10 ▪ WASTEWATER PUMP STATIONS

10.01 *Design Basis and Standard Requirements*

This Chapter provides minimum standards for the design and construction of wastewater pump stations and force mains. All wastewater pump stations connected to the City of Belmont system shall meet the requirements of the North Carolina Administrative Code, Title 15A, Subchapter 02T - Waste Not Discharged to Surface Waters, and the NCDENR *Minimum Design Criteria for the Permitting of Pump Stations and Force Mains* with the following modifications and additions.

10.02 *Information Required*

a. Plans and specifications for sanitary pump stations shall be submitted to the City of Belmont for review and approval prior to the submittal to NCDENR – Division of Water Quality (DWQ) for construction permit.

b. The pump station plan set shall contain a sheet with the total service area (drainage basin) outlined, land use assumptions, and detailed flow calculations used to determine the required station capacity.

c. Calculations and other information shall be submitted to the City in an Engineer's design report.

10.03 *Pump Station Classification*

a. Pump stations are classified by the capacity and function of the station.

   (1) Neighborhood pump stations generally serve a single neighborhood or sub-region of the tributary watershed basin. For the purpose of these standards, neighborhood pump stations will be considered as stations having a capacity of 300 gallons per minute (gpm) or less and serving a single development.

   (2) Regional pump stations are high capacity stations designed to serve a larger tributary area, quite often including several tributary neighborhood pump stations. The capacity of these stations will vary. A regional pump station may initially have a capacity of less than 300 gpm, but will ultimately be enlarged. Proposed regional pump stations that have been identified in the City's water and sewer master planning documents include the East, West, and South Pump Stations.

b. Additional requirements apply to regional pump stations.

10.04 *Capacity Determination*

a. Pump capacity shall take into consideration proposed service area and tributary areas that may ultimately connect to the station.

b. The pump station submittal shall include an Engineering Report that has been signed, sealed, and dated by a Professional Engineer licensed in North Carolina. The report must include, at a minimum, the following:

(1) Total service area map (drainage basin).

(2) Land use assumptions and detailed flow calculations used to determine the required station capacity.

(3) Total dynamic head calculations for all applicable pumping situations.

(4) System curve/pump curve analysis used to determine pump selection and operational point.

(5) Detailed surge analysis under all operating conditions.

(6) Pump station cycle and pump run times, including an evaluation of any depressed sections of the force main to determine if the pump station is capable of completely flushing the force main section being evaluated in a single pumping cycle.

(7) Pump station flotation and buoyancy calculations.

(8) Available emergency storage capacity at average and peak wastewater flows.

(9) Minimum velocity within the force main.

(10) Maximum detention times within the pump station and force main.

(11) Downstream sewer evaluation demonstrating that the pump station discharge will not overload the receiving sewer line:

- In situations where the pump station discharges into a gravity sewer, the downstream gravity sewer shall be evaluated based on peak flow from the proposed project as well as peak flows already tributary or permitted to the downstream gravity sewer.

- In situations where the pump station discharges into another pump station, the downstream pump station shall be evaluated to verify its ability to convey peak

flows from the proposed project as well as peak flows already tributary or permitted to the downstream pump station.

- In situations where the pump station discharges into an existing force main, the common force main shall be evaluated on peak flows from the proposed project as well as peak flows already tributary to the common force main. The ability of each pump station tributary to the common force main to pump against additional head created by greater flows through the force main shall also be evaluated. An evaluation of the discharge point of the downstream force main shall also be performed.

c. For pump stations that will ultimately be expanded in capacity, the following accommodations shall be made in the design and initial construction of the facilities:

(1) Wet well must be sized for ultimate influent flow rate and pump operation.

(2) Motor control panels and electric wiring must be sized to accommodate future increases in pump motor horsepower.

(3) Generator capacity, transfer switch and controls, and electric wiring shall be adequate for future pump motor size.

10.05 *Pumps and Motors*

a. Only non-clog pumps designed and manufactured for use in conveying raw, unscreened wastewater shall be acceptable. Pumps shall be adequately protected from damage due to failure conditions specific to the selected pump type and pump station configuration.

b. Pump selection and construction shall consider the duty requirements as well as the physical and chemical characteristics of the wastewater.

c. Pumps shall be suitable for continuous duty in conveying raw, unscreened wastewater.

d. Pumps shall be capable of handling a three-inch solid and any trash or stringy material that can pass through a four-inch hose.

e. Pump suction and discharge openings shall be no less than four inches in diameter.

f. At least two pumps shall be provided.

g. Submersible pumps shall include rail system to facilitate pump and motor removal without maintenance personnel entering the wet well.

h. Motors shall be explosion proof.

i. Pump shut-off elevation in wet well shall be above the top of pump.

j. Electrical service for pump motors shall be three phase.

