SECTION 23 21 23 – PUMPS

PART 1 - GENERAL

1.1 SYSTEM DESIGN REQUIREMENTS

A. Pumping System Design
1. Primary-secondary pumping systems are required where applicable. Provide standby pumps for primary pumps and pumps serving critical areas.
2. Design pumping systems so that the available positive head at the pump intake will be larger than the required net positive suction head at the highest possible water temperature at the pump intake.
3. The pump curve representing flow-head relationship shall intersect the system curve at design operating point.
4. Select pumps to operate at optimum efficiency.
5. Pump motor shall be non-overloading over the entire pump curve shown by the manufacturer.
6. Specify pumps with separate pump and motor shafts and replaceable couplings for all but cartridge pumps.
7. Provide mechanical shaft seals. Gland seals are not acceptable.
8. Provide duplex pumping units for sewage ejectors and for sump pumps in critical areas. Include lead/lag selector and automatic switchover in the event of failure.
9. Pumps for Softened or DI water shall have Stainless Steel Impellers

1.2 QUALITY ASSURANCE

A. Regulatory Requirements:
1. HI Compliance: Design, manufacture and install HVAC pumps in accordance with HI "Hydraulic Institute Standards".
2. UL Compliance: Design, manufacture and install HVAC pumps in accordance with UL 778 "Motor Operated Water Pumps".
3. UL and NEMA Compliance: Provide electric motors and components, which are listed and labeled by Underwriters Laboratories, and comply with NEMA standards.
4. SSPMA Compliance: Test and rate sump and sewage pumps in accordance with Sump and Sewage Pump Manufacturers Association (SSPMA) and provide certified rating seal.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. Acceptable Manufacturers: Subject to compliance with requirements, provide products by the following:
1. In-line Circulator Pumps:
   a. Armstrong Pumps, Inc.
   b. Bell and Gossett ITT: Fluid Hanoung Div.
   c. Aurora
2. Vertical In-line Pumps:
   a. Armstrong Pumps, Inc.
   b. Bell and Gossett ITT: Fluid Handung Div.
   c. Aurora
3. Base-Mounted End Suction Pumps:
   a. Armstrong Pumps, Inc.
   b. Bell and Gossett ITT: Fluid Handung Div.
   c. Aurora
4. Positive Displacement Pumps:
   a. Viking
   b. Blackman

c. Roper
5. Vertical Suspended Sump Pumps and Sewage Ejector:
   a. Armstrong Pumps, Inc
   b. Peerless Pump
   c. Wek Pumps Co.
6. Submersible Sump Pumps and Sewage Ejectors:
   a. Weil
   b. Armstrong Pumps, Inc.
   c. Peerless Pumps

2.2 MATERIALS, GENERAL

A. Provide factory-tested pumps, thoroughly cleaned and painted with one coat of machinery enamel prior to shipment. Type, size and capacity of each pump is listed in the pump schedule. Provide pumps of same type by same manufacturer.

B. In-line Circulator Pumps:
1. General: Provide All pumps shall be bronze fitted.
2. Body: Cast iron with suction and discharge gauge tappings.
3. Shaft: Hardened alloy steel.
4. Bearings: Oil lubricated bronze journal bearings.
5. Seal: Mechanical with carbon seal ring and ceramic seat.
6. Motor: Non-overloading at any point on pump curve, open, drip-proof, oil lubricated journal bearings, resilient mounted construction, built-in thermal overload protection on single phase motors.
7. Coupling: Self-aligning, flexible coupling.
8. Impeller: Bronze, enclosed type, hydraulically and dynamically balanced and keyed to shaft.

C. Vertical In-Line Pumps:
1. General: All pumps shall be bronze fitted.
2. Body: Cast iron, 125 psi ANSI flanges of equal size, tappings for gauge and drain fittings.
3. Shaft: Steel with replaceable shaft sleeve.
4. Seal: Mechanical seal with ceramic seal seat.
5. Motor: Non-overloading at any point on pump curve, open, drip-proof, ball bearings, 15,000 hours bearing life, with lifting lug on top of motor.
6. Impeller: Bronze enclosed type, hydraulically and dynamically balanced, keyed to shaft and secured with locking screw.

D. Base Mounted End Suction Pump:
1. General: All pumps shall be bronze fitted.
2. Type: Horizontal mount, single-stage, flexible coupling, base mounted, designed for 175 psi working pressure.
3. Casing: Cast iron, 125 psi ANSI flanges, tappings for gauge and drain connections.
4. Shaft: Steel with replaceable shaft sleeve.
5. Bearings: Regreasable ball bearings.
6. Seal: Mechanical, with carbon seal ring and ceramic seat.
7. Motor: Open, drip-proof, regreasable ball bearings. Non-overloading at any point on the pump curve.
8. Impeller: Bronze enclosed type, hydraulically and dynamically balanced, keyed to shaft and secured with locking screw.
9. Baseplate: Structural steel with welded cross members and open grouting area.
10. Coupling: Flexible, capable of absorbing torsional vibration, equipped with coupling guard.

