

**DOCUMENTS FOR THE CONSTRUCTION OF**



**WELCOME HOME**

**PROVO CITY CORPORATION**

**PROVO WATER CENTER**

**PLANT LIFT STATION**  
**VOLUME 1 - SPECIFICATIONS**

**FEBRUARY 2021**

**90% SUBMITTAL**

**ENGINEERS:**



**WATERWORKS**  
**E N G I N E E R S**



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## SECTION 01 13 00

### SPECIAL PROJECT CONSTRAINTS

#### PART 1 - GENERAL

##### 1.1 LIMIT OF CONSTRUCTION ACTIVITIES ON WORK SITE

###### A. Traffic Control:

1. During project construction, access to all plant areas will need to be maintained. The CONTRACTOR shall provide for alternate access routes, existing access routes, backfill trenches, or suitable steel plates (as necessary) to facilitate access to all plant areas.

##### 1.2 SEQUENCE OF WORK

###### A. General:

1. The CONTRACTOR shall schedule and sequence their work in order to complete the Work by the specified completion date.
2. The OWNER's water reclamation facility and sewer collections system must remain operational at all times.
3. Re-vegetation of graded areas shall take place as quickly as possible as weather permits.

##### 1.3 PROJECT CONSTRAINTS

###### A. Maintenance of OWNER's Operations:

1. Constraints listed herein involve limits on activities during construction. These limits relate to the critical nature of the existing water system.
2. Continuous operation of OWNER's facilities is of critical importance. Schedule and conduct activities to enable existing facilities to operate continuously, unless otherwise specified.
3. Work Plan:
  - a. The CONTRACTOR shall submit a detailed Work Plan and time schedule for all construction activities that will make it necessary to remove a tank, pipeline, electrical circuit, equipment, structure, road, or other facilities from service including the critical outages identified herein.
  - b. The Work Plan shall, at a minimum, identifying:
    - 1) the date and time when each activity will occur;
    - 2) what equipment will be present including standby equipment;
    - 3) what assistance will be required by OWNER's operating personnel;
    - 4) an emergency backup plan identifying what action will be taken if Work cannot be completed within the allotted time; and
    - 5) what individual will be in charge of the activity.
  - c. Submit Work Plan 10 days prior to the scheduled activity.
4. Perform Work continuously during critical connections and changeovers, and as required to prevent interruption of OWNER's operations.
5. Shutdowns:
  - a. Coordinate proposed Work with OWNER and facility operations personnel before affecting unit shutdowns. The CONTRACTOR shall provide written confirmation

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- of the shutdown date and time two (2) working days prior to the actual shutdown.
  - b. Under no circumstances shall the CONTRACTOR cease Work at the end of a normal working day or at the end of a working week if such actions may inadvertently cause a cessation of any facility operating process, in which case, remain onsite until necessary repairs are complete.
  - 6. Do not close lines, open valves or gates, shut down equipment, or take other action which would affect the operation of existing systems, except as specifically required by the Contract Documents and after approval of OWNER.
  - 7. Do not proceed with Work affecting a facility's operation without obtaining OWNER's advance approval of the need for and duration of such Work.
- B. Relocation of Existing Facilities:
- 1. During construction, it is expected that minor relocations of Work will be necessary.
  - 2. Provide complete relocation of existing structures and Underground Facilities, including piping, utilities, equipment, structures, electrical conduit wiring, electrical duct bank, and other necessary items.
  - 3. Use only new materials for relocated facility. Match materials of existing facility, unless otherwise shown or specified.
  - 4. Perform relocations to minimize downtime of existing facilities.
  - 5. Install new portions of existing facilities in their relocated position prior to removal of existing facilities, unless otherwise accepted by OWNER.
- C. Overtime:
- 1. Conduct Work outside regular working hours on prior written consent of OWNER to meet Project schedule and avoid undesirable conditions.
  - 2. All overtime Work by the CONTRACTOR necessary to conform to the requirements of this section and related sections shall be performed by the CONTRACTOR, at no cost to the OWNER and shall be performed in accordance with the General Conditions. The CONTRACTOR shall make no claims for extra compensation as a result thereof.

#### 1.4 SCHEDULED SHUTDOWNS AND CONSTRUCTION SEQUENCING CONSTRAINTS

- A. Scheduled Shutdowns:
- 1. The scheduled shutdowns during the period of the CONTRACTOR'S Work will be as shown in Table 01 13 00-A
  - 2. All Work requiring the OWNER's facilities to be out-of-service shall be performed during the scheduled shutdowns shown.
  - 3. The OWNER's staff will continue to perform administrative, operation and maintenance functions during shutdowns.
- B. Critical work sequencing constraints are described in this paragraph. Work not specifically covered in this section may, in general, be done anytime during the contract period.
- C. Key work sequencing constraints are detailed in Part 3, Execution:

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

**PART 3 - EXECUTION**

3.1 SCHEDULE OF TIE-INS

**01 13 00 - Maintenance of Plant Operations, Table A - Schedule of Tie-Ins**

<b>Tie-In No.</b>	<b>Tie-In Building/Location</b>	<b>New Line (Size and Service)</b>	<b>Existing (Connecting) Line Size &amp; Service</b>	<b>Remarks</b>
1	10-inch PSS Tie-In to Existing 8-inch PSS Line at Existing Lift Station	10-inch PSS	8-inch PSS	Tie-in to the force main for the existing plant lift station will require bypass pumping from existing plant lift station to influent pump station.
2	10-inch SS Tie-in to existing sewer manhole.	10-inch SS	10" SS	Tie in from existing sewer manhole to plant lift station will require bypass pumping to deliver flows from the existing manhole to the existing plant lift station while the connection to the new manhole is made.
3	24-inch SS Tie in from Manhole to New Plant Lift Station	24-inch SS	24-inch SS	No bypass pumping will be required. Plant lift station will be brought online after connection to the manhole is completed.
4	IPW Line Tie-In to new hose bibs at plant lift station	2-inch IPW	6-inch IPW	Existing stubbed out connection has a valve to allow tie-in without utilities shutdown.