10.06 *Wet Well*

a. Wet well shall be sized to meet cycle time requirements of the DWQ.

b. Consideration shall be made to oversizing the wet well to accommodate future tributary area flows.

c. Wet wells shall be designed to minimize pump or pump suction piping operational problems resulting from the accumulation of solids and grit material within the wet well.

(1) Acceptable designs include the use of fillets and sloped wet well floors.

(2) The design of fillets and slopes shall be such that solids are effectively moved toward the pump or pump suction piping.

(3) No projections shall be allowed within the wet well or on the well wall which would allow deposition of solids under normal operating conditions.

d. Influent pipe shall not discharge onto pump float controls. An outside drop pipe assembly shall be provided.

e. Provide large hatch for inspection of pumps and float controls, and for easy removal of pumps and motors.

f. Do not provide manhole steps.

g. Wet well shall be coated on the interior with Polyurea or as approved.

10.07 *Influent Bar Grate*

a. A separate influent bar grate structure shall be provided upstream of the wet well for neighborhood pump stations.

b. Structure shall have a minimum internal dimension of four feet square.

c. If structure is greater than six feet deep to pipe invert, structure shall be six foot square or larger to accommodate safe personnel access.

d. Structure shall include:

(1) Galvanized steel grate with bar spacing of 1-1/2 inch on centers.

(2) Stainless steel wire mesh basket for screenings.

(3) Overflow weir / channel.

(4) Aluminum access ladder.

(5) Corrosion resistant grating at the bar grate level for personnel to stand on during raking. Materials are subject to City approval and conditions of operation.

(6) Post and chain guard railing around structure.

(7) Polyurea or as approved interior coating.

10.08 *Mechanically Cleaned Screen*

a. Regional pump stations shall be provided with an automatic screening device in separate concrete structure.

b. Screening devise shall be, or be similar to, the grinding unit manufactured by JWC Environmental as the “Muffin Monster” or as approved.

c. Screening device and structure shall be design for easy access and equipment removal for maintenance.

10.09 *Influent Gravity Sewer*

a. The first system manhole upstream of the bar grate structure or screening equipment chamber shall be coated on the interior with Polyurea or as approved coating.

b. The section of the influent gravity sewer upstream of the bar grate structure shall be cement lined ductile iron pipe (DIP), AWWA C151, Pressure Class 350 with 401 Protecto or as approved ceramic epoxy interior coating.

10.10 *Pump Hoist*

a. A hoist of sufficient capacity to lift the pumps and motors out of the wet well shall be provided. It shall be removal for storage.

b. A recessed socket (with cover) shall be embedded in the wet well top slab.

10.11 *Pump Station Building*

a. A 30 foot by 30 foot building shall be provided at regional pump stations for the pump motor controls, odor control chemical storage tank and delivery system, and emergency power generator.

b. Building shall be provided with access door and rollup equipment door adequately sized for the removal and replacement of equipment.

c. Building shall be of brick or concrete masonry unit construction with metal roof. Building shall be designed to be compatible with the surrounding development and have low maintenance requirements.

d. Building shall include a small employee restroom.

e. No building is required for neighborhood pump stations.

10.12 *Valve Vault and Accessories*

a. A separate vault shall be provided for check and isolation plug valves.

b. The minimum internal dimension shall be four feet square.

c. A diaphragm protected pressure gauge shall be provided on the force main discharge pipe.

d. Provide large hatch for inspection of valve vault equipment including pressure gauge, and for easy removal of valves and piping.