E. In-Line Recirculation Pumps:
1. General: Provide in-line recirculation pumps where indicated and of capacities as scheduled.

2. Type: Horizontal, oil lubricated, designed for 125 psi working pressure, 225 degree F (107 degree C) continuous water temperature and specifically designed for quiet operation.
3. Impeller: Bronze.
4. Body: Bronze or stainless steel construction.
5. Shaft: Steel, ground and polished, integral thrust collar.
6. Bearings: Two horizontal sleeve bearings designed to circulate oil.
7. Seal: Mechanical, with carbon seal face rotating against ceramic seat.
8. Motor: Non-overloading at any point on pump curve, open, drip-proof, sleeve bearings, quiet operating, rubber mounted construction, built-in thermal overload protection.
9. Coupling: Self-aligning, flexible coupling.

F. Positive Displacement Pump:
1. Type: Single stage, rotary gear.
2. Pumps: Cast iron casing hardened shaft with stainless steel sleeves and mechanical seal, seal-lubricating bronze bearings and integral by-pass type adjustable relief valve.
3. Drive: flexible couplings.
4. Base: Cast iron common mounting for pump and motor with drop rim and drain tapping.

G. Vertical Suspended Sump Pump and Sewage Ejector:
1. General: Provide above pit sump pumps as indicated, of size and capacity as scheduled.
2. Pump: Cast iron shell, stainless steel impeller for sewage ejector; bronze impeller for sump pump, stainless steel shaft, two factory sealed heavy duty grease lubricated sleeve bearings, elevated thrust bearing, ceramic mechanical seal, and perforated steel strainer.
3. Provide extended tubing for grease bearing service above basin cover.
4. Provide basin cover and pump support with access/inspection cover.
5. Provide stainless steel removal system.
6. Controls:
    a. Wall mounted sump/sewage electrical control in a self containing NEMA 12 enclosure, two door type fabricated from not less than 14 gauge steel. Neoprene sponge door gasket seals sufficient to protect interior components from weather and dust. Electrical panel doors constructed from 12 gauge steel with integral latches.
    b. All external operating devices shall be dust and weather proof. Provide operating handle for main power disconnects on the front of the panel. Mount internal components of the enclosures on removable back panels. Mounting screws for components shall not be tapped in the panel enclosure. Internal wiring within and interconnecting between, the panels shall be complete and no field wiring within the panels shall be required. Self contained wiring troughs and cable raceways within the enclosures. External cable traps or wiring troughs are not permitted.
    c. Do not install pressure gauges, pressure switches, water activated devices or water lines of any sort in any electrical control panel. Panel shall include the following:
        1) Low voltage control power transformer
        2) Transformer primary and secondary shall be fused.
        3) Nameplates shall identify the piece of equipment and respective function.
        4) All pilot lights shall be of the push to test type.
        5) Lamps shall be of the filament type and shall include 3-phase calibrated, adjustable class 10 overload relay including ambient compensated thermal overloads. They shall provide differential single-phasing protection.
        6) H.O.A. for each pump.
        7) Make termination of wires and cables at designated terminal blocks only. Identify control wiring as well as terminal blocks by abbreviated legends, clearly designating the equipment with which the wiring and terminal blocks are associated. Identify all wiring with heat shrink labels.
        8) All panel wiring shall be type XHHW, stranded copper. Minimum control wire size shall be #14 AWG.

7. The pump and alarm controller shall provide full range differential control of two pumps, plus a high and low level alarm in response to an electronic, level-proportional signal. Provide automatic switchover in the event one pump fails.
8. The controller will have the capabilities of observing the level and making adjustments of the control form the face of the controller. The level will be displayed on a 40 segment LED bar graph. Level adjustments will be by means of plug-in programming pins.
9. An alarm silence push-button on the face of the controller with four LEDs across the top of the controller shall indicate the ON/OFF state of each pump and alarm control circuits.
10. Locate manual override switch on the face of the unit. This switch will allow the input level signal to be overridden to confirm the performance of the controlled equipment. The switch shall be a spring-return-to-center type with raise-auto-lower positions.
11. The controller shall measure 36 inch high by 45 inch wide by 10 inch deep. All job connections to be a clamp type barrier terminal.
12. One (1) Model A-100 submersible transducer constructed of PVC/Buna N, supported by wall or cover clamps. Transducer will start and stop pumps and give alarm function of high/low level alarm and water in wet well depth. Mercury and/or magnet type float will not be used. Alarm levels and pump start/stop settings will be field adjusted via the plug in programming pin on the control panel.
13. Provide field wiring of pumps, level transducer, moisture temperature sensor, remote alarm, and incoming power.

