



ENGINEERING CLARIFICATION

EC TITLE: Facility 310 and 340 Submersible Pump Clarification

PROJECT: 3 Kings Water Treatment Plant

EC NO.: 99

DATE: 2/12/2021

STATUS: Open

SECTION 1: BY CONTRACTOR

QUESTION:

This clarification provides adjustments to the submersible pump specification for the pumps in Facility 310 and 340.

1. Head conditions for the Facility 310 pumps have been updated.
2. Secondary duty point for the Facility 340 pumps has been updated based on submitted pump curves.
3. Removal of the control panels and level switches as described in Article 2.04 and 2.05 of the specification.

DRAWING NO.:

SPECIFICATION SECTION: 44 42 56.04 Submersible Pumps

POTENTIAL COST IMPACT:

POTENTIAL SCHEDULE IMPACT:

PROPOSED SOLUTION:

Revise specification as shown in the attached markups.

COMMENTS:

INITIATOR: Menk, Sean/SLC

PRIORITY: Normal

REQUESTED RESPONSE DATE: 2/26/2021

SECTION 2: BY REVIEWER

RESPONSE:

COMMENTS:

REVIEWED BY:

REVIEWED DATE:

**SECTION 44 42 56.04
SUBMERSIBLE PUMPS**

PART 1 GENERAL

1.01 REFERENCES

- A. The following is a list of standards that may be referenced in this section:
1. American Bearing Manufacturers Association (ABMA):
 - a. 9, Load Ratings and Fatigue Life for Ball Bearings.
 - b. 11, Load Rating and Fatigue Life for Roller Bearings.
 2. American Society of Mechanical Engineers (ASME): B16.1, Gray Iron Pipe Flanges and Flanged Fittings, Class 25, 125, and 150.
 3. ASTM International (ASTM):
 - a. A48, Standard Specification for Gray Iron Castings.
 - b. A576, Standard Specification for Steel Bars, Carbon, Hot-Wrought, Special Quality.
 4. Hydraulic Institute Standards (HIS):
 - a. 11.6, Submersible Pump Test.
 - b. 14.6, Rotodynamic Pumps for Hydraulic Performance Acceptance Tests.
 5. National Electrical Manufacturers Association (NEMA).
 6. National Fire Protection Association (NFPA):
 - a. 70, National Electrical Code.
 - b. 497, Recommended Practice for the Classification of Flammable Liquids, Gases, or Vapors and of Hazardous (Classified) Locations for Electrical Installations in Chemical Process Areas.
 7. Underwriters Laboratories Inc. (UL).

1.02 DEFINITIONS

- A. Terminology pertaining to pumping unit performance and construction shall conform to ratings and nomenclature of Hydraulic Institute Standards.

1.03 SUBMITTALS

- A. Action Submittals:
1. Make, model, weight, and horsepower of each equipment assembly.
 2. Complete catalog information, descriptive literature, specifications, and identification of materials of construction, including cable seal details.
 3. Performance data curves showing head, capacity, horsepower demand, and pump efficiency over entire operating range of pump, from shutoff

to maximum capacity. Indicate separately head, capacity, horsepower demand, overall efficiency, and minimum submergence required at guarantee point.

4. For variable speed motors, provide variable speed curves for every 50 rpm over the operational range.
5. Power and control wiring diagrams, including terminals and numbers.
6. Motor data, in accordance with the requirements of Section 26 20 00, Low-Voltage AC Induction Motors.
7. Adjustable frequency drive data, in accordance with the requirements of Section 26 29 23, Low-Voltage Adjustable Frequency Drive System.
8. Factory-finish system.
9. L-10 bearing life calculations per ABMA.
10. If required, wiring for motor protection module.
11. Seismic anchorage and bracing drawings and cut sheets, as required by Section 01 88 15, Seismic Anchorage and Bracing.

B. Informational Submittals:

1. Seismic anchorage and bracing calculations as required by Section 01 88 15, Seismic Anchorage and Bracing.
2. Special shipping, storage and protection, and handling instructions.
3. Manufacturer's printed installation instructions.
4. Manufacturer's Certificate of Compliance, in accordance with Section 01 61 00, Common Product Requirements, that factory finish system meets requirements specified herein.
5. Suggested spare parts list to maintain equipment in service for period of 1 year and 5 years. Include list of special tools required for checking, testing, parts replacement, and maintenance with current price information.
6. List special tools, materials, and supplies furnished with equipment for use prior to and during startup and for future maintenance.
7. Operation and Maintenance Data as specified in Section 01 78 23, Operation and Maintenance Data.
8. Manufacturer's Certificate of Proper Installation, in accordance with Section 01 43 33, Manufacturers' Field Services.

