cable. One spare set of cable seal accessories shall be provided. The entry cable system shall be warranted as described in Paragraph 1.06, Warranty.

- D. Incoming lead wires shall be spliced in the motor terminal housing. After splicing, the terminal housing shall be filled with epoxy to seal the outer cable jacket and the individual strands to prevent possibility of water entering the motor housing or the terminal housing. A secondary elastomer compression grommet shall also be supplied. The combination of the epoxy seal and compression grommet shall provide complete sealing and strain relief. Sufficient cable shall be supplied to extend from the motors to the pump control without splicing. Each pump shall be equipped with adequate cable to be routed from the termination junction box to the pump without any splices at a minimum. The power cable shall be sized according to NEC and ICEA standards and also meet P122-MSHA approval and this classification shall be embossed on the cable.
- E. Wire leads entering the junction box chamber and motor shall be separated by a terminal board, which shall isolate the interior from foreign material gaining access through the pump top. Alternately, the junction box chamber shall be sealed from the motor with a poured epoxy seal with bared conductor to prevent wicking. The assembly shall provide ease of changing the cable when necessary using the same entry seal. Sufficient cable shall be supplied to extend from the motors to the pump control without splicing. Each pump shall be equipped with adequate cable to be routed from the termination junction box to the pump without any splices at a minimum. The power cable shall be sized according to NEC and ICEA standards and also meet P122-MSHA approval and this classification shall be embossed on the cable. The cable entry junction chamber shall be isolated from the motor by a terminal board.
- F. The junction chamber, containing the terminal board, shall be sealed from the motor by elastomer compression seals (O-ring). Connection between the cable conductors and stator leads shall be made with threaded compressed type binding post permanently affixed to a terminal board each with an individual O-ring to prevent liquid passage.
- G. Each unit shall be provided with an adequately designed cooling system. Provision for external cooling and flushing shall also be provided, if the cooling system consists of a water jacket. Each unit shall have motor seal failure and temperature sensor(s).
- H. The motor, cable, and electrical controls shall be sized, furnished, and installed so that the motor shall never exceed the nameplate rating at any point on the pumping curve.
- I. Provide stainless steel cable strain relief on each cable at wet well roof slabs.
- J. Each unit should motor housing shall be provided with a moisture detection system provided by the motor manufacturer and per the manufacturer's requirements, complete with all sensors, control power transformer, intrinsically safe control modules, and relays. The moisture detection system shall be rated for a 120V AC supply. The moisture detection system shall provide two normally open dry output contacts rated 5 amps at 120 volts AC. The contacts shall close when moisture is detected in the motor housing and an alarm relay energized. The pump shall not be shut down. All moisture detection system components shall be furnished by the pump supplier and shall be shipped loose for installation into the motor controller enclosure, or if required to be mounted separately all components shall be mounted in a NEMA 4 stainless steel enclosure.

## 2.04 DISCHARGE ELBOW AND GUIDERAIL BASE

- A. A discharge elbow and guiderail base shall be provided for each pump and shall be permanently installed in the wet well. The discharge elbow and base must be epoxy coated ASTM A48 Class 35B Cast Iron or approved equal. Stainless steel anchor bolts embedded in concrete in accordance with pump manufacturer's layout and recommendations shall secure these connections.
- B. Series 316 Stainless steel anchor bolts embedded in concrete (pump station bottom slab) in accordance with pump manufacturer's layout and recommendations must secure these connections. Anchor bolts embedded only in the base's grout will not be accepted.

## 2.05 GUIDERAIL AND LIFTING CHAIN

- A. The guiderails and lifting chain positive recovery system shall be sized by the pump supplier. Guiderails and lifting chains shall be constructed of 316 stainless steel. Intermediate and upper guiderail brackets shall be provided by the pump supplier to achieve the arrangement shown on the Plans.
- B. Guiderails must be at minimum 2-inch diameter for pumps 2 through 40 HP and 3-inch diameter above 40 HP.
- C. The guiderails shall be continuous stainless steel designed to resist corrosion in sewage or sludge applications. Any joints in the rails shall be reinforced from within if pipe is used; continuously full-depth welded, ground smooth, and treated to resist corrosion. If pipe is used, it shall be minimum Schedule 40. The rail system shall be of adequate length to extend from the lower guide holders on the pump discharge connection to 6 inches below the top of the wet well. The system shall be mounted with series 300 stainless steel hardware.
- D. The guiderail support system shall be furnished by the Pump Manufacturer, to adequately support the guide (slide) rails. Intermediate guide rail supports shall be used every 10 feet. The system shall be mounted with stainless steel hardware.
- E. Each pump shall be fitted with a series 300 stainless steel chain of adequate strength and length to permit raising and lowering the pump for inspection or removal. A stainless steel cable is not an acceptable alternative to a lifting chain. The chain shall be long enough to extend from the pump in its operating position to 4 inches above the top of the wet well. Furnish and install a stainless steel hook at the top of the wet well to hold the chain when the pump is in service.
- F. Each pump shall be fitted with 3 feet of stainless steel chain of adequate strength to permit raising and lowering of the pump, and an adequate length of 1/4-inch diameter nylon rope or 1/8-inch stainless steel rope. The pump supplier shall provide a gripping system, which when lowered into position over the nylon rope, will automatically attach to the chain for lifting and automatically release the chain after lowering the pump back into position. The gripping system, pump chain, and associated hardware shall have a minimum capacity of 1-1/2 times the pump weight.