10.13 *Piping and Valves*

a. A single influent line shall be oriented so that turbulence and air bubbles do not affect pump operation. Incoming flow shall not fall onto any pump. Influent piping shall be cement lined DIP, AWWA C151, Pressure Class 350 with 401 Protecto or as approved ceramic epoxy interior coating within the station fence enclosure or a minimum of 36 feet.

b. Each pump shall be provided with separate discharge piping. The piping shall be cement lined DIP, AWWA C151, Pressure Class 350 with 401 Protecto or as approved ceramic epoxy interior coating. Piping shall not be less than four inches in diameter with the final size being selected to achieve velocities between 4 and 10 feet per second(fps). The pipe and fittings shall have a minimum of 12 inch clearance from any wall or floor and there shall be a minimum 30-inch clearance between the piping of each pump.

c. All fittings inside pump station, valve vault, and through the emergency pump connection shall be flange joint ductile iron fittings. Flange joints shall be either Class 125 or Class 250, as required. Flanges, flange bolts and nuts, and gaskets shall conform to the dimensional requirements of ANSI B16.1 for Class 125 or ANSI B16.2 for Class 250. Bolts shall be ASTM F593 316 stainless steel (SS) and have standard hexagonal heads and ASTM F 594 304 SS nuts. An anti-seize compound shall be used

during assembly. No all-thread connections are allowed between valves or between valves and piping.

d. The suction and discharge piping systems shall be provided with sufficient valves to effect proper operation and maintenance of the pump station during both normal and emergency conditions. Pump isolation valves shall have the seat oriented towards the pump. All valves within the station enclosure shall open left.

(1) Valves shall be suitable for use with raw, unscreened wastewater and shall be of a design suitable for its function, its installation location, as well as the normal and maximum operating pressures expected at the pump station.

(2) Valves and piping shall have sufficient room for easy disassembly of flange bolts and piping and valves.

(3) A full-closing eccentric plug shut-off valve shall be provided on the discharge piping of each pump.

(4) A swing check valve shall be provided on the discharge piping of each pump, between the pump and the shut-off valve. Check valves shall be placed in the horizontal position.

(5) All valves shall be located so that they are readily accessible.

e. All valves for pressure sewers and force mains shall be eccentric plug valves as follows:

(1) Valves shall have a direct pressure rating of 100 psi with a working pressure of 175 psi for 12-inch and smaller valves and 150 psi for 14-inch and larger valves. Bi-directional shutoff is required.

(2) Plug valves shall be as manufactured by Dezurik or as approved.

(3) Buried valves, and all valves under 8-inches in size, shall have 2-inch square operating nuts.

(4) Valves 8-inches and larger require gearing in enclosed gear cases. Gearing shall be in accordance with the valve manufacturer's recommendations as required to permit easy operation of the valve by one man without excessively large hand wheel or cranks.

(5) Extension stems, stem guides, operating levers, and other miscellaneous items required for a complete installation shall be provided in accordance with the requirements and recommendations of the valve manufacturer.

(6) Discharge valves in vault shall be installed with adjustable aluminum pipe cradle and stainless steel standpipe. Buried valves shall be provided with a valve box.

f. Pipe Connections

(1) Flexible pipe joints shall be used between the pump station structures to allow for differential settlement without compromising the integrity of the overall pump station.

(2) Pipe inlets and outlets of pump station structures shall be made watertight with flexible boots according to ASTM C-923 and grouted.

10.14 *Emergency Pump Connection*

a. Piping shall be provided above ground level for the connection of a portable emergency pump.

b. Connection assembly shall allow use of the force main while pumping out of wet well during emergency situations.

c. Piping shall connect to the force main on the discharge side of the valve vault.

d. The discharge force main shall be fitted with an eccentric plug valve outside the valve vault and downstream of this valve shall be a flanged tee with a riser pipe extending vertically to the surface.

e. The riser pipe shall have a check valve and an eccentric plug valve fitted on the end. This plug valve shall have a blind flange with a male cam-lok connector with a ¼" National Pipe Taper (NPT) ball valve and dust cap.

f. The buried plug valve shall operate with a two-inch square nut and the surface plug valve shall operate with a wrench.

g. The Contractor shall furnish a valve key and a wrench as part of the permanent station equipment.

10.15 *Motor Control Components*

a. Motor controls for regional pump stations shall have variable frequency drives.

b. Motor controls shall be installed in the building required for regional pump stations.

c. Neighborhood pump station motor controls shall be mounted on a metal rack and protected with rain shield roof. An area light shall be provided under the roof overhang.

d. The following components shall be included:

(1) Weather proof stainless steel enclosure.

(2) Delayed start timers for each pump.

(3) Running lights for each pump.

(4) Hand-off-automatic switches for each pump.

(5) Elapsed time meters for each pump.

(6) Motor overload reset button for each pump.

(7) High motor temperature and moisture detection shutdown devices.

(8) Pump sequence selector switch.

(9) Automatic pump alternation.