+ + END OF SECTION + +

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Provo City  
Provo WATRR Center  
Plant Lift Station

February 2021  
90% Submittal



## SECTION 23 70 00

### HEATING, VENTILATION AND AIR CONDITIONING EQUIPMENT

#### PART 1 - GENERAL

##### 1.1 SERVICE CONDITIONS:

- A. All units will be designed using the following outdoor design conditions:

<b>Elevation, ft MSL</b>	4,500
<b>Summer</b>	
Outdoor Dry-Bulb Temperature	98 degrees F
Outdoor Wet-Bulb Temperature	62 degrees F
<b>Winter</b>	
Outdoor Dry-Bulb Temperature	1 degree F

- B. All equipment located outside shall be capable of continuous operation in environmental conditions installed. Provide applicable accessories and coatings for proper operation in environmental conditions.

##### 1.2 SUBMITTALS:

- A. Submittals shall be in accordance with the requirements of Section 01 33 00, Submittal Procedures.
- B. Complete specifications, descriptive drawings, catalog cuts, and descriptive literature that include make, model, dimensions, weight of equipment, horsepower, and electrical schematics for products and control system components specified.
- C. Complete performance data that indicates full compliance with the Specifications.
- D. Recommended procedures for protection and handling of equipment and materials prior to installation.
- E. Manufacturer's standard finish color selection for cabinet finishes.
- F. Operation and Maintenance Manuals: Submit complete manuals including copies of all approved shop drawings, test reports, maintenance data and schedules, description of operation, and spare parts information
1. List of recommended spare parts for equipment and materials specified.

##### 1.3 QUALITY ASSURANCE

- A. Quality Control procedures shall be in accordance with Section 01 45 00, Quality Control.
- B. Reference Standards: Comply with applicable provisions and recommendations of the latest editions of the following, except as otherwise shown or specified. Specific provisions of this Contract shall supersede the Standards in case of conflict:
1. AHRI 310/380, Standard for Packaged Terminal Air-Conditioners And Heat Pumps

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2. ASHRAE 90.1, Energy Standard for Buildings Except Low-Rise Residential Buildings
3. ASTM E331-00, Standard Test Method for Water Penetration of Exterior Windows, Skylights, Doors, and Curtain Walls by Uniform Static Air Pressure Difference

#### 1.4 DELIVERY, HANDLING, AND STORAGE

- A. Delivery, handling and storage shall be in accordance with all manufacturer requirements and the requirements of Section 01 66 10, Product Storage Handling and Delivery.

#### 1.5 WARRANTY

- A. Furnish 2-year warranty for all equipment in accordance with the requirements of Section 01 78 36, Product Warranty.
- B. Furnish a 5-years special warranty for refrigeration section compressor(s) in accordance with the requirements of Section 01 78 36, Product Warranty.

### **PART 2 - PRODUCTS**

#### 2.1 WALL MOUNTED EXHAUST FAN (EXF)

- A. General: Provide steel wall-mounted exhaust propeller fan with thermostat control and thermostat bypass switch for on/off only control.
- B. Performance:
  1. Continuous operating temperature from -10° F to 130° Fahrenheit
  2. Propeller shall be statically and dynamically balanced in accordance with AMCA Standard 204-05
  3. The propeller and fan inlet shall be aligned and shall have precise running tolerances for maximum performance and operating efficiency
  4. Each fan shall bear a permanently affixed manufacture's engraved metal nameplate containing, fan performance, the model number and individual unit serial number
- C. Propeller:
  1. Propeller shall be constructed of cast aluminum tapered airfoil blades and cast aluminum hubs
  2. Propeller shall be securely attached to motor shaft with a standard square key, set screw and tapered bushing
- D. Motor:
  1. Motor enclosure shall be Open type
  2. Motor to be a DC electronic commutation type motor (ECM) specifically designed for fan applications. AC induction type motors are not acceptable.
  3. Motors are permanently lubricated, heavy duty ball bearing type to match with the fan load and pre-wired to the specific voltage and phase
  4. Internal motor circuitry to convert AC power supplied to the fan to DC power to operate the motor.
  5. Motor shall be speed controllable with factory mounted equipment set for 2 speeds as noted on schedule.