1.04 EXTRA MATERIALS

A. Furnish for this set of pumps:

1. One set mechanical seals.
2. One complete set of special tools required to dismantle pump.

PART 2 PRODUCTS

2.01 GENERAL

- A. Submersible, vertical shaft, centrifugal nonclog type, for pumping wastewater.
- B. Designed for continuous operation under submerged or partially submerged conditions, and intermittent operation when totally dry without damage to pump or motor.
- C. Pump and Electrical Driver: Meet requirements for class, group, and division location in accordance with NFPA 70.
- D. Where adjustable speed drives are required, furnish a coordinated operating system complete with pump, drive, and speed controller.
- E. Pumps furnished under this section to be provided by a single manufacturer.

2.02 SUPPLEMENTS

- A. Specific requirements are attached to this section as supplements.

2.03 COMPONENTS

- A. Equipment consists of pump complete with motor, control system, guide rail, anchoring brackets, base elbow, power cable, and pump lifting cable.
- B. Characteristics:
 - 1. Motor and rotating parts shall be removable from motor end of pump.
 - 2. Mating surfaces to be watertight and fitted with nitrile O-rings.
 - 3. Pumps fitted with dynamically balanced nonclog impellers designed to pass course solids and stringy materials.
- C. Lifting Arrangement:
 - 1. Stainless steel chain, 2 feet minimum, and one “grip-eye.”
 - 2. Attach chain permanently to pump and access platform with stainless steel wire rope.
 - 3. “Grip-eye” capable of being threaded over and engaging links of stainless steel chain so pump and motor may be lifted with “grip-eye” and independent hoist.

- D. Sliding Guide Bracket:
 - 1. Integral part of pump unit.
 - 2. Pump unit to be guided by no less than two guide bars, or equivalent cable system, and pressed tightly against discharge connection elbow with metal-to-metal contact or through use of profile-type gasket, provided gasket is attached to pump's flange and can be easily accessed for inspection when pump is lifted out of wetwell.
- E. Oil chamber between seals shall be equipped with drain and inspection plug. Plug shall have positive antileak seal and shall be easily accessible from outside.
- F. Motor nameplate horsepower not to be exceeded at head-capacity point on pump curve.
- G. Pump motor and sensor cables shall be suitable for submersible pump application and cable sizing shall conform to NFPA 70 specifications for pump motors. Cables shall be of sufficient length to reach junction boxes without strain or splicing.
- H. Motor Protection Module: If required, provide pump with a motor protection module for remote mounting. Contract Drawings are based on first named submersible pump manufacturer and motor protection module. If pump and motor protection module other than first named manufacturer is provided, provide revised wiring for the motor protection module.
- I. Cable Entry System:
 - 1. Junction chamber and motor separated by stator lead sealing gland or terminal board that prevents foreign material entering through pump top.
 - 2. Utilize cable with factory-installed sealing gland with nonshrink epoxy seal system.
 - 3. O-ring compression seal between sealing gland and cable entry point shall also be acceptable.

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~~2.04 CONTROL PANEL~~

- ~~A. NEMA 4X enclosure, for outdoor duty.~~
- ~~B. Refer to Section 40 90 00, Instrumentation and Control for Process Systems, for additional panel requirements.~~
- ~~C. Free standing, post mounted.~~

3KINGS WTP PHASE III DESIGN

D. Features:

1. Main circuit breaker disconnect interlocked with panel door.
2. Combination circuit breaker type, NEMA rated motor starters.
3. Fused control power transformer, 120V ac.
4. Alternator and pump lead-lag controls.
5. ON/OFF/AUTO switches.
6. Running lights.
7. High level indication.
8. Normally closed, dry, 5 amps at 120V ac contacts for remote indication of:
 - a. High level alarm.
 - b. Pump failure (temperature or moisture alarm).
9. Terminal strip for interfacing with external wiring.
10. High temperature indication.
11. Moisture alarm indication.
12. Alarm (high temperature, moisture, or high level) beacon located on top of panel.
13. Lightning protection.
14. Intrinsically safe relays as required for UL validation.
15. Alarm silence button.
16. Document pocket located inside panel with pump and panel operation and maintenance manual, and separate laminated pump curve.
17. 110-volt, duplex GFI outlet, weather-protected, and accessible from outside of panel.
18. Run hour meter.
19. 100 watts minimum, condensation heater with thermostat.
20. UL listing mark.