(10) Auxiliary power transformer - 115 volt.

(11) Duplex GFCI service receptacle - 115 volt.

(12) High water alarm - flashing red light and horn with battery back-up power.

(13) Alarm indicator light.

(14) Alarm silence switch.

(15) Circuit breakers and other miscellaneous equipment.

(16) Lightning – surge protection.

(17) Voltage phase monitor for 3-phase service.

(18) Mercury float switches for pump off, lead pump on, lag pump on, high water, and backup high water alarm.

(19) Automatic telephone dialer.

(20) Pocket for and with wiring diagrams and O&M manual.

10.16 *Automatic Telephone Dialer*

a. The automatic dialer shall be supplied with battery back-up power capable to signal seven alarm conditions including:

(1) Utility power failure or phase abnormality.

(2) Pump high temperature - one for each pump.

(3) Pump fail to start or run - one for each pump.

(4) High wet well level.

(5) Spare.

b. Automatic dialer manufacturer is subject to City preference and approval.

10.17 *Emergency Generator*

a. Generator shall be permanently installed at the site with automatic transfer switch.

b. Generator shall be capable of powering both pumps and controls during power outages.

c. A natural gas powered generator is to be provided where natural gas is available. Provide backup propane tank with capacity to operate generator for a 24 hour period.

d. If natural gas is not available, provide diesel engine powered generator. Provide above ground fuel tank with sufficient capacity to operate the pump station over a 24 hour period. Fuel tank may be base mounted, but must meet all storage tank secondary containment requirements.

e. Generator to be located inside building at regional pump stations. Fuel tank shall be exterior of the building.

f. Generator shall be equipped with noise attenuation equipment appropriate for residential conditions.

10.18 *Odor Control*

a. Odor control at regional pump stations shall include chemical injection of Bioxide or as approved at the wet well. Included in the system shall be a chemical storage tank with 3,000 gallon capacity, injection pump, electrical service, and piping.

b. Tank and injection pump shall be located in pump control and generator building.

c. Odor control system shall be installed with initial construction, and sized for initial and ultimate wastewater flows rates.

d. At neighborhood pump stations, provisions shall be included in the design for the future installation of Bioxide or as approved odor control equipment. To be provided with pump

station initial construction are:

(1) Concrete pad (6 inches thick) for future chemical storage tank.

(2) Underground piping and conduits.

(3) Additional circuit in electrical panel box.

10.19 *Flushing Connection and Potable Water*

a. All pump stations shall be provided with a 4 inch water service as a supply for flushing the pump station and force main.

b. The service shall include 4 inch tap on nearest water main, 4 inch restrained joint ductile iron pipe service line, reduced pressure backflow prevention device, buried plug valve and box, and water meter.

c. Flushing line shall terminate at the bar grate structure for neighborhood pump stations and at the wet well of regional pump stations. An air gap is required between the bottom of the discharge and maximum liquid level in the bar grate structure or wet well.

d. A 1 inch freeze proof potable water yard hydrant is required. The water line for this shall branch from the backflow protected side of the 4 inch service line.

10.20 *Force Mains*

a. Pipe material and specifications shall be selected based on the installation and operating conditions of the force main following installation. Such factors include, but are not limited to:

(1) Installation depth and overburden pressure.

(2) Soil conditions and groundwater presence.

(3) Corrosion resistance from both external and internal sources.

(4) Strength required to withstand internal pressures expected during normal operation, and those resulting from hydraulic surges and water hammer.

b. Minimum depth of bury for all force mains regardless of pipe material is 36 inches.

c. Force mains shall be constructed of one of the following:

(1) Cement lined ductile iron pipe (DIP), Pressure Class 350.

- Pipe shall conform to AWWA C151.
- Pipe shall have 401 Protecto or as approved ceramic epoxy interior lining.
- Fittings shall be ductile iron conforming to AWWA C110 or AWWA C153. All fittings shall be epoxy lined and coated.
- Force mains of ductile iron pipe shall have mechanical or gasketed push-on type joints. Restrained joint ductile iron pipe shall be used for thrust restraint.

(2) Polyvinyl chloride (PVC)

- PVC pipe shall conform to AWWA C900 or C905. The thickness and pressure class of PVC pipe required for the installation and operating conditions during the expected service life of the force main shall be determined in accordance with AWWA C900 or AWWA C905 but shall be a minimum of Pressure Class 200 with an SDR of 14 or less.
- Force mains of PVC pipe shall have elastomeric gasketed push-on type joints.
- Mechanical joint ductile iron epoxy coated pipe fittings conforming to AWWA C110 and C116 shall be used for force mains four inches in diameter and larger.
- Appropriate thrust restraint is required. Method of restraint is subject to City approval.