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- E. Damper:
  - 1. Aluminum gravity type balanced for minimal resistance to flow.
- F. Coating:
  - 1. Coating shall be provided to protect from environmental conditions.
- G. Accessories:
  - 1. OSHA Motor Side Guard
  - 2. Weather hood kit with bird screen, 45-degree angle, aluminum material, matching coating
- H. Controls:
  - 1. Provide Manual ON/OFF switch for continuous operation of fan as noted on schedule
- I. Manufacturer:
  - 1. Loren Cook
  - 2. Greenheck
  - 3. Or Approved Equal

## 2.2 GAS UNIT HEATER – (GUH)

- A. Unit heaters shall be natural gas type with 82% minimum efficiency provided by an indirect-fired heat exchanger with dimpled tube pattern for efficient heat transfer.
- B. Details of Construction:
  - 1. Unit casing shall be constructed of a minimum 20-gauge aluminized steel.
  - 2. Exterior casing parts shall be coated with an electrostatically applied baked-on gray-green polyester powder paint at a minimum 7-mil thickness for corrosion resistance.
  - 3. The unit shall be furnished with horizontal air deflectors.
  - 4. The venting shall be a power exhausted arrangement. The unit shall include a factory mounted differential pressure switch designed to prevent main burner ignition until positive venting has been proven.
  - 5. The heat exchanger(s) seams and duct connections shall be certified to withstand 0.5" W.C. external static pressure without burner flame disturbance
  - 6. The burner(s) shall be made of the same material as the heat exchanger with a thickness of not less than 28 gauge. Burner(s) shall have non-clogging, slotted ports with a stainless steel separator strip designed for good lighting characteristics without noise of extinction for natural gas.
  - 7. The ignition controller(s) shall be 100% shut-off with continuous retry.
  - 8. The gas pressure shall be between 6-7" W.C for natural gas.
  - 9. The solid-state ignition system shall intermittently light the pilot each time the system is energized. Once the pilot is proven, the main gas valve shall open and allow gas flow to the main burner
- C. Controls:
  - 1. Single-stage gas controls with a single-stage combination gas control, an ignition control, and a single-stage low voltage thermostat. The unit fires at 100% full fire based on a call for heat from a room thermostat
  - 2. An automatic reset high limit switch mounted in the air stream to shut off the gas supply in the event of overheating.
  - 3. Time delay relay that delays the start of the air mover to allow the heat exchanger a warm-up period after a call for heat.

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- a. The time delay relay shall also continue the air mover operation after the thermostat has been satisfied to remove any residual heat in the heat exchanger.
- 4. The unit shall be orificed for 4,500 elevation above sea level.
- D. Electrical:
  - 1. All electrical components shall carry UL, ETL, or CSA listing.
  - 2. Low voltage terminal board for direct wiring connection to an external thermostat.
  - 3. Single step-down transformer shall be provided for all unit controls.
- E. Mounting:
  - 1. Units shall be provided with two-point adjustable suspension points to allow for level hanging or wall mounted.
- F. Flue / Gas Vent:
  - 1. Provide wall penetration for flue / vent size installation as recommended by manufacturer.
  - 2. Penetrations shall be sealed watertight. Provide insect screen on outlet end of vent piping.
- G. Accessories:
  - 1. Provide gas regulator to reduce the inlet gas pressure for the operating controls as necessary.
- H. Thermostat:
  - 1. Single stage room thermostat with a 50°-90°F temperature set point range. The stat shall also include switching for Heat/Off and Fan On/Auto control.
- I. Manufacturer and Model:
  - 1. Modine
  - 2. Reznor
  - 3. Or Approved Equal.

### 2.3 FIXED LOUVERS - (LVR)

- A. Furnish storm class fixed blade louvers where shown and with the dimensions and shapes shown on Drawings. Louvers shall be designed for intake and exhaust while providing maximum resistance to water penetration due to wind-driven rain.
- B. Fixed Louver Construction:
  - 1. Design: Combination exhaust louver backdraft damper type with all welded construction of stationary blades and frame.
    - a. Frame:
      - 1) Frame Depth: 4 inches
      - 2) Wall Thickness: 0.081-inch nominal.
      - 3) Material: Extruded aluminum, Alloy 6063-T6.
    - b. Louver Blades:
      - 1) Style: non-drainable "k"-style. 45 degrees at 5 inches
      - 2) Wall Thickness: 0.081-inch nominal.
      - 3) Material: Extruded aluminum, Alloy 6063-T6.
    - c. Backdraft Damper Blades:

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- 1) Style: Gravity
- 2) Material: .050-inch extruded aluminum 6063 T6
- 3) Minimum Assembly Size: 12 inches wide by 12 inches high
2. Louver shall be shaped and dimensioned as shown on the drawings.
3. Install aluminum louver screen on interior side of the louver.
4. Finish: Kynar 500 fluorocarbon coating, or equal.
  - a. Color to be selected by OWNER from manufacturer's standard offering of colors.

C. Fixed Louver Design:

1. Free Area: Minimum 55% net free area. Provide AMCA 500 test data.
2. Pressure Loss: AMCA certified rating of no greater than 0.30-inch WC at 750 fpm.
3. Provide louver supports designed to carry 30 psf wind load.
4. Louvers to be designed for air flow in either direction.
5. Louvers to provide protection from water penetration due to wind-driven rain. Provide test results, per AMCA standard 500L, which show that the louver being provided has the following performance characteristics:
  - a. 99% effectiveness at preventing water penetration of 3 inches per hour of wind driven rain at a wind speed of 29.1 miles per hour directed to the face of the louver
6. Integral or external gravity operated backdraft damper
7. Insect screen, Aluminum: 18-16 mesh, mill finish, 0.011-inch wire
8. 20-gauge, Filter rack for 1 inch MERV 11 filter

D. Manufacturers and Products:

1. Greenheck ESJ
2. Or equal

### **PART 3 - EXECUTION**

#### **3.1 INSTALLATION**

- A. Install equipment and systems in accordance with manufacturers' instructions.
- B. Exhaust Fan and Gas Unit Heaters shall be interlocked to the fire alarm(s) system. When alarm is engaged, equipment shall shut down.
- C. Louvers:
  1. Install louvers at locations indicated on the drawings and in accordance with manufacturer's instructions.
  2. Install louvers plumb, level, in plane of wall, and in alignment with adjacent work.
  3. The supporting structure shall be designed to accommodate the point loads transferred by the louvers when subject to the design wind loads
- D. Provide Testing and Balancing Reports of all HVAC systems, see Section 23 05 93, Testing, Adjusting and Balancing of HVAC Systems.

