

## **PUMP STATION DESIGN CRITERIA**

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### **PART 1 GENERAL**

- 1.1 The Contractor shall furnish and properly construct submersible pump stations as described herein and shown on the drawings.
- 1.2 The Contractor shall be responsible for all permits and/or waivers necessary to provide a complete and operational submersible pump station.
- 1.3 Major components of the pumping stations include the concrete structures, the pumping equipment, the pump controls, generators, telemetry, valves, fencing, site work, and related appurtenances.

### **PART 2 PUMPS**

- 2.1 Pump Station No. (assigned by BCWS) - Pumps shall be \_\_\_" size, non-clog submersible sewage pumps, capable of passing 3" diameter spherical solids. Each pump shall be designed for a capacity of \_\_\_ GPM against \_\_\_ ft. total dynamic head and require a \_\_\_ horsepower motor.
- 2.2 Pumps shall be manufactured by Flygt or ABS.
  - A. The drawings were developed using Flygt/ABS dimensional data.
- 2.3 Hermetically sealed submersible type electric motors designed to Class I, Group "D" specifications, shall be furnished for each pump. The motor nameplate horsepower rating shall not be exceeded by the brake horsepower requirement of the pump design condition of service for the impeller installed. The motor shaft shall be stainless steel, impervious to the liquid and waste matter being handled. Thermal overload protection and moisture detection systems shall be built into the motors.
  - A. Pump Station No. \_\_\_ - Shall operate at \_\_\_ volts, 3 phase, 60 hertz.
  - B. Two seals providing double protection for electrical parts and a moisture-sensing probe quickly detecting the influx of water past the first seal and warning of impending failure shall be provided.
  - C. The pump motor cable shall be suitable for submersible pump application with P122-MSHA approval and this shall be indicated by a code or legend permanently embossed on the cable. Cable sizing shall conform to NEC and ICEA specifications for pump motors. A ground check conductor shall be provided. Cables shall be unspliced from motors to load side of motor starter. Cable conduit shall have sealing fittings installed to minimize the

passage of gases from one portion of the electrical installation to another. Cable shall be suspended from stainless steel Kellem grip strain relief.

- D. Motors shall have Class F (155°C) insulation and withstand Class B (130°C) temperature rise with a service factor of 1.2 at the efficient point of the curve.
- 2.4 Pump Construction - The pump shall be constructed in accordance with ASTM A48 latest revision, Class 30, which shall include cast iron for integral support legs, pump casing and impeller. All pipe flanges shall be faced and to the thickness required for compliance with 125 lb. American Standard. Bolt slots are acceptable in lieu of drilled holes.
- A. Pump Casing - The pump casing shall be of the volute type and made of cast iron. The casing shall be of one-piece construction and of centerline discharge design to minimize clogging or flow interference.
  - B. Impeller - The impeller shall be cast in one piece and directly mounted to a one-piece stainless steel motor pump shaft. It shall not require separate pump shaft or coupling. Each impeller shall be a single vane type and shall pass a three-inch sphere. The ends of the blades shall be rounded to prevent clogging.
  - C. The impeller hub shall be provided with a keyway and key and will be locked to the pump shaft and maintained in this position by a washer and self-locking impeller screw.
  - D. Motor Bearings shall have a B-10 bearing life with a minimum of 40,000 hours.

### **PART 3 QUICK LIFT ASSEMBLY**

- 3.1 General - The Contractor shall furnish new "Quick Lift" side rail mechanisms to guide each submersible pump from upper level to its operational location in each wetwell.
- 3.2 Elbow - The base elbow shall be cast in accordance with ASTM A48 latest revision, Class 35B. All pipe flanges shall be faced and to the thickness required for compliance with 125 lb. American Standard. Bolt slots are acceptable in lieu of drilled holes. Bolt slots in the base shall be provided for mounting the elbow to the concrete floor or sole plate. The base elbow shall be specifically designed to permit the slide mechanism to link up the pump with the base elbow.
- 3.3 Guide Rails – The guide rails and all brackets shall be constructed from stainless steel, guide rails shall be 2" schedule 40 stainless steel and

attached to the curb frame or doorframe at the upper level by an attachment bracket.

