ADDENDUM 6

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ADDENDUM 6

SECTION 33 28 31

VERTICAL TURBINE PUMP AND MOTOR

PART 1 GENERAL

1.01 SUMMARY

A. Furnish and install one new vertical turbine motor on the existing well pump and motor mount/discharge head.

B. Disassembly, removal, and installation or connection of all necessary appurtenances that are associated with the Work, including but not limited to the following:
   1. Well discharge piping.
   2. Motor
   3. Electrical instrumentation equipment, piping, and wiring.
   4. Pre-lube piping.
   5. Seal drain piping.
   6. Well level instrumentation measurement devices.
   7. Any other appurtenances that are replaced, relocated, or temporarily removed.
   8. Coordination with the Owner for removal and reinstallation of the well pump and discharge head.
      a. Work by Others: Owner will remove the discharge head and well pump from the well, after the Contractor has disconnected the necessary items and removed the motor. Owner will reinstall the well pump and discharge head after inspection and repairs.

C. Related Sections:
   1. 01 12 16 Work Sequence
   2. 01 75 00 Starting and Adjusting
   3. 09 97 21 Coating systems for Water Treatment Facilities
   4. 26 05 10 Motors
   5. 40 23 00 Process Piping General Provisions
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   7. 40 23 30 Process Piping Specialties
   8. 40 23 50 Process Piping Testing, Adjusting, and Disinfection
   9. 40 90 00 Control System Functional Descriptions
   10. 40 90 19 Instrumentation

1.02 EXISTING SYSTEM DESCRIPTION

A. Existing Well Pump:
   1. The existing well pump is Goulds Model: VIF-WS, Size: 14RJHC 4 Stage(s).
   2. Water lubricated open line shaft vertical hollow shaft turbine pump.
   3. Maximum no-load pump speed: 1,800 RPM.
   4. Specified Flow: 2200 GPM.
   5. Specified Head: 292 FT.
   6. Efficiency at Design: 85%
   7. To be removed and replaced by Owner.

B. Existing discharge head to be re-installed by Owner.

C. Existing Motor to be replaced by Contractor.

D. See Drawings for photo details.

1.03 SUBMITTALS

A. Comply with Section 01 33 00.

B. Submit Product Data which includes the following for each item furnished:
   1. Manufacturer, motor size and model number.
   2. Component materials.
   3. Detailed specifications
   4. Detailed assembly drawings and dimensions.
   5. Motor specifications.

C. Provide Operation and Maintenance manuals in accordance with Section 01 78 23.

1.04 GENERAL REQUIREMENTS

A. Motor equipment materials, construction features and performance specified herein are considered minimum requirements. Manufacturers shall incorporate specified requirements into standard products to fully conform to Specifications.

B. Contractors are advised that due to manufacturer's variations in equipment design, changes from Drawings in piping arrangement and layout, electrical and control circuitry, and related dimensions of equipment foundation and anchorage details may be required for equipment installations.

PART 2 PRODUCTS

2.01 MANUFACTURERS

A. Motor:
   1. U.S.
   2. General Electric.
   3. Westinghouse.

2.02 EQUIPMENT

A. Motor:
   1. Requirements:
      a. Suitable for mounting on existing pump discharge head.
      b. Vertical, solid shaft
      c. High efficiency electric.
      d. Code G, or better.
      e. Premium Efficiency, Inverter Duty
      f. Weather-protected, Type 1 enclosure.
      g. Rated for 200 HP.
      h. Maximum no load speed: 1,800 RPM.
      i. Non-reverse ratchet.
      j. Locate thrust bearing in top of unit.
      k. Motors shall have oversized terminal boxes.
      l. Exterior finish: Factory primed using two-part Tnemec N69 or Sherwin-Williams Macropoxy 646 epoxy paint.
   2. Characteristics:
      a. 3-phase.
      b. 60 Hz.
      c. 480 Volt.
   3. Comply with Section 26 05 10.

B. Instrumentation:
   1. Requirements:
      a. Pressure switch.
      b. Pre-lube solenoid.
      c. Pressure transducer.
      d. Vibration switches.

2. Comply with Section 40 90 00 and 40 90 19.

2.03 TOOL, SUPPLIES, AND SPARE PARTS

A. The Contractor shall furnish all special tools necessary to provide routine maintenance of the equipment.

B. The Contractor shall furnish all recommended lubricating oils and grease for start-up and initial operation.

C. The manufacturer shall submit a list of no less than four manufacturer's standard lubricants which may be used interchangeably for each type of lubricant required. Lubricants shall be NSF 61 approved.