+ + END OF SECTION + +

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## SECTION 40 05 10 PS

### PIPE SCHEDULE

#### PART 1 - GENERAL

##### 1.1 DESCRIPTION

- A. General:
1. This schedule is provided for the convenience of the CONTRACTOR. Some flow streams may be shown on the drawings, but not listed here.
- B. Flow Stream IDs:
1. PSS – PUMPED SANITARY SEWER (FORCE MAIN)
  2. SS - SANITARY SEWER
- C. Pipe Materials:
1. DIP – Ductile Iron Pipe
  2. HDPE2 – HDPE Pressure Pipe
  3. PVC4 – PVC Sewer Pipe
- D. Joint Types:
1. FLG – Flanged
  2. MJ – Mechanical Joint
  3. PO – Push On
- E. Coating Systems: As described in Section 09 90 00, Painting
1. Exposed piping shall be color coded and labeled to facilitate identification of piping in accordance with the ANSI 253.1 and 13.1.

2. Color (Per Utah Regulation R317-3-4.4.H):

<b>Service</b>	<b>Pipe Color</b>	<b>Label Color</b>
Sewage	Gray	White

3. Label
  - a. Piping contents and direction of flow shall be legibly stenciled on the label and/or pipe
  - b. Labels are securely on the piping at interval and all locations required in conformance with ANSI A13.1.

Buried piping does not have color or label requirements.

##### 1.2 PIPE SCHEDULE

- A. Contractor shall install piping systems in accordance with the following pipe schedule:

FLOW STREAM I.D.	DESCRIPTION	SERVICE	EXPOSURE	SIZE RANGE	MATERIAL	JOINT TYPE	TEST PRESSURE	Notes
PSS	Pumped Sanitary Sewer	Water	Buried	All	HDPE2	FLG, WLD	45 psi	
			Exposed	All	DIP	FLG	45 psi	
			Under Slab	All	PVC2	PO	N/A	Concrete Encased
SS	Sanitary Sewer	Raw Sewage	Buried	All	PVC4	PO, MJ	N/A	

**PART 2 - NOT USED**

**PART 3 - NOT USED**

+ + END OF SECTION + +

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## SECTION 40 05 51 VS

### VALVE SCHEDULE

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

##### 1.1 DESCRIPTION

- A. General:
1. This schedule is provided for the convenience of the CONTRACTOR. Some valves may be shown on the drawings, but not listed here.
  2. Valve specifications are given in Section 40 05 51, Valves and Operators.
- B. Valve Tag Number:
1. Tag numbers are as noted in the Drawings.
- C. Valve Type:
1. Valve types are as described in 40 05 51, Valves and Operators
- D. Valve Actuators are described in 40 05 51, Valves and Operators

##### 1.2 VALVE SCHEDULE

Valve Tag Number	Diameter	Valve Ends	Installation	Actuator	Valve Type
P09-PLV-010	10"	Flanged	Exposed	Handwheel	PLV-10
P09-PLV-011	10"	Flanged	Exposed	Handwheel	PLV-10
P09-PLV-020	10"	Flanged	Exposed	Handwheel	PLV-10
P09-PLV-021	10"	Flanged	Exposed	Handwheel	PLV-10
P09-PLV-030	10"	Flanged	Exposed	Handwheel	PLV-10
P09-PLV-001	10"	Flanged	Exposed	Handwheel	PLV-10
P09-PLV-002	10"	Flanged	Exposed	Handwheel	PLV-10
P09-PVL-003	4"	Flanged	Exposed	Handwheel	PLV-10
P09-CKV-010	10"	Flanged	Exposed	N/A	CKV-10
P09-CKV-020	10"	Flanged	Exposed	N/A	CKV-10
P09-CKV-030	10"	Flanged	Exposed	N/A	CKV-10

#### PART 2 - **NOT USED**

#### PART 3 - **NOT USED**

+ + END OF SECTION + +

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## SECTION 40 61 96.09

### I&C – CONTROL DESCRIPTIONS – PLANT LIFT STATION

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

##### 1.1 SCOPE OF WORK

- A. This document provides the control narrative for the Bioreactor and Membrane Basin Drain System.

##### 1.2 REFERENCES

- A. Refer to the Process and Instrumentation Drawings (P&IDs):
  - 1. N-101, Existing Influent Junction Structure and New Plant Lift Station P&ID.
- B. Refer to specifications on major equipment and vendor packaged systems.
- C. Refer to electrical design documents for power coordination and distribution.

