Section XVII

SANITARY SEWER PUMP STATION

DESIGN GUIDELINES

A. GENERAL

1. The following sanitary sewer pump station design guidelines are based on Federal, State and local health requirements and the Hilton Head No. 1 Public Service District engineering design criteria.

2. These design guidelines are applicable to all developments including but not limited to residential, commercial and industrial developments, subdivisions and/or parks requiring sewer service from the Hilton Head No. 1 Public Service District.

3. Design criteria for other than normal circumstances are to be presented to the District for approval prior to preparation of plans and specifications.

4. All design criteria, materials, and construction shall be in accordance with DHEC regulations, AWWA, and ASTM Standards.

B. GENERAL PUMP STATION DESIGN

1. Two (2) pumps of equal capacity, each capable of handling the design peak flow.

2. Capable of passing 3" diameter spherical solids, minimum.

3. At least two (2) pumps or pneumatic ejector shall be provided, unless the pump station serves only one (1) residential lot or one (1) building. An exception may be if the building serves a significant flow amount (e.g., apartment complex). If only two (2) units are provided, they shall have the same capacity and each shall be capable of handling the expected peak flow. Where three (3) or more units are provided, they shall be designed to fit actual flow conditions and shall be of such capacity that with any one unit out of service, the remaining units shall have capacity to handle peak sewage flows. The Department may consider the effect flow equalization, where applicable.

4. For domestic wastewaters and industrial wastewaters with solids which are similar in size and nature to solids in domestic wastewater, pump openings shall be capable of passing spheres of at least (3) inches in diameter, for raw, unscreened wastewater, and pump suction and discharge piping shall be at least four (4) inches in diameter, except for grinder pumps.

5. Pump stations:

   a. Submersible

      1) Default for all applications.

   b. Self priming centrifugal

      1) Only for special exceptions as determined by the District.

   c. Grinder pumps are not acceptable.

6. Peak factor:

   a. Minimum, 2.5.

   b. Based on the source of the wastewater and the distance of the pumpstation from the source.

7. Future capacity: Consideration is to be given when designing pumps of the ultimate capacity as outlined in the District's sanitary sewer master plan.

8. Wetwell level settings:

   a. Distance between pump "OFF" and lead pump "ON": minimum as specified by the pump manufacturer.

   b. Distance between lead pump "ON" and lag pump "ON" and alarm "ON": 6", minimum.

   c. Distance between lag pump "ON" and alarm "ON": 6", minimum.

   d. Distance between alarm elevation and inlet pipe: 1'-0", minimum.

e. For pump stations with duplex pumps each pump shall be designed to operate in a lead lag sequence and be on an alternating cycle. For pump stations with more than two (2) pumps alternate designs may be considered.

9. A shutoff valve (e.g., gate valve) and a check valve shall be located on the discharge line from each pump. The check valve shall be located between the shutoff valve and the pump.

10. The shutoff valve(s) for the pump station, as required in subsection 67.300.C.8. above, or an additional shutoff valve on the common discharge line, shall be located outside of the wet well in a separate valve pit or apparatus (e.g., valve box) to facilitate proper use of the valve. In certain cases, the Department may require watertight design of the pit or other apparatus for the purpose of capturing valve leakage. For watertight design, it shall have a means of dewatering (e.g., drain line) back to the wet well, with provisions for preventing gases from entering the pit from the wet well.

11. The check valves for the pump station shall be located outside the wet well in a separate valve pit or dry well, unless the check valves are an integral part of the pump and can be removed from the wet well for repair or replacement with the pump, without dewatering the wet well or disconnecting any piping in the wet well, or unless the following conditions are provided by the applicant, and approved by the Department:

    a. The entity accepting the pump station for operation and maintenance shall apply for a waiver to the requirement stating reasons for the request.

    b. The entity shall certify in writing to the Department that its employees are trained to use all appropriate safety equipment to allow entry to confined spaces in accordance with State and Federal OSHA/Labor laws and regulations.

    c. The utility’s operation and maintenance record may be reviewed to determine that operation and maintenance problems with pump stations have not occurred or, if they have, the problems were rectified to the Department’s satisfaction. If problems with the operation and maintenance of pump stations have occurred and were not rectified to the Department’s

satisfaction, then the Department may require the check valves to be located outside of the wet well, in a separate valve pit.

12. Pumps shall have an operating point at or near peak efficiency.

13. Self priming pumps:

    a. Lower capacity pumps can be provided initially if:

        1) Adequate parts are provided to allow the speed or impeller to be changed for future ultimate capacity.

        2) Motor is designed for ultimate design flow.