PART 3 EXECUTION

3.01 INSTALLATION

A. Motor shall be installed on existing discharge head in accordance with manufacturer's requirements.

B. Motor oil shall be added upon installation.

C. The manufacturer and grades of oil and grease shall be in accordance with the manufacturer's recommendations and requirements.

D. Pump seal water plumbing:
1. Install seal water discharge line assemblies between the pump seals.
2. Install 3/4-inch discharge head drain lines between the discharge heads and the trench drain.
3. Route lines in horizontal and vertical runs true to the lines of the pump, piping, and building.

E. Install instrumentation devices on the well head and discharge line including valves, piping, and electrical connections:
1. Pressure switch.
2. Pressure transducer.
3. Pre-lube solenoid, piping, and valves.
4. Vibration switches.

3.02 FIELD QUALITY CONTROL

A. Manufacturer’s Field Services:
1. Supervise motor installation.
2. Inspect and approve final installation.
3. Perform all necessary calibration and adjustments in accordance with manufacturer’s recommendations.
4. Coordinate start-up with installation of related equipment.

3.03 SYSTEM AND EQUIPMENT START-UP

A. Conform to the requirements of Section 01 75 00.

B. Provide written certification that check-out services have been completed and 1 week notice prior to start-up and demonstration.

C. Place various items of equipment into operation, along with related piping and control systems, at times acceptable to Owner. After satisfactory start-up of these systems and their related equipment, they will remain in continuous or intermittent operation as required by the Owner.

D. All equipment and accessories shall be adjusted and calibrated prior to any start-up and any equipment placed into temporary operation prior to Final Completion of the total Project shall be readjusted and/or recalibrated as necessary.

E. Contractor shall supervise, control, and be responsible for operation and maintenance of new equipment and/or systems during start up.

F. No system start-ups will be held on holidays, Fridays, weekends, or the day before a holiday.

3.04 DEMONSTRATION AND TRAINING

A. Provide factory trained serviceman to instruct the Owner's personnel in the proper operation and maintenance of the equipment and certify to the Engineer that motors and accessories are installed and operating properly.

B. Following completion of successful equipment start-up, the Contractor shall arrange for a factory representative and installer of each operating piece of equipment and other work requiring regular or continuing maintenance, to meet at Site with Owner's personnel to provide necessary basic instruction in proper operation and maintenance of entire work. Where installers are not experienced in required procedures, include instruction by manufacturer's representatives.

C. For each piece of operating equipment, the factory representative and installer shall provide two separate training sessions to the Owner's operations and maintenance staff. The two training sessions shall be separated in time by at least 1 week (7 days) and shall be arranged to meet the schedules of the Owner's operations and maintenance staff.

D. Each training session shall be inclusive of a minimum 4 hours on-site instructional time. All travel time and costs necessary to perform each training session shall be considered as additional and incidental to four hours of on-site instructional training time.

E. The training session time shall be separate and distinct from the time spent on equipment start-up.

F. Contractor shall coordinate the schedule for each training session a minimum of 2 weeks (14 days) ahead of schedule.

G. All final copies of the Operation & Maintenance manuals for each piece of operating equipment shall be delivered to the Engineer a minimum of 1 week (7 days) prior to scheduling the initial training session.

H. At a minimum, each training session shall include the following:
   1. Utilize operation and maintenance manuals as basis for instructions.
   2. Review contents of manual with Owners' personnel in detail to explain all aspects of operation and maintenance.
   3. Include a detailed review of the following items:
      a. Maintenance manuals.
      b. Record documents.
      c. Spare parts and materials.
      d. Tools.
      e. Lubricants.
      f. Fuels.
      g. Identification systems.
      h. Control sequences.
      i. Hazards.
      j. Cleaning.
      k. Warranties.
      l. Maintenance agreements and similar continuing commitments.
   4. Manufacturer's representative shall demonstrate the following procedures to Owner's personnel prior to date of final inspection:
      a. Startup.

b. Shutdown.
c. Emergency operations.
d. Noise and vibration adjustments.
e. Safety procedures.
f. Economy and efficiency adjustments.
g. Effective energy utilization.
h. Troubleshooting.
i. Maintenance.

l. Prepare and insert additional data in operations and maintenance manuals if need for additional data becomes apparent during instructions.

END OF SECTION

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ADDENDUM 6

SECTION 43 21 13

HORIZONTAL CENTRIFUGAL SPLIT CASE PUMPS

PART 1 GENERAL

1.01 SUMMARY

A. Section includes the furnishing and installation of horizontal split case centrifugal pumps, motor, mounting bases, anchor bolts, and appurtenances necessary for satisfactory operation.