- 3.4 Guide Shoes - Two shoes shall be provided to guide the pump assembly down the guide rail until the shoes contact the discharge elbow. The pump then fulcrums about this point and positions the pump discharge flange to properly engage it with the discharge elbow and maintain a leak-tight joint. Freeflo Base Elbow Systems manufactured by Conery Mfg., Inc. (Model No. BERS-0400 and POF-0400) – No exceptions unless specifically approved by BCWS.
- 3.5 Slide - The pump discharge shall be bolted to the slide on one side and the guide shall be attached to the other side. The slide will be guided in its descent and ascent by the rail and guide shoes. The guide rail upper bracket will be designed to permit removal of the pump without having to disconnect the guide shoes.
- 3.6 Chain and Cable – 316 stainless steel chain and cable shall be used to lift the pump/motor assembly from the wet well. Provide adequate length to reach bracket plus 3 feet. The entire lifting assembly shall be comprised of overhead rated materials with a documented working load rating of 125% of the pump and power cable weight.
- 3.7 The pump shall be capable of being removed from the wet well without having any personnel assist in the removal by entering the wet well.
- 3.8 Cable Hooks – 316 stainless steel cable hooks are required so pump cables can be hung from hooks and secured not to interfere with the removal of the pumps.

#### **PART 4 WETWELL, VALVES, AND EQUIPMENT**

- 4.1 Wetwell shall conform to the requirements of precast manholes in the sewer line section of these specifications. Wetwell base sections shall be designed in accordance with soil boring logs. All internal concrete surfaces of the wetwell and the discharge piping shall receive hydrogen sulfide protective coating approved by BCWS. Wet well to be sized to accommodate pump clearances. Minimum well size on standard pump station is 8' diameter. Wet-well excavation backfilled with lifts as specified in geotechnical report and ASTM D-1557. 3<sup>rd</sup> party compaction testing results submitted to EOR/BCWS prior to pad pours. Pad installation around top of wet well must be a monolithic pour with properly sized rebar for size of pad determined by the EOR. Any deviations must be approved by BCWS. Failure to provide these test results will hold up paving and potential project closeout and permitting of the station.

- 4.2 The pump access covers for the wet wells shall consist of access covers installed and positioned over the pumps as per the pump manufacturer's recommendations. All covers shall have a load capacity Load Rating: 300lbs. psf (1464 kg.psm) uniform live load. Material shall be aluminum alloy 6063-T5 and T6, or equivalent, 1/4" plate, with stainless steel or aluminum hasp, handle, and hinges. The frame shall be complete with hinged and hasp-equipped exposed padlock clip recessed locks are not acceptable. No "slam lock" with T handle key is required. The frame for the wetwell hatch shall include upper guide in the top slab of the wetwell. The doors shall have safety locking handles to lock the access door in the open position. Main hatches shall primarily be hinged on the discharge piping side to open back towards discharge piping and shall allow full access to remove pumps out of the front side without interference unless otherwise noted and approved on plans. Guide rail brackets and guide rails shall be installed away from the wall with sufficient room to remove pumps through the hatch with no clearance issues.
- Note: A Flygt Safe-Hatch or BCWS approved equal safety grate is required.

#### 4.3 Valves and Piping

- A. Check valves - Check valves shall be 175 psi working pressure, flanged, bronze disc ring and seat ring, neoprene faced, weight and lever, cushioned swing operated type valves. The cushion chamber shall be attached to the side of the valve body externally and so constructed with a piston operating in a chamber that will effectively permit the valve to be operated without any hammering action. The shock absorption shall be by air, and the cushion chamber shall be so arranged that the closing speed will be adjustable to meet the service requirements. All cushion chamber parts shall be composed of aluminum and stainless steel components. Valves shall be AWWA approved. A right and left hand model will be installed so the weight and lever are on the outside of the piping for access and ease of operation.
- B. Piping - Piping shall be of the diameter as shown on the Drawings. All pipe sections shall be of DI flanged AWWA Class B with flanges cast or ASA Class 250 with 125 pounds standard screwed flanges. All cored holes into wet well top for discharge piping shall be large enough for removal of installed pipe segments including flanges without disassembly of pipe flanges or cutting of pipe. All link seals installed shall be left exposed, no grouting or any other coating is required.
- C. Fittings - All pipe fittings shall be DI Class 125 ASA flange, fittings.