14. An emergency operation plan on the sewer pump station(s) shall be provided. For areas determined by the Department to be environmentally sensitive (e.g., shellfish harvesting areas, designated recreational waters, or primary source water protection areas located in close proximity), the Department may require more extensive plans and equipment, including on site auxiliary power or a Department approved equivalent plan. The Department may evaluate the effect of power outages where the pump station serves sources such as businesses that would not be able to operate otherwise. The plan shall include one of the following methods showing how the pump station(s) shall be designed to provide continuous operability in the event of a power failure, natural disaster, etc.:

    a. An on site standby generator, either permanently installed with capability to operate automatically or skid/trailer mounted types with appropriate connections provided.

    b. Connecting the pump station to two (2) separate utility substations, with an automatic switching feature.

    c. Providing sufficient capacity, in the wet well, above the pump on level, to contain the wastewater that may be generated during the longest power outage of the last five (5) years. A letter shall be submitted from the utility company that serves this pump station with electricity stating the longest power outage, in the service area of the pump station, that occurred during the last five (5) years, excluding a catastrophic storm.

d. Provide a method to pump around the pumps and control panel by using a pump and providing a way to pump into the force main downstream of the check valve.

e. Provide a transfer switch for a portable generator and demonstrate that the utility owns adequate generators and could reasonably respond during a power outage.

f. Industrial facilities need to provide back up power as specified above unless the industrial facility can show that their processes stop in the event of a power outage and that enough storage is available until power is restored, so an overflow shall not occur. Design calculations or other information shall be provided for justification. Refer to DHEC Reg. 61-67.3.C.15.

15. Locate pumps, influent pipe and float cable so that influent pipe does not interfere with manhole steps or float cables during operation.

16. Provide manhole on influent line within 40' of pump station for by-pass pumping.

C. SELF-PRIMING PUMP STATION

1. Self contained fiberglass enclosure.

2. Individual suction line for each pump.

3. Pressure and suction gauges with isolation valves on each pump.

4. Suction lift pumps shall be of the self priming or vacuum priming type.

D. SUBMERSIBLE PUMP STATION

1. Opposite opening, dual access covers with stainless steel safety chains or nylon coated stainless steel wire rope.

2. Stainless steel hoist sockets with covers on top of wetwell.

3. Install valves in a valve pit separate from the wetwell.

a. Adequate valve pit dimensions to allow operation and maintenance of all valves in the pit.

b. Minimum dimensions:
   1) 4-inch main: 4'x4'.
   2) 6-inch main: 6'x4'.

4. Provide opposite opening, double leaf access hatch with opening dimensions the same as the inside dimensions of the vault.

   1) Stainless steel safety chains or nylon coated stainless steel wire rope.

   b. Provide manhole steps.

   c. Vault is to have a 4" floor drain with integral P-trap and float valve with drain back to the wetwell.
      1) Provide adequate depth to allow installation of the floor drain.

   d. Precast vaults are acceptable as long as the wall dimensions and reinforcing steel match Detail XX-7.

5. Provide ½" tap with pressure gauge connection prior to check valve. See Detail XX-8.

E. WETWELL DESIGN CRITERIA

1. Size the wetwell based on the following:

   a. Flow from proposed development and any associated future development.

   b. Capability to receive flows from surrounding areas as determined by the District's Master Sewer Plan.

   c. Formula:

$$V = \frac{T}{\frac{1}{Q-S} + \frac{1}{S}}$$

Where: V = Effective volume of wetwell (in gallons)
T = Time for one pump cycle (in minutes)
Q = Pumping rate (GPM)
S = Flow into wetwell (GPM)

2. Normal operating volume shall prevent any one pump from starting more than three (3) times per hour.

3. Interior components:

    a. Type 316L stainless steel hardware including, but not limited to, the following:

        1) Lifting chains

        2) Anchor bolts

        3) Bolts and nuts

        4) Guide rails

        5) Rail guides

        6) Cable holder

        7) Discharge piping.

4. Level control is to be provided by ultrasonic level controller or submersible transducer.

5. Pump stations shall have an alarm system (e.g., audible and visible high water alarm, centralized automated alarm system). The alarm system shall be designed to function if power is not available for any pump. For pump stations located in remote and/or environmentally sensitive areas (e.g., adjacent to shellfish harvesting areas, designated recreational areas, and primary source water protection areas), the Department may require an automatic dialing system via dedicated phone line or equivalent systems to assure minimal impact in the event of pump station failures. In remote and/or environmentally sensitive areas, the Department may also require that a backup battery pack be provided in the control panel of the pump stations so that in the event of a power outage the audible/visible high water alarms and/or automatic dialing system shall be activated.