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

##### 2.1 NOT APPLICABLE

#### **PART 3 - EXECUTION**

##### 3.1 LIST OF CONTROL DESCRIPTIONS:

- A. Bioreactor and Membrane Basin Drain System
- B. Plant LS Pump No. 1 (P09-PMP-010) (Typical of two (2) Plant LS Pumps)

##### 3.2 PROCESS CONTROL DESCRIPTIONS

- A. Bioreactor and Membrane Basin Drain System
  - 1. General
    - a. The Plant Lift Station has been designed to accommodate sewer flows from the NOORDA Campus and Apartments which are being constructed south of the Provo WATRR Center. The sanitary sewer collection system will convey sewerage to the Plant Lift Station wet well south of the existing headworks via a 24-inch sewer pipe. In addition, a 10-inch sewer line will deliver sewerage to the wet well from a small portion of the City's collection system with minimal connections, and a relatively small flow capacity.
    - b. The Plant Lift Station wet well is equipped with three (3) constant speed submersible pumps in a lead, lag, lag-lag configuration. The lead, lag, lag-lag designation will be automatically rotated after each pumping cycle. Operators may also manually designate the lead, lag, lag-lag status at their discretion. A level indicator and transmitter (LE/LIT-P09001) will continuously monitor the water depth in the wet well. If the water depth in the wet well reaches a

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designated high water depth of 5 feet, the lead pump will be started. If the water level has not dropped below the designated high water depth within a designated delay period (operator adjustable, initially set to five (5) minutes), the lag pump will be started. The pumps will continue to operate until a designated low level of 2 feet, 6 inches, at which time both pumps will be stopped.

- c. A high-high level float switch (P09-LSHH001) will be activated if the water depth in the wet well reaches 6 feet. When the float switch is activated, an alarm is generated at the SCADA PLC/OWS level, and all three pumps are started. Once the water depth has dropped below the designated high level the lag-lag pump will be stopped, and the lead and lag pump will continue to operate until the low water level is reached, at which time both pumps will be stopped.
- d. A low-low level float switch (P09-LSLL001) will be activated if the water depth in the wet well reaches a designated low-low level of 2 feet. When the low-low level switch is activated, an alarm is generated at the SCADA PLC/OWS level, and all pumps are stopped to prevent damage to the pumps.
- e. The pumps are also protected by an intrinsic temperature switch (TSH-P09001) and moisture switch (MSH-P09010), which will automatically power off a pump if a manufacturer designated high motor temperature is reached or if a seal leak is detected inside the motor. In addition to stopping the pump, these switches will generate an alarm at the SCADA PLC/OWS level.
- f. A flow meter on the pump discharge manifold will continuously monitor flow from the Plant Lift Station to the existing influent junction box. If a pump is operating and flow meter detects a flow of less than 1,000 gpm, an alarm will be generated at the SCADA PLC/OWS level.

B. Plant LS Pump No. 1 (P09-PMP-010) (Typical of two (2) Plant LS Pumps)

1. General
  - a. Pumps will be operated as described in the previous section.
2. Controls
  - a. LCS
    - 1) Not Applicable.
  - b. MCP
    - 1) Not Applicable.
  - c. MCC (P09-FVNR-010)
    - 1) Manual/Off/Auto Hand Switch (HS-P09010A)
      - a) Manual Position:
        1. The pump may be controlled using the MCC.
      - b) Off Position:
        1. The pump cannot run.
      - c) Auto Position:
        1. Pump will be operated according to automated programming protocols.
    - 2) Start Button (HMS-P09010B)
      - a) Starts the pump.
    - 3) Stop Button (HMS-P09010A)
      - a) Stops the pump.
    - 4) Emergency Stop (HS-P09010B)
      - a) Equipment on P09-FVNR-010 shall be stopped.
    - 5) Reset Button (HMS-P09010C)
      - a) Equipment on P09-FVNR-010 shall be cleared of faults.
  - d. Hardwired Interlocks

- 1) If the low-low level float switch (LSLL-P09001) is activated, an alarm signal will be produced and all pump will be stopped, if not already off.
  - 2) If the pump's integral high motor temperature switch (TSH-P09010) is activated, the pump will be stopped, and an alarm signal will be produced.
  - 3) If the pump's integral moisture switch (MSH-P09010) is activated, the pump will be stopped, and an alarm signal will be produced.
- e. SCADA PLC/OWS (LS-RTU-001)
- 1) Operator inputs and controls as described above.
  - 2) Manual/Off/Auto Software Switch
    - a) Manual Setting
      1. The pump may be manually started and stopped by the operator if all hardwired and software interlocks are satisfied.
    - b) Off Setting
      1. The pump cannot run.
    - c) Auto Setting
      1. The pump will be controlled automatically by programming protocols.
  - 3) Start Button
    - a) Starts the pump.
  - 4) Stop Button
    - a) Stops the pump.
  - 5) Reset Button
    - a) Equipment on P09-FVNR-010 shall be cleared of faults.
- f. Automatic Control Scheme
- 1) If the wet well's high level setpoint is reached, the lead pump will be started.
  - 2) If the wet well's high level setpoint is reached, and the lead pump has not started after five minutes, the lag pump will start, and a timeout alarm will be generated.
  - 3) If the high-high level float switch (LSHH-P09001) is activated an alarm signal will be produced and all pumps will be started, if not already on. The lag-lag pump will be stopped when the designated high level is reached, and the lead and lag pump will continue to operate until the designated low level is reached.
  - 4) If the wet well's level has increased above the high level with the lead pump operating for a designated delay period, the lag pump will be started.
  - 5) If the pump's low level setpoint is reached, the pump(s) will be stopped.
  - 6) If the pump's low level setpoint is reached, the pump(s) will be stopped and an alarm signal will be generated.
3. Alarms/Monitoring
- a. LCS
    - 1) Not Applicable
  - b. MCP
    - 1) Not applicable
  - c. MCC (P09-FVNR-010)
    - 1) Running (MR-P09010A)
      - a) The pump is operating.
    - 2) Stopped (MR-P09010B)
      - a) Pump is not operating.
    - 3) Fault Alarm (YA-P09010B)
      - a) A pump fault has occurred.
    - 4) High Temperature Alarm (TAH-P09010A)
      - a) High motor temperature has been detected.
    - 5) Seal Leak Alarm (MAH-P09010A)