## 2.06 SLIDING COUPLING SYSTEM

- A. A sliding guide bracket shall be an integral part of the pumping unit or securely attached thereto. The guide bracket shall be designed such that no strain is placed on the pump or guide rails. The volute casing shall have a machined discharge flange to automatically and firmly connect with the discharge connection, which when bolted to the floor of the sump and discharge line, will receive the pump discharge connecting flange without the need of adjustment, fasteners, clamps or similar devices. Discharge base elbow and base plate shall be supplied by the Pump Manufacturer.
- B. The pump sliding coupling system shall be designed so that the downward force of the machined mating flanges shall shear away rags, hair, or other debris that would prevent a uniform watertight seal. No portion of the pump unit shall bear directly on the floor of the wet well. The pump body and slide coupling mating faces shall be bronze against cast iron.

## 2.07 ACCESS DOOR HATCHWAYS

- A. The access door hatchway shall be provided by the Contractor and shall be as specified in Section 08 31 19 "Floor Access Doors. Hinged and corrosion resistant access hatches with metal grate style fall protection for equipment and personnel shall be provided for all structures, shall be certified for traffic rated and sized appropriately. The pump manufacturer must verify that the proposed pumps will fit through the door opening and that the location of the doors will allow easy removal of each pump. The Contractor must provide the size doors specified if adequate or the size required if a larger size is required to remove the pumps from the wet well. The access cover must be provided with open assist-slow closure device and hold open device. The hatch must follow OSHA standards.

## 2.08 WET WELL FLOOR

- A. The wet well floor shall have a grout fillet with a minimum slope of one-to-one (1:1) toward a hopper bottom with the horizontal area of the bottom being no greater than necessary for proper installation and function of the pumps, per manufacturer's requirements.

## 2.09 SAFETY GRATE

- A. The safety grate shall be designed to withstand a minimum live load of 300 pounds per square foot using 17,300 psi as the design stress for the aluminum. Deflection shall not exceed 1/150th of the span. Each safety grate shall be designed to combine covering of the opening, fall through protection per OSHA standard 1910.23 and controlled confine space entry per OSHA standard 1910.146.
- B. Safety grate shall be as manufactured for Halliday, US Foundry, Bilco or approved equal.
- C. The safety grate shall be made of 6061-T6 aluminum and designed per the "Specifications for Aluminum Structures", by the Aluminum Association, Inc., 5th Edition, Dec. 1986 for "Bridge Type Structures." This specification requires the manufacturer to use 38,000 psi as the ultimate strength and 35,000 psi as the minimum yield strength, for grade 6061-T6 aluminum and then a safety factor of 2.2 be applied, leaving a 17,300 psi design stress.
- D. Grate openings shall allow for visual inspection, limited maintenance and float adjustments while the safety grate fall through protection is left in place.

- E. Grating design shall provide an opening for the pump power cable once the pump is pulled. This design allows the safety grate(s) to be closed after the pump is pulled, while leaving a space for the power cable.
- F. Design must assure that the fall through protection is in place before the doors can be closed.
- G. Each grate shall be provided with a permanent hinging system, which will lock the grate in the 90 degree position once opened.
- H. Each grate shall have an opening arm, which will allow opening of the grate, while providing the grate as a barrier between the operator and the pit. The opening arm shall also be equipped with a controlled confined space entry lock (lock provided by Owner). This locking device will prevent unauthorized entry to the confined space. The grating system will allow anyone to make visual inspection and float adjustments without entering the confined space.
- I. Each aluminum safety grate shall be coated with a safety orange color, promoting visual awareness of the hazard. Powder coat system shall be applied by the electrostatic spray process. The coating is a thermosetting, powder coat finish with a minimum thickness of 2 to 4 mils and shall be baked at 350 to 375 F, or as recommended by the manufacturer, until cured.
- J. Welding shall be in accordance with ANSI/AWS D1.2-90 Structural Welding Code for Aluminum.
- K. All mounting hardware, bolts, nuts, etc. shall be 316 stainless steel.