6. Locate level switch where flow from the inlet pipe will not interfere with the float.

7. Provide a hanger for the float switch cable and power cables.

8. Line wetwells, walls, and bottom surface of the top cover with a high density polyethylene (HDPE) concrete protective liner (CPL) or Raven epoxy coating.

9. Where an increase in main size is required, provide a reducing elbow at the pipe flange connection.

10. Locate to allow access with vacuum truck and boom truck.

11. Minimum slope of one to one on the floor to the hopper bottom.

12. Horizontal area of hopper bottom shall be no larger than necessary for proper installation and operation of the pump or pump inlet.

13. The pump station wet well and dry well shall be ventilated, excluding the valve pit. The vent (e.g., a screened inverted “j” tube) shall be constructed of a weather durable material (e.g., stainless steel).

F. ELECTRICAL

1. Design electrical service to handle the ultimate capacity of the pump station.

2. Provide support for electrical equipment in accordance with Details XX-4 and XX-10.

3. Location of control panel.

   a. Minimum, three (3) feet clear access from front face of panel to wetwell.

4. Provide 3-phase power.

5. Provide surge protector on main power source.

6. Provide emergency receptacle.

7. Provide industry standard LED floodlight.

G. PUMP STATION SITE

1. Minimum property size: 50' x 50'.

2. Design gate to allow entrance of service trucks without blocking the main roadway.

3. Design site layout to allow access of service trucks to the pump station.

4. Access road:

   a. 12 foot wide.

   b. Crushed stone pavement.

5. Area within pump station site:

   a. 4" of No. 57 washed stone with plastic weed barrier to 1' beyond fence.
      1) Acceptable weed barrier product: Mirafi 600X.

6. Fencing:

   a. Each pump station shall be fenced or secured in a locked building/enclosure or be located in a restricted access area to prevent access by unauthorized persons. The type of fencing or other means of controlling access shall be approved by the Department.

   b. A weather durable sign, approved by the Department, with a twenty four (24) hour emergency telephone number, shall be located at a conspicuous point on the fence or structure of the pump station, unless the pump station is located in a restricted access area.

7. Provide potable water source, minimum 1".

H. Operational Description

1. The pump station shall be supplied with a pump control panel which shall provide local pump control and shall interface with the Remote Telemetry Unit (RTU) being supplied by the Instrumentation and Control System Integrator.

2. In normal operation level in the wet well shall be detected by a level sensing device supplied by the Instrumentation and Control System Integrator. This level signal (4 to 20 mA) shall be input to the RTU. Upon increasing level, when the level reaches the “Lead Pump On” set point, the RTU shall produce a dry contact closure which shall be wired to the Pump Control Panel and shall cause the lead pump to start. If the level in the wet well continues to rise and reaches the “Lag Pump On” set point, the RTU shall produce a dry contact closure which shall be wired to the Pump Control Panel and shall cause the lag pump to start.

3. When the level in the wet well falls below the “Lag Pump Off” set point, the RTU shall produce a dry contact closure which shall be wired to the Pump Control Panel and shall cause the lag pump to stop. When the level in the wet well falls below the “Lead Pump Off” set point, the RTU shall produce a dry contact closure which shall be wired to the Pump Control Panel and shall cause the lead pump to stop.

4. After each complete pumping cycle the pumps shall be alternated by logic in the RTU.

5. In the event that the level sensing device fails or the RTU fails and the level in the wet well rises to the High-High level, the High-High level float switch shall be activated. This signal shall be wired directly to the Pump Control Panel and when activated shall cause both pumps to start. When the level in the wet well falls to below the Low-Low level, the Low-Low level float switch shall be activated. The Low-Low level float switch shall be wired directly to the Pump Control Panel and when activated shall cause both pumps to stop running.

6. A dedicated terminal strip shall be installed in the Pump Control Panel to allow the following signals to be wired out as dry contacts for monitoring by the RTU:

    1) High-High Wet Well Level Alarm

    2) Low-Low Wet Well Level Alarm

    3) Pump No. 1 Status (Running/Stopped)

    4) Pump No. 1 Fault Condition

    5) Pump No. 1 H-O-A Selector Switch in “Auto” Position

    6) Pump No. 2 Status (Running/Stopped)

    7) Pump No. 2 Fault Condition

    8) Pump No. 2 H-O-A Selector Switch in “Auto” Position

    9) Power Phase Loss Alarm

7. A dedicated terminal strip shall be installed in the Pump Control Panel to accept the following control signals (as dry contacts) from the RTU:

1) Pump No. 1 Start/Stop
2) Pump No. 2 Start/Stop