- a) Moisture has been detected in the pump motor.
- d. SCADA PLC/OWS (LS-RTU-001)
  - 1) Not in Auto
    - a) Pump is not operating according in automatic control mode.
  - 2) Low-Low Level Alarm
    - a) The low-low level setpoint has been reached.
  - 3) High Level Timeout Alarm
    - a) The high level setpoint has been reached, and pump has not started.
  - 4) High-High Level Alarm
    - a) The high-high level setpoint has been reached.
  - 5) High Temperature Alarm
    - a) High motor temperature has been detected.
  - 6) Seal Leak Alarm
    - a) Moisture has been detected in the pump motor.
  - 7) Level Indication (LI-P09010)
    - a) Indicates level of water in Bioreactor Drain Wet Well.
  - 8) Event Running
    - a) The pump is operating.
  - 9) Fault Alarm
    - a) A pump fault has occurred.
  - 10) E-stop Alarm
    - a) The emergency stop button has been pressed.
  - 11) Flow Indication (FI-P09001)
    - a) Indicates flow of water from Plant Lift Station Wet Well.
  - 12) Totalized Flow Indication (FQI-P09001)
    - a) Indicates total volume of flow from Plant Lift Station Wet Well.

++ End of Section ++

## PROCESS CONTROL SYSTEM INSTRUMENT INDEX

<b>P&amp;ID Drawing Number</b>	<b>Tag (Area-Type-Number)</b>	<b>Type-Class Name</b>	<b>Status</b>	<b>Device</b>	<b>Size / Rating</b>	<b>Setpoints / Range</b>
N-101	FE-P09001	Field Analog Instrument	New	Magnetic Flowmeter	10"	0.1 - 3000
N-101	FIT-P09001	Field Analog Instrument	New	Flow Indicating Transmitter	10"	0.1 - 3000
N-101	LE-P09001	Field Analog Instrument	New	Radar Level Element	10"	0-10
N-101	LIT-P09001	Field Analog Instrument	New	Level Indicating Transmitter	10"	0-10
N-101	LSHH-P09001	Field Discrete Instrument	New	Level Float Switch	10"	NA
N-101	LSLL-P09001	Field Discrete Instrument	New	Level Float Switch	10"	NA
N-101	PI-P09010	Field Instrument	New	Pressure Gauge		0-125
N-101	PI-P09020	Field Instrument	New	Pressure Gauge		0-125
N-101	PI-P09030	Field Instrument	New	Pressure Gauge		0-125

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## SECTION 43 24 00

### SUBMERSIBLE SEWAGE PUMPS

#### PART 1 - GENERAL

##### 1.1 DESCRIPTION

- A. Scope:
1. EQUIPMENT SUPPLIER (SUPPLIER) shall furnish two (2) duty and two (1) standby new submersible sewage pumps as specified below.
  2. The specified pumps shall be installed in the wet pit of the plant lift station and will be used to pump raw sanitary sewer flow from the plant lift station to the plant influent pump station. All pumps shall be complete with power, instrumentation, and all required accessories.
  3. The pump and pump motor shall be considered an integral unit and its design shall be the responsibility of the Supplier.
  4. Supplier shall provide installation and start up assistance, certification, and training services.
  5. Supplier shall develop and submit shop drawings for review by OWNER and ENGINEER; coordinating with OWNER and ENGINEER regarding design details.
- B. The CONTRACTOR will install the pumps under a separate contract with the OWNER.

##### 1.2 SITE CONDITIONS

- A. This section describes the environmental conditions which have been observed at the site of the work and which may reasonably be anticipated throughout the life of the Project.
- B. The site of the work is at an elevation of approximately 4,500 feet above mean sea level.
- C. Hydrogen sulfide gas may be present in the wastewater and flow conveying structures.
- D. National Fire Protection Association (NFPA) 820 per National Electric Code, Area Electrical Classification: Unclassified.

##### 1.3 QUALITY ASSURANCE

- A. Reference Standards: Work covered by this specification shall meet or exceed the provisions and recommendations of the latest editions of the following codes and standards in effect at the time of awards of the Contract , except as otherwise shown or specified.
1. National Electric Code (NEC).
  2. National Electrical Manufacturers Association (NEMA).
  3. Institute of Electrical and Electronic Engineers (IEEE).
  4. American National Standards Institute (ANSI).
  5. American Society of Mechanical Engineers (ASME).
  6. American Society for Testing and Materials (ASTM).
  7. American Welding Society (AWS).