### **3.00 EXECUTION**

#### **3.01 INSTALLATION, START-UP, AND TESTING**

- A. Pump(s) and all appurtenances shall be installed in accordance with the Manufacturer's requirements to produce a finished product that is clean and demonstrates true craftsmanship. Any modification to the structure as a result of requiring different size access door hatchways is the responsibility of the Contractor.
- B. Contractor shall be fully responsible for installing all equipment in this section and conducting startup and testing in accordance with the equipment Manufacturer's written recommendations and/or requirements. The Contractor shall include in his costs all assistance required of the Manufacturer to: ensure proper installation; provide startup and testing assistance; and train the Owner's personnel.
- C. Following installation but prior to startup or testing, the Manufacturer shall send a representative to the job site to inspect the installation. Any deficiencies noted during the Manufacturer's inspection must be corrected prior to startup or testing. The manufacturer shall note his findings in a written Installation Deficiency Report to the Contractor, with a copy provided to the Engineer.
- D. The Contractor shall remedy the deficiencies noted by the Manufacturer in the Installation Deficiency Report. The Manufacturer shall re-inspect the installation and this process shall be repeated until the Manufacturer finds the equipment to be installed in accordance with its recommendations and requirements.

- E. Upon finding of satisfactory installation, and prior to startup or testing, the Manufacturer shall issue a Certificate of Proper Installation and provide a copy to the Engineer. Startup and testing may begin once the Engineer has received the Certificate of Proper Installation from the Manufacturer.

### 3.02 FIELD TESTING

- A. Pump(s) shall be field tested after installation to demonstrate operation without excessive noise, vibration, cavitation or over heating to the satisfaction of the Engineer. Field tests shall be conducted by the Manufacturer or his Authorized Representative. Field test shall include, but not be limited to, checking for correct rotation, correct operation at design point(s), maximum motor amperage draws within the nameplate specifications, balanced voltages on each power leg with the pump operating to within Manufacturers tolerances, ability of the pump to be raised from the wet well and lowered back into the seated position, and demonstrated compatibility of the pump/motor with the controls supplied. All tests shall be performed in the presence of the Engineer. Test results shall be in printed form and signed by the Manufacturer or his Representative and supplied to the Owner.
- B. If required, the Contractor shall make any changes necessary to assure satisfactory and efficient operation of the equipment being provided. These changes shall be done at the Contractor's own expense.

### 3.03 CERTIFICATION

- A. A Manufacturer's representative that is qualified in the particular equipment requirements shall fully inspect and certify the equipment installation. Written certifications shall be provided that state the equipment is installed properly, is operating within the design parameters, and will be warranted as required by the specifications.
- B. Install the pumps in strict accordance with Manufacturer's recommendations.

### 3.04 SHOP PAINTING

- A. Pumps, motors, baseplates, and discharge elbows shall be coated with a factory fusion bonded epoxy.

### 3.05 MANUFACTURER'S SERVICES

- A. Manufacturer's Representative: Present at Site or classroom designated by Owner, for minimum person-days listed below, travel time excluded:
  - 1. One trip, one 8-hour day for installation assistance and inspection.
  - 2. One trip, one 8-hour day for functional and performance testing and Owner training. Training shall not commence until an accepted detailed lesson plan for each training activity has been reviewed by Engineer.

### 3.06 FIELD QUALITY CONTROL

- A. Upon completion of installation of the equipment, an acceptance test to verify the satisfactory operation of each unit shall be conducted. The Contractor shall provide the services of authorized representative to conduct all field tests. The test shall be conducted

in a manner approved by and in the presence of the Engineer. The unit shall be checked for excessive noise, vibration, alignment, general operation, ease of removal, etc. All automatic and manual controls shall be tested to verify that they function in accordance with the requirements. Verify that drive equipment operates without being overloaded. The unit must perform in a manner acceptable to the Engineer before final acceptance will be made by the Owner.

### 3.07 SPARE PARTS

- A. ~~Pumps: one rotating assembly (impeller, key, nut, washer and mechanical seal) per pump & a spare impeller, key, nut, and washer of opposite rotation than assembly.~~
- B. One spare pump of the exact make and model of the two being installed shall be provided.

### 3.08 SCHEDULES

|                                                          | Industrial Park Lift Station                |
|----------------------------------------------------------|---------------------------------------------|
| Location                                                 | As indicated in Drawings                    |
| Equipment No.                                            | Pump 1 and Pump 2                           |
| Number of Units                                          | <del>Two</del> Three (2 installed, 1 spare) |
| Operating Point 1 (rated head)                           | 250 gpm @ 135-ft TDH                        |
| Operating Point 2 (maximum head)                         | -                                           |
| Operating Point 3 (minimum head)                         | -                                           |
| Minimum Shutoff Head                                     | 150-ft                                      |
| Maximum Speed                                            | 1,800 rpm                                   |
| Minimum Pump Speed (rpm)                                 | 70 percent of max. speed                    |
| Maximum Motor HP                                         | 35                                          |
| Minimum Pump Efficiency - Operating Point 1 (rated head) | <del>55%</del> 44%                          |
| Normal Operating Head Range                              | 110 – 140-ft                                |
| Minimum WSL                                              | 5 ft                                        |
| Minimum diameter of test sphere                          | 3-inch                                      |
| Maximum NPSHR at duty                                    | 10-ft                                       |
| Minimum pump discharge size                              | 4-inch                                      |