(3) All pipe used for force main construction shall be labeled or otherwise identified as conveying wastewater.

- All force mains shall be clearly identified with green plastic locator tape made specifically for that purpose. The tape shall be marked with black lettering clearly identifying the pipeline as sanitary sewer. The tape shall be Type III Detectable Marking Tape as manufactured by Lineguard, Inc., or as approved. The tape will be placed both approximately 1 foot above the pipe and also 2-feet below the ground surface.
- A 14-gauge solid copper coated tracer wire shall be laid on top of PVC force mains. This wire shall be secured to the pipe near every bell and at the center of each pipe joint. This wire shall be brought into air release valve vaults and secured to the stainless steel hook along with the valve shutoff cable.

(4) Air release and air / vacuum relief valves.

- The route of the force main shall be designed such that the number of air release

and vacuum relief valves is minimized.

- An automatic air release valve shall be provided at all high points to prevent air locking of the force main. An automatic combination air release and vacuum relief valve will be located at the ultimate high point and when necessary for surge control where sub-atmospheric pressures or column separation may occur. Automatic air release valves shall be used at other local high points. Air release valves are required when the difference between the low point and high point exceeds one pipe diameter.

- These valves shall be of the quick-opening, slow-closing type and may be standard height or short body design with a minimum 2-inch diameter screw-threaded inlet. Outlet is to be screw-threaded.

- Air and vacuum sewer valves shall be mounted to force main through the use of a bronze corporation stop and stainless steel tapping saddle followed by a stainless steel ball valve.

- The minimum depth of bury for force mains must be increased to allow adequate vertical clearance for the valve and valve vault manhole.

- Valve vault shall be precast concrete with manhole cover and steps.

- Manhole frames and covers shall be US Foundry 669 or as approved with "SANITARY SEWER" cast into cover.

- Vent pipes shall be installed so that the above grade portion is near the right of way line.

10.21 *Surge Control*

a. Force mains and their associated pump stations shall be analyzed for hydraulic transients.

b. The force main design shall include active devices for control of transient hydraulic conditions. When necessary, the following control strategies shall be considered by the design professional and are subject to City approval:

   (1) Construction of the force main using a higher-strength pipe.

   (2) Surge relief valves at the pump station.

   (3) Vacuum relief valves.

(4) Specialized control and/or release valves and other devices designed to prevent transient pressures from reaching levels that could damage the pump station and force main systems.

10.22 *Site Location and Improvements*

a. Pump stations shall be located and designed to minimize the development of nuisance conditions (i.e., noise, odor, etc.) in the surrounding area. A grading and landscape plan shall be included in all pump station plans.

b. Minimum 40 foot by 60 foot fenced site is required for neighborhood pump stations.

c. Minimum fenced site for regional pump stations shall be 100 feet square.

d. The pump station sites shall be located within convenient view from a public road for police surveillance.

e. Pump station sites shall be accessible by an all-weather driveway, dedicated solely to station access, and provided from a hard surface road.

f. The site and driveway shall be at least two feet above the 100-year flood elevation as identified on the most recent FEMA Flood Insurance Rate Map when available or as established through appropriate modeling techniques.

g. The roadway shall be designed to accommodate the largest vehicle expected to service the pump station. In no case shall the driveway be less than 14 feet in width or have a centerline curve radius of less than 90 feet.

h. Parking for two maintenance vehicles shall be provided outside the fenced area.

i. Vehicle turn around pavement shall be provided for pump station sites with long driveways.

j. At a minimum, the driveway and area inside fence shall be paved with 6 inch ABC and 2 inch asphalt, or 6 inch concrete over a suitable compacted subgrade. The maximum allowable driveway slope is 10%.

k. Stations in close proximity to sensitive or significant streams or bodies of water may be required to have a spill containment basin. This basin will have a minimum storage volume of 24 hours of the average hourly flow. A larger basin may be required and the exact volume required will be determined on a case-by-case basis.

l. All points of entry into pump station structures, vaults, panels, etc. shall be lockable.

m. The pump station shall be provided with adequate outdoor and indoor lighting to facilitate normal and emergency operation and maintenance activities during daylight and non-daylight hours. A minimum of two area lights shall be provided. The plans must indicate if these lights will be provided by the power company.