E. Prewired and factory tested.

F. Mount control switches, indicating lights, and switches on hinged front panel.

G. Single Feed: 480 volts, three-phase.

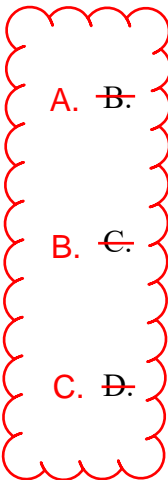
~~2.05~~
~~2.04~~

~~ACCESSORIES~~

~~A. Level Switches: In accordance with Section 40-91-00, Instrumentation and Controls Components, component L8 and for:~~

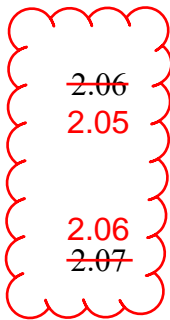
- ~~1. Low Level: Pumps off.~~
- ~~2. Low Level: First pump on.~~
- ~~3. High Level: Second pump on.~~
- ~~4. High Level: Alarm.~~

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- ~~A.~~ ~~B.~~ Equipment Identification Plate: 16-gauge stainless steel with 1/4-inch die-stamped equipment tag number securely mounted in readily visible location.
- ~~B.~~ ~~C.~~ Anchor Bolts: Type 316 stainless steel, sized by equipment manufacturer, and as specified in Section 05 50 00, Metal Fabrications. Coat in accordance with Section 09 90 00, Painting and Coating.
- ~~C.~~ ~~D.~~ Sidewalk Door: Size as shown on Drawing or if not shown, sized by equipment manufacturer. As specified in Section 05 50 00, Metal Fabrications, with the following additional requirements:

1. Gasketed and odor tight.
2. Channel drain is not required.



FACTORY FINISHING

- A. Manufacturer's standard epoxy system for continuous submergence in corrosive water.

SOURCE QUALITY CONTROL

- A. Control Panel:

1. Factory Inspections: Inspect control panels for required construction, electrical connection, and intended function.
2. Factory Tests and Adjustments: Test all control panels actually furnished.

- B. Pump:

1. Factory Performance Test:
 - a. In accordance with HIS 11.6, Level B for submersible pump tests.
 - b. Include curve test results and performance test logs.
2. Conduct on each pump.
3. Perform under actual or approved simulated operating conditions.
 - a. Throttle discharge valve to obtain pump data points on curve at 2/3, 1/3, and shutoff conditions.

- C. Submersible Motor Functional Test: In accordance with HIS 11.6.

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PART 3 EXECUTION

3.01 INSTALLATION

- A. Install in accordance with manufacturer's printed instructions.
- B. Mount the discharge elbow to the floor of the wetwell floor with stainless steel bolts.
- C. Connect piping without imposing strain to flanges.
- D. No portion of pump shall bear directly on floor of sump.

3.02 FIELD FINISHING

- A. Equipment as specified in Section 09 90 00, Painting and Coating.

3.03 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.
 - 2. Flow Output: Measured by plant instrumentation and storage volumes.
 - 3. Operating Temperatures: Monitor bearing areas on pump and motor for abnormally high temperatures.
 - 4. Test for continuous 3-hour period.
 - 5. Test Report Requirements: In accordance with Hydraulic Institute Standards for submersible pump tests HIS 14.6 and 11.6.
- B. Manufacturer's Representative: Present at Site or classroom designated by Owner, for minimum person-days listed below, travel time excluded:
 - 1. 1/2 person-day for functional testing, completion of Manufacturer's Certificate of Proper Installation.
 - 2. 1/2 person-day facility startup and post-startup training of Owner's personnel.
- C. See Section 01 43 33, Manufacturers' Field Services.

3.04 SUPPLEMENTS

- A. The supplements listed below, following “End of Section,” are part of this Specification.
 - 1. Pump Data Sheets:
 - a. 01, Filter Press Filtrate Pumps 1 and 2.
 - b. 02, Backwash Waste Clarification Feed Pumps 1, 2, 3, and 4.