H. Submersible Sump Pump and Sewage Ejector:
1. General: Provide submersible sewage ejectors and sump pumps as indicated, of size and capacity as scheduled.
2. Pump: Cast iron shell, stainless steel impeller for sewage ejector; bronze impeller for sump pump, stainless steel shaft, two factory sealed heavy duty grease lubricated sleeve bearings, perforated steel strainer and seal to be a carbon rotating against a stationary ceramic seat rated for 225°F.
3. Provide extended tubing for grease bearing service above basin cover.
4. Provide basin cover and pump support with access/inspection cover.
5. Provide stainless steel removal system.
6. Controls:
    a. Wall mounted sump/sewage electrical control in a self containing NEMA 12 enclosure, two door type fabricated from not less than 14 gauge steel. Neoprene sponge door gasket seals sufficient to protect interior components from weather and dust. Electrical panel doors constructed from 12 gauge steel with integral latches.
    b. All external operating devices shall be dust and weather proof. Provide operating handle for main power disconnects on the front of the panel. Mount internal components of the enclosures on removable back panels. Mounting screws for components shall not be tapped in the panel enclosure. Internal wiring within and interconnecting between, the panels shall be complete and no field wiring within the panels shall be required. Self contained wiring troughs and cable raceways within the enclosures. External cable traps or wiring troughs are not permitted.
    c. Do not install pressure gauges, pressure switches, water activated devices or water lines of any sort in any electrical control panel. Panel shall include the following:
        1) Low voltage control power transformer
        2) Transformer primary and secondary shall be fused.
        3) Nameplates shall identify the piece of equipment and respective function.
        4) All pilot lights shall be of the push to test type.
        5) Lamps shall be of the filament type and shall include 3-phase calibrated, adjustable class 10 overload relay including ambient compensated thermal overloads. They shall provide differential single-phasing protection.
        6) H.O.A. for each pump.
        7) Make termination of wires and cables at designated terminal blocks only. Identify control wiring as well as terminal blocks by abbreviated legends, clearly designating the equipment with which the wiring and terminal blocks are associated. Identify all wiring with heat shrink labels.

8) All panel wiring shall be type XHHW, stranded copper. Minimum control wire size shall be #14 AWG.

7. The pump and alarm controller shall provide full range differential control of two pumps, plus a high and low level alarm in response to an electronic, level-proportional signal. Provide automatic switchover in the event one pump fails.
8. The controller will have the capabilities of observing the level and making adjustments of the control form the face of the controller. The level will be displayed on a 40 segment LED bar graph. Level adjustments will be by means of plug-in programming pins.
9. An alarm silence push-button on the face of the controller with four LEDs across the top of the controller shall indicate the ON/OFF state of each pump and alarm control circuits.
10. Locate manual override switch on the face of the unit. This switch will allow the input level signal to be overridden to confirm the performance of the controlled equipment. The switch shall be a spring-return-to-center type with raise-auto-lower positions.
11. The controller shall measure 36 inch high by 45 inch wide by 10 inch deep. All job connections to be a clamp type barrier terminal.
12. One (1) Model A-100 submersible transducer constructed of PVC/Buna N, supported by wall or cover clamps. Transducer will start and stop pumps and give alarm function of high/low level alarm and water in wet well depth. Mercury and/or magnet type float will not be used. Alarm levels and pump start/stop settings will be field adjusted via the plug in programming pin on the control panel.
13. Provide field wiring of pumps, level transducer, moisture temperature sensor, remote alarm, and incoming power.

I. Spare Parts: Refer to Section 01 78 46 – Extra Stock Materials.

PART 3 - EXECUTION

A. Pipe drain from bases and stuffing boxes to floor drains.

B. Discharge increasers shall be concentric and located at pump discharge nozzle. Suction piping reducers shall be eccentric (flat on top) and located at pump suction nozzle. Do not use horizontal elbows at pump suction.

C. Support pumps and piping separately so that piping is not supported by pumps. Provide support under elbows on pump suction and discharge line sizes 4 inches and over.

D. Access: Arrange pumps to provide access for periodic maintenance, including removal of motors, impellers, couplings, and accessories.

E. Install base-mounted pumps on minimum of 6 inch high concrete housekeeping pad equal or greater than 3 times total weight of pump and motor with anchor bolts poured in place. Set and level pump, grout under pump base with non-shrink grout.

F. Install in-line pumps using continuous-thread hanger rod and vibration isolation hangers of sufficient size to support pump weight independent of piping system.

G. Electrical Wiring: Install electrical devices furnished by manufacturer but not specified to be factory-mounted. Furnish copy of manufacturer’s wiring diagram submittal to electrical installer.

H. Verify that electrical wiring installation is in accordance with manufacturer’s submittal and installation requirements of Division 26 sections. Do not proceed with equipment start-up until wiring installation is acceptable to equipment installer.

I. Install line size isolation valves on both sides of pumps. The valve on the discharge side shall be a balancing type with “Memory Stop”.

J. Install flexible connections on suction and discharge sides of base-mounted pumps between pump casing and valves, unless grooved pipe and fittings are used.

3.2 TESTING, CLEANING, AND CERTIFICATION

A. Balance all base-mounted pumps to 1 mil Peak to Peak.

3.3 COMMISSIONING (DEMONSTRATION)

A. Training: Provide 2 hours of instruction to the university representative for each pumping system provided.

END OF SECTION 23 21 23