8. American Water Works Association (AWWA).
9. Hydraulic Institute (HI).
10. American Iron and Steel Institute (AISI).
11. National Fire Protection Association (NFPA).
12. Anti-Friction Bearing Manufacturers Association (AFBMA).
13. International Organization of Standardization (ISO)- ISO9001
14. Factory Mutual (FM)

B. Qualifications:

1. The Supplier shall have complete responsibility to supply the pumping unit (submersible pump, submersible motor, cable suspension system, instrumentation, and accessories) that meet the requirements of this specification. The pump performance shall be the sole responsibility of the Supplier.
2. The Supplier shall have experience in producing similar equipment and shall show evidence of five (5) installations in satisfactory operation for at least five (5) years, with contact information supporting qualification under this requirement.
3. Installation and Start-up representative:
  - a. Supplier shall furnish a competent installation and start-up representative who is knowledgeable and experienced with the installation and start-up procedures for submersible pumps and the associated equipment specified.
  - b. When requested, the installation and start-up representative shall be responsible for providing complete and correct direction during installation, initial start-up, and subsequent operation of equipment until field tests are completed.
  - c. The installation and start-up representative shall initiate instructions for actions necessary for proper receipt, inspection, handling, uncrating, assembly, and testing of equipment.
  - d. The installation and start-up representative shall also keep a record of measurements taken during testing and shall furnish hard copy and electronic copy on thumb drive to the ENGINEER upon request or on the completion of commissioning. The CONTRACTOR shall be responsible for coordinating the required field services with the Supplier.

C. Factory Testing:

1. Pumps shall be tested at the factory:
  - a. Verify that impeller, motor rating and electrical connections comply with this Section.
  - b. Measure for moisture content and insulation defects in motor and cable, both before and after the submergence test described below.
  - c. Run pump dry to verify proper rotation, alignment and mechanical integrity.
  - d. Run pump submerged for at least 30 minutes under a minimum of 8 feet of water to check for balance, unusual noise and overheating. Verify specified pumping capacities.
  - e. Test motor for no-load current at rated voltage, high potential, and locked rotor current.
  - f. A certified test curve (per HI standards) showing the performance of the pump shall be supplied to the ENGINEER. Tests shall cover the pumps anticipated operating flow rate and head conditions specified in paragraph 2.1.B, including the minimum TDH condition and corresponding SUPPLIER calculated flow rate. The aforementioned tests shall be conducted, as specified, on all supplied pumps, generating a curve showing actual flow, total head, static head, BHP and hydraulic efficiency.

- g. Prior tests on similar units or prototype model tests may be provided.
2. Tests shall be witnessed by a registered professional engineer who may be an employee of the SUPPLIER. The registered professional engineer shall sign and seal all copies of test curves and shall certify that performance tests were performed. Tests shall be conducted conforming to the Standards of the Hydraulics Institute.

#### 1.4 EQUIPMENT TAG NUMBERS

- A. This specification section refers to pump numbers P09-PMP-010, P09-PMP-020, and P09-PMP-030.

#### 1.5 SUBMITTALS

- A. Product Data:
  1. Make, model, weight, and horsepower of each equipment assembly.
  2. Complete catalog information, descriptive literature, specifications, and identification of materials of construction.
  3. Dimensional outline and installation drawing. Full installation instructions.
  4. Performance data curves showing head, capacity, horsepower demand, pump efficiency, and net positive suction head required over the entire operating range of the pump, from shutoff to maximum capacity. Indicate separately the head, capacity, horsepower demand, overall efficiency, and minimum submergence required at the guarantee point.
  5. Data on the moisture/temperature protective relay
  6. Complete motor nameplate data, as defined by NEMA, motor manufacturer, and including any motor modifications.
  7. Factory finish system.
- B. Motor Tests and Data:
  1. For each motor furnish an inspection report for the motor or for a previously manufactured electrically duplicate motor that has been tested. Provide the following minimum data:
    - a. Running current.
    - b. Locked rotor current.
    - c. Winding resistance measurement.
    - d. High potential test.
    - e. Bearing inspection.
- C. Operation and Maintenance Manuals: Submit complete manuals including copies of all approved shop drawings, test reports, maintenance data and schedules, description of operation, and spare parts information.
- D. Warranty: Submit Warranty in accordance with the requirements of Section 01 78 36, Product Warranty.
- E. Test Data: Pumps shall not be shipped until the ENGINEER has approved the test reports. Submit four copies of certified pump tests.

## **PART 2 - PRODUCTS**

### **2.1 SERVICE CONDITIONS AND PERFORMANCE**

- A. See the table below for service conditions and performance requirements. The pump's internal head loss calculation shall be Manufacturer's responsibility, and is not considered in service conditions and performance requirements below.

<b>Design Conditions</b>	
Location	Plant Lift Station
Fluid Pumped	Sanitary Sewer
Number of Pumps Required	2 Duty + 1 Standby
Design Total Suspended Solids Concentration, mg/L	270
Design Flow (Duty Point), gpm	1,675
Minimum Static Head, ft	12.0
Maximum Static Head ft	14.5
Design Total Dynamic Head Corresponding to Duty Point, ft.	46
Minimum Shutoff Head, ft.	150
Type of Seals	Mechanical
Wet Well Slab Elevation (ft. above Mean Sea Level)	4479.00
Minimum Liquid Elevation. in Wet Well (ft. above Mean Sea Level)	4481.50
Maximum Liquid Elevation in Wet Well (ft. above Mean Sea Level)	4484.00
Pump Mounting Slab Elevation	4479.50
Maximum Fluid Temperature, degrees F (degrees C)	68 (20)
Fluid Specific Gravity	1.0
Max Motor Size (hp)	35
Inverter Duty Rated	Yes (VFD not required)
Motor Voltage/Phase/Hertz	480/3/60

- B. Pump equipment shall consist of three (3) pumps, complete with motors, guide rails and supports, base elbows, suction elbows, anchoring brackets, power cables, pump lifting cables, and protective control system. Pump metal parts that come into contact with guide rail or cable system shall be made of non-sparking materials.
- C. Liquid temperature may range between 50 degrees F and 68 degrees F.
- D. Pump Features:
1. Service: Sanitary sewage as described in the table in Paragraph 2.1.A.
  2. Type: Non-clog centrifugal submersible sewage pump
  3. Capacity: Passing 2" ball, minimum
  4. Volute: ASTM A48 CL35B Cast Iron
  5. Impeller: ASTM A48 CL35B Cast Iron

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- a. Leading edge of impeller shall be capable of handling solids, fibrous material, heavy sludge and other matter normally found in wastewater.