- D. Plug Valves –Plug valves shall be ASTM A-126 Class B cast iron body, flanged end, stainless steel bearings, and lever actuator type valves. Valves shall be manufactured by Milliken or DeZurik. A right and left hand model will be installed so the operator faces the outside of the piping for ease of access and operation. Seats on plug valves installed on above ground piping shall be oriented toward the pumps. Valves shall be 100% port eccentric no exceptions. Plug valves are required on bypass tee on FM discharge header as identified on BCWS details.
- E. Each discharge line shall be equipped with a tapped fitting, petcock, gauge diaphragm and a 4" glycerin filled dual range pressure gauge reading in feet and PSI, with the range and scale appropriate for the application. The gauge shall read in the center of the range during normal operations. A stainless steel diaphragm will be installed to separate the gauge from sewer. Location of gauge shall be identified on the plans and as noted on BCWS detail between check valve and plug valve on discharge header. Gauge diaphragm to be Ashcroft diaphragm isolator/Seal flushing type model No. 50-101SS-04T-CG or equivalent.
- F. Air release valves shall be ARI Model No. D-025 or equivalent. Size and location shall be as indicated on the Drawings based on pumping flow rates and manufacturer's recommendations. ARI Model No. D-26 or approved equal may be required based on flow rates. Design engineer to verify with manufacturer appropriate number and location of all ARVs installed on station header piping as additional ARVs may be necessary for optimum pump performance.
- G. Two emergency signs shall be attached to gate or fence in a location which is readily visible from the street. The sign shall be constructed from 1/8th inch aluminum and be bolted on the gate. All lettering shall be block style in black on a white reflective background. One sign shall contain the emergency phone information and the other shall contain the street address of the facility. Size & wording shall be as indicated on the drawings. Facility number and address shall be provided by BCWS
- H. Flow meter requirement: All regional pumps stations will require a flow meter be installed. Also any lift station that is manifolded to another force main shall be equipped with a flow meter. Toshiba Mount Anywhere 600 series with integral display shall be used and stainless steel shade protection is required.
- I. Hoist requirement: Lift stations with pumps over 100HP will require a hoist assembly and hoist. Hoist assembly must include a stainless steel cover for weather protection. Size and design to be reviewed and approved by BCWS. Structure can be galvanized or painted. If painted must follow

above grade pipe coating spec. Hoist electrical enclosure shall be rated NEMA 4 or higher for outside condition use.

## **PART 5 SUBMITTAL REQUIRED AT CLOSEOUT**

- 5.1 Certified final factory test report shall be provided to Owner, certifying the unit's full power rating, stability, voltage and frequency regulation.
- 5.2 (2) hard copy sets and one digital copy of complete:
  1. Pump O&M manuals with part list.
  2. Catalog cuts and wiring diagrams for approval
  3. Impeller and design information (pump curves).
  4. Factory performance test results for each pump.
  5. Multismart O&M manuals or one electronic copy.
  6. 3<sup>rd</sup> Party Compaction Test results from backfill material around wet well
- 5.3 Reports showing that all manufacturer recommended maintenance has been performed on the pumps since delivery was taken.
- 5.4 Spare parts, one rebuild kit, one hydraulic kit (Impeller, wear ring/wear plate, and any hardware associated)

## **PART 6 WATER SERVICE**

- 6.1 1" water service connection is to be installed with at least a 5/8" water meter and box according to the utility provider's specifications.
- 6.2 Merrill Frost Proof Yard Hydrant Model # C7502 ((3/4" pipe connections × 2" bury depth), IOWA Freezeless Yard Hydrant Model Y34, or approved equal shall be installed at the end of the service connection inside the fenced area with minimum 2' separation from fencing.
- 6.3 Reduced pressure principle backflow preventer assembly shall be installed within 3' of the water meter. Freeze protection is required on all backflows. 3<sup>rd</sup> party backflow inspection test report is required after station is online and has been permitted to operate. Design Engineer/contractor shall coordinate with BCWS testing time and provide inspection report.

## **PART 7 START-UP SERVICES**

- 7.1 The pumping unit Supplier shall be available for at least two days of start-up assistance and drawdown testing. The representative shall be fully capable of assuring the proper operation of the units and troubleshooting

any difficulties. He shall fully instruct Owner's personnel as to correct operating and testing procedures.

- 7.2 If the Permit to operate for the system is not issued within twelve (12) months of the start-up inspection, another start-up inspection must be conducted and be found satisfactory for BCWS to accept and assume O&M responsibilities.

## **PART 8 SECURITY OF LIFT STATION**

PVC Vinyl privacy fencing around station is required as identified in BCWS Detail Sewer Panel 3Q or as specified on approved plans. Footing width to be twice the post width or min of 18" diameter. Minimum depth of 36". All post shall incorporate aluminum stiffener inserts and shall be installed according to manufacturer's instructions. Submit shop drawings, gate design, and color samples with layout to BCWS and engineer for approval. White is the standard color for most BCWS lift stations. Main gate access shall be a slide gate design submitted to BCWS for approval. Hinged gate access is no longer the standard access gate allowed on BCWS pump stations unless specifically approved or called out on plans. Facility emergency signage is required as identified in BCWS detail Sewer Panel 3P. Two TFX2 LED 4000k floodlights or equivalent shall be mounted above the main control panel and positioned to illuminate entire fenced enclosure.

**END OF SECTION**