B. Pump shall be installed in lay length provided at the location of the existing booster pumps.
   1. The connections to the existing suction and discharge pipes at each pump location (3 pumps), requires the Contractor to perform work prior to ordering the pumps, in order to verify that the suction and discharge piping can be adapted to match the suction and discharge sizes on the new pumps. Prior to ordering pumps, the Contractor shall visit the site and verify existing conditions and pipe sizes and lay lengths and all conditions for the new pumps. If increasing or decreasing pipe fittings are required, the supply and installation of those fittings will be considered incidental to the complete installation of each pump. See drawings for additional detail.

C. Related Sections:
   1. Section 09 91 50 - Shop Painting
   2. Section 26 29 24 - Variable Frequency Drives

1.02 PERFORMANCE REQUIREMENTS

A. Liquid Temperature Range: 40-70 degrees F.

B. Meet or exceed the operating condition requirements listed at the end of this section.

C. NSF 61/372 compliant.

D. Performance Requirements.
   1. Small Booster Pump (QTY1):
      a. Design basis:
         1) Fairbanks Morse 1824 single-stage, split-case, horizontal centrifugal pump.
         2) Impeller: 444A329.
         3) Suction: 6-inch.
         4) Discharge: 5-inch.
         5) Speed: 1800 rpm.
      b. Design Condition:
         1) Full speed (1775 rpm).
         2) Provide 1,400 gpm against a total dynamic head of ~~175~~ **200** feet.
         3) Minimum efficiency at this speed = ~~77~~ **73** percent.
         4) Minimum shut-off head: 210 feet.
         5) Runout flow: 1,950 gpm at 120 feet.
   2. Large Booster Pumps (QTY 2):
      a. Design Basis
         1) Fairbanks Nijhuis ~~1823~~ 2824C single-stage, split case, horizontal centrifugal pump.
         2) Impeller: 444R330.
         3) Suction: 8-inch.
         4) Discharge: 6-inch.
         5) Speed: 1800 rpm.
      b. Design Condition:
         1) Full speed ~~on~~ (1775 rpm).
         2) Provide 2,100 gpm against a total dynamic head of ~~175~~ **200** feet.
         3) Minimum efficiency at this speed = ~~81~~ **78** percent.

4) Minimum shut-off head: 215 feet.
5) Runout flow: 2900 gpm at 105 feet.

1.03 SUBMITTALS

A. Product Data:
1. Preliminary characteristic performance curves.
2. List of pump components and materials.

B. Shop Drawings:
1. Pump schematic.
2. Component sizes and dimensions.
3. Field measurements of existing piping conditions including available space between pipe flanges to remain.

C. Test Reports: Certified factory H.I. performance test results for pumps to be provided prior to shipping.

D. Manufacturer's Operation and Maintenance Instructions.

E. Close-out:
1. Performance test results from installed units.
2. Provide within 7 days of field testing.

PART 2 PRODUCTS

2.01 MANUFACTURERS

A. Fairbanks Morse, Kansas City, KS

B. Approved equal.

2.02 EQUIPMENT

A. High Service Pump Schedule
1. High Service Pump No. 1: HSP-1.
2. High Service Pump No. 2: HSP-2.
3. High Service Pump No. 3: HSP-3.

B. General Requirements:
1. Split case centrifugal pump with shaft in the horizontal orientation.
2. Quantity: three (3).
3. NSF 61 and NSF 372 Listed to comply with the Reduction of Lead in Drinking Water Act.
4. Maximum Speed: 1800 rpm.
5. Rated Motor Horsepower: (QTY 1) Small Booster:~~100~~ **125** HP; (QTY 2) Large Boosters: ~~125~~ **150** HP.
6. Power Supply: 480V, 3-phase, 60 Hz.
7. Acceptable Pumps:
   a. Fairbanks Morse Pump
      1) Size: 5-inch 1824 (QTY 1); and 6-inch 1823 (QTY 2).
      2) Maximum pressure: 250 psig.
   b. Other pumps are acceptable only if they meet all the requirements of this specification and with prior approval by Engineer.

C. Materials
1. Casing: Cast iron (ASTM A48.)
2. Impeller (for use with chlorinated water above 2 PPM): Alpha Nickel Aluminum Bronze or 316 Stainless Steel.
3. Shaft Sleeve: 316 stainless steel.

4. Shaft: Steel AISI C1045.
5. Casing Wear Ring: 416 stainless steel.
6. Impeller Wear Ring: 316 stainless steel.
7. Base Plate: Structural steel or cast iron.