E. Accessories:

1. Base Elbow: ASTM A48, CL35B Cast Iron, one per pump
2. Pump Suction Elbow
3. Guide Rails: Type 316 Stainless Steel, coordinate length with drawings, 2-inch diameter, two per pump
4. Upper Guide Rail Brackets (one per pump):
  - a. Type 316 Stainless Steel
  - b. Mount to wetwell hatch opening
5. Intermediate Guide Rail Brackets (one per pump):
  - a. Type 316 Stainless Steel
  - b. Provide if guide rails are longer than 20-feet
  - c. Brackets shall mount to discharge piping
6. Pump Lift System:
  - a. Furnish accessories necessary for lifting the pump and motor from the wetwell. The working load of the lifting system shall be a minimum of 50% greater than the pump unit's weight.
  - b. Lifting Chain: approximately 18" long 316 Stainless Steel, provide one chain per pump
  - c. 45 feet of nylon line connected to the lifting chain
  - d. Forged steel grip eye for connecting/disconnecting davit crane hook and cable to pump chain.
7. Safety Hooks and Cable Holders: 316 Stainless Steel, provide one of each per pump
8. Wetwell hatch:
  - a. Hatch dimensions per drawings
  - b. 300 psf rated
  - c. Aluminum checkerplate
  - d. Gasketed, with rain gutter
  - e. Provide with fall protection compliant with OSHA 1910.23
    - 1) Provide secondary hinged coated aluminum grating
    - 2) 300 psf rated

F. Motors:

1. Connected load shall not exceed 90 percent of motor nameplate horsepower
2. Motor shall be non-overloading for the entire pump operating curve.
3. National Fire Protection Association (NFPA) 820 per National Electric Code, Area Electrical Classification: Unclassified
4. Vertical mounting
5. Solid shaft
  - a. Shaft seal: Tandem mechanical seals
6. Service factor: 1.15
7. Thermal Protection: Normally closed thermal switch in stator housing
8. Moisture Protection: Leakage Sensor in stator housing
9. Motor capable of 15 starts per hour
10. Motor capable of continuous full-load operation while unsubmerged without overheating.
11. Class F insulation
12. Provide motor lifting lug
13. Provide motor power and control cables with connections made at the motor inside a junction chamber. Cable entry shall be sealed and provided with means of strain

relief. Cables shall comply with applicable code requirements. Coordinate pump cable length with distance between pump and control panel, per drawings and field installation.

G. Controls:

1. Provide moisture protection/thermal protection relay for connection to leakage sensor and thermal switch on each motor for installation in an external control panel by others.
2. Provide two float switches for installation in each of two wet wells (LSLL, LSHH - elevations per drawings)
3. Provide Level Indicator/Transmitter for each of two wet wells
4. Control Description:
  - a. When pumps are in "Remote" position:
    - 1) Pump start on LSHH
    - 2) Pump stop on LSLL
  - b. Pump disable on motor overhear (thermal switch) or moisture leakage (leakage sensor)
  - c. Local beacon and siren
    - 1) Activate beacon and siren on LSHH and LSLL
  - d. Remote alarms
    - 1) Make the following alarms available for pick-up at a terminal strip in the control panel:
      - a) LSHH, LSLL
      - b) Pump trouble for each pump (indicating motor overhear or moisture leakage)
      - c) Pump run status for each pump
      - d) Panel power status

H. Manufacturers/Models:

1. Flygt Model N-3171 MT3
2. KSB
3. Sulzer
4. Or Equal

I. Spare Parts:

1. Spare parts shall be provided in accordance with the requirements of Section
2. Provide the following spare parts for each pump:
  - a. One complete set of upper and lower bearings
  - b. One complete set of seals, gaskets and O-rings
3. Special tools required for normal operation and maintenance of the equipment shall be furnished with the equipment by the manufacturer.

## **PART 3 - EXECUTION**

### **3.1 INSTALLATION**

- A. Installation shall be in complete accordance with manufacturer's instructions.
- B. Installation shall include furnishing and applying an initial supply of grease and oil, recommended by manufacturer.

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- C. Check and align all pumps, motors, etc. after pump assemblies have been installed to ensure alignment and assembly has been unchanged from factory assembly conditions. Make adjustments required to place system in proper operating condition. Pump installation shall place no strain on adjacent piping systems.

### 3.2 FIELD QUALITY CONTROL

- A. Functional Test: Conduct on each pump.
  - 1. Alignment: Test complete assemblies for correct rotation, proper alignment and connection, and quiet operation.

### 3.3 MANUFACTURER'S FIELD SERVICES

- A. A factory trained representative shall be provided for start-up and test services and operation and maintenance personnel training services. The representative shall make one one-day visit to the site for performing these services.

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