END OF SECTION

SUBMERSIBLE PUMP DATA SHEET, 01

Tag Numbers: PMP-340-114-01, PMP-340-116-01

Pump Name: Filter Press Filtrate Pumps 1 and 2

Manufacturer and Model Number: (1) Flygt
(2) Grundfos
(3) KSB

SERVICE CONDITIONS

Liquid Pumped (Material and Percent Solids): Filter Press Filtrate, 1% solids

Pumping Temperature (Fahrenheit): Normal: 60 Max 77 Min 41

Specific Gravity at 60 Degrees F: 1.0

pH: 7.0-8.0

Abrasive (Y/N) N Possible Scale Buildup (Y/N): N

Total suspended solids (mg/L): 200

Minimum diameter solid pump can pass (inches): 1

Min. NPSH Available (Ft. Absolute): _____

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PERFORMANCE REQUIREMENTS

Capacity (US gpm): Rated: 80

Secondary: ~~TBD~~ 178
Secondary: ~~TBD~~ 28

Total Dynamic Head (Ft): Rated: 40

Maximum Shutoff Pressure (Ft): _____

Min. Rated Pump Hydraulic Efficiency at Rated Capacity (%): 50

Max. Pump Speed at Rated Capacity (rpm): 1,800

Constant (Y/N): Y Adjustable (Y/N): N

DESIGN AND MATERIALS

Pump Type: Heavy-Duty Nonclog (Y/N) Y Other: _____

Volute Material: Cast Iron ASTM A48

Pump Casing Material: Cast Iron ASTM A48

Motor Housing Material: Cast Iron ASTM A48

Wear Rings Case (Y/N): Y Material: SST

Wear Ring Impeller (Y/N): Y Material: SST

Elastomers: Nitrile Rubber

Fasteners: Stainless Steel

Impeller: Type: Double-Shrouded Non-Clog (Y/N): Y Other: _____
Material: Cast Iron ASTM A48

Shaft Material: Carbon Steel, ASTM A576 with stainless steel sleeve or all stainless steel

Base Elbow: Cast Iron ASTM A48

Double Mechanical Seal (Y/N): Y Bearing Life (Hrs): 100,000

DRIVE MOTOR (See Section 26 20 00, Low-Voltage AC Induction Motors.)

Horsepower: 7.5 Voltage: 480 Phase: 3 Synchronous Speed (rpm): 1,800

Enclosure: EXP

Adjustable Speed Drive Range: 40 Hz min to 60-Hz max, See Section 26 29 23, Low-Voltage Adjustable Frequency Drive System

Other Features: _____

Moisture Detection Switches (Y/N): Y

Thermal Protection Embedded in Windings (Y/N): Y

REMARKS: _____

SUBMERSIBLE PUMP DATA SHEET, 02

Tag Numbers: PMP-310-101-01, PMP-310-102-02, PMP-310-104-03, PMP-310-105-04

Pump Name: Backwash Waste Clarification Feed Pumps 1, 2, 3, and 4

Manufacturer and Model Number: (1) Flygt NP3127 MT3 Adaptive 439
(2) Grundfos
(3) KSB

SERVICE CONDITIONS

Liquid Pumped (Material and Percent Solids): Manganese Dioxide Filter Backwash Waste & Titanium Dioxide Adsorber Backwash Waste. Fine solids likely to be present.

Pumping Temperature (Fahrenheit): Normal: 60 Max 77 Min 41

Specific Gravity at 60 Degrees F: 1.0

pH: 7.0-8.0

Abrasive (Y/N) N Possible Scale Buildup (Y/N): N

Total suspended solids (mg/L): 1,000

Minimum diameter solid pump can pass (inches): 1

PERFORMANCE REQUIREMENTS

Capacity (US gpm): Rated: 350 Secondary: 80

Total Dynamic Head (Ft): Rated: 35 46 Secondary: 16

Min. Rated Pump Hydraulic Efficiency at Rated Capacity (%): 60.0

Max. Pump Speed at Rated Capacity (rpm): 3,600

Constant (Y/N): N Adjustable (Y/N): Y

DESIGN AND MATERIALS

Pump Type: Submersible non-clog

Volute Material: Cast Iron ASTM A48

Pump Casing Material: Cast Iron ASTM A48

Motor Housing Material: Cast Iron ASTM A48

Wear Rings Case (Y/N): Y Material: 316L SST per ASTM A276

Wear Ring Impeller (Y/N): Y Material: 316L SST per ASTM A276

Elastomers: Nitrile Rubber

Fasteners: Type 316 stainless steel per ASTM A193

Impeller: Type: Self-cleaning semi open-open channel or approved equal (Y/N): Y
Other: _____
Material: Cast Iron ASTM A48

Shaft Material: Carbon Steel, ASTM A576 with stainless steel sleeve or all stainless steel

Base Elbow: Cast Iron ASTM A48

Coating System: See Section 2.06 Factory Finishing.

Double Mechanical Seal (Y/N): Y Bearing Life (Hrs): 100,000

DRIVE MOTOR (See Section 26 20 00, Low-Voltage AC Induction Motors.)

Horsepower: 7.5 Voltage: 460 Phase: 3

Max Synchronous Speed (rpm): 3600

Enclosure: See Section 26 20 00, Low-Voltage AC Induction Motors.

3KINGS WTP PHASE III DESIGN

Adjustable Speed Drive Range: 35 Hz min to 60 Hz max, See Section 26 29 23, Low-Voltage Adjustable Frequency Drive System.

Other Features: _____

Moisture Detection Switches (Y/N): Y

Thermal Protection Embedded in Windings (Y/N): Y

REMARKS: _____