D. All pumps furnished under this section shall be provided by the same manufacturer.

2.03 COMPONENTS

A. Casing:
1. Horizontal split cast design.
2. Flange Connections: ANSI 125 pound rated.
3. Tapped and plugged holes for priming and draining. Furnish and install a 0.75-inch air release valve installed in a provided tap in the top of the volute of each casing, to facilitate air removal from the water column. See Section 40 23 20 for Air Release Valve requirements. Install with isolation ball valve. Route discharge per the air release detail and provide stainless steel screen.
4. Provide for removal of the rotating element without disconnecting the suction or discharge piping.
5. Furnish lower half of casting with cored passageways from the high-pressure area of the volute to each seal box for positive lubrication without the use of external flushing lines.
6. Integrally cast bearing arms with lower half of casing to ensure positive bearing alignment.
7. Bolt-on bearing arms are not acceptable.

B. Impeller:
1. Enclosed type, vacuum cast in one piece.
2. Dynamically balanced.
3. Key to shaft.
4. Exterior Finish: Turned.
5. Interior Finish: Finished smooth, free of burrs, trimmings, and irregularities.

C. Shaft Sleeves:
1. Seal sleeve to impeller hub by means of an O-ring.
2. Positively drive sleeve to the keyway.
3. Fasten the sleeve to the shaft by means that the manufacturer recommends.

D. Shaft Seal: Mechanical, Type 21.

E. Shaft:
1. One piece, finished and polished on all sections.
2. Length: Shortest practicable distance between bearings to minimize deflection and vibration.
3. Maximum Allowable Deflection: 0.002 inches at any point on the pump operating curve.

F. Casing Wearing Ring:
1. Radial type.
2. Press fit into casing.

G. Bearings:
1. Regreasable lubrication ball type.
2. Average Life: 100,000 hours.
3. Radial Loads: Provide single row inboard bearings.
4. Thrust Loads: Provide double row outboard bearings.
5. Mount bearings in moisture and dust proof machined housing.
6. Housing:
    a. Registered fits to ensure alignment.
    b. Pinned, to prevent rotation.
    c. Bolt to bearing arms.
7. Supply each housing with grease fitting and plugged relief port.

H. Coupling:
1. Provide flexible coupling to connect pump and motor shaft.

2. All metal type with flexible rubber insert.
3. Enclose entire rotating coupling element by means of a coupling guard.

I. Base Plate:
1. Mount pump and motor on:
   a. Groutable steel base plate.
   b. Steel drip rim base plate.
2. Incorporate integral drip channels on each side.
3. Provide NPT connection and plug for each channel.
4. Capable of supporting pump and motor without the use of additional supports or members.

J. Nameplate:
1. Mount permanent nameplate in a prominent location on the pump.
2. Include the following information:
   a. Manufacturer's name.
   b. Serial number.
   c. Pump design characteristics.

K. Motors:
1. NEMA configuration.
2. Premium efficiency.
3. Totally enclosed, fan-cooled.
4. Design for normal starting torque and low starting current.
5. Size: Sufficient to operate pump from shutoff head to open discharge without operating in the motor service factor.
6. Horsepower Rating: Sufficient to operate pump at any point on the head-capacity curve without overloading the nameplate horsepower rating of the motor, regardless of service factor.
7. Class F thermostat, one per phase.
8. Motor shall be inverter duty, 10:1 turndown (6-60 Hz), and meeting NEMA MG1 Part 31.
9. Manufacturers:
   a. US Motors.
   b. Marathon.
   c. WEG.
   d. Baldor.

L. Shop Coatings: Coat pump and base in accordance with Section 09 91 50.

PART 3 EXECUTION

3.01 INSTALLATION

A. Install pump in accordance with manufacturer's recommendations.

3.02 FIELD QUALITY CONTROL

A. Field Testing:
1. Conduct test of the pumping equipment in the presence of the Engineer.
2. Testing Period: One hour minimum, or longer as may be required to determine compliance with the specifications.
3. Provide all power, gages, measurement devices, and other apparatus required for the testing.
4. Remove all testing equipment upon completion of testing.
5. Provide copies of all test data and results to Owner and Engineer.
6. Resulting pump capacities shall be within 5 percent of the previously supplied certified curves.
7. Replace or rework pumping equipment or components which fails to meet the specified requirements.

B. Manufacturer's Field Services: Check pumps and motors for alignment (using laser alignment device) after installation and prior to field testing.

3.03 DISINFECTION

A. Disinfect all water contact surfaces prior to placement in service.

B. Disinfectant: 200 ppm chlorine solution or dusting chlorine compound per AWWA C654.

3.04 DEMONSTRATION

A. Provide minimum of 4 hours of operator training after pumps are in service.

END OF SECTION

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