n. Safety placards for all pump station structures and equipment, as required by Federal, State, County, and City agencies shall be provided and be readily visible.

o. Six foot chain link fence with 3 strand barbed wire and minimum 15 foot wide double gate shall be provided.

p. Structures and equipment shall be positioned in the site to provide easy vehicular access for maintenance and removal of equipment.

q. Potable water shall be provided into the site.

r. An identification sign meeting the requirements of the City for size and lettering style shall be provided and mounted on the access gate. At a minimum, it shall indicate the pump station is operated by the City of Belmont, identify the station by name, provide emergency telephone number, and include any warnings regarding high voltage, etc.

10.23 *Electric and Telephone Service*

a. All arrangements regarding the supplying of electrical and telephone service to the site shall be made by the design professional and contractor.

10.24 *SCADA System*

a. Provisions shall be made for the future installation of SCADA equipment to monitor:

(1) Wet well level.

(2) Pump operation.

(3) Electrical service conditions.

(4) Building intrusion.

b. The required provisions include the installation of underground conduits for the cabling, electric service, and space for mounting the SCADA signal transmission equipment near the motor control panel.

10.25 *Shop Drawings and Operations & Maintenance (O&M) Manuals*

a. Four sets of shop drawings shall be submitted for review and approval prior to the manufacture, fabrication, and construction. The shop drawings shall include the following at a minimum:

(1) Outline drawings showing equipment dimensions and weights, location of accessories, and clearances required.

(2) Force main piping and appurtenances.

(3) Pumps.

(4) All electrical components.

(5) Control panel.

(6) Generator / transfer switch.

(7) Valve vault / wet well.

(8) Auxiliary equipment.

(9) Certified factory test and characteristic curves showing field performance for each pump and a pump curve / system curve with beginning and end of life operating points.

(10) Wiring and schematic diagrams including accessories.

(11) Spare parts list.

b. An O&M Manual shall be prepared for each pump station and one copy shall be submitted to City for review within 14 days prior to startup date. After approval, four copies and a bookmarked and indexed Adobe “pdf” file on CD reflecting any changes during construction shall be provided by the start-up date, along with the spare parts specified. O&M Manuals shall contain the following information, at a minimum:

(1) Approved shop drawings, including design data for all installed equipment and each major component.

(2) Control panel wiring diagrams and a reduced set of station/force main plans.

(3) Warranty information for all installed equipment and each major component.

(4) Inventory, functional descriptions, and complete operating instructions for all installed equipment and each major component, including all valves.

(5) Instructions for start-up/shut-down as well as for calibration and adjustment of all installed equipment and each major component.

(6) Recommended maintenance plan, including preventative and predictive maintenance, for all installed equipment and each major component including odor control.

(7) Contingency plan and analysis of critical safety issues.

(8) Contact information for local parts suppliers and service companies as well as instructions for replacement of all installed equipment and each major component.

(9) Contact information for local contractors capable of performing emergency repairs.

(10) Factory start-up report.

10.26 *Service Manual and Spare Parts*

a. Service manuals shall be furnished for all mechanical and electrical equipment specified and shall be bound in a single book. The manual shall contain a description of the equipment, a complete accessory and parts list, and complete installation, operation and maintenance instructions. One copy shall be submitted for review within 30 days after approval of shop drawings. After approval of manual, four copies of each manual shall be submitted by start-up date.

b. Equipment manufacturer shall furnish the proper lubricants for initial operation of each piece of equipment. Each type of lubricant shall be furnished in a separate sealed container, clearly labeled showing the type of lubricant, equipment for which it is intended, and instructions for use.

c. The manufacturer is to furnish a list of all recommended spare parts including, at a minimum, two sets of mechanical seals, o-rings, gaskets, and wear rings. The spare parts shall be provided by start-up date. Spare parts shall be provided in original packaging in factory new condition.

d. The contractor is to furnish two sets of record drawings by the start-up date. These drawings shall include any changes during construction with any such changes recorded on original design drawings by design engineer.

10.27 *Pump Station Testing*

a. Watertightness Testing

(1) Wet wells and other wastewater-containing structures at the pump station shall be inspected and tested for watertightness. The watertightness test shall be performed in the presence of the City.

(2) Wet wells shall be filled with water and allowed to saturate over 24 hours. Then the level will be noted at two places 180 degrees apart on the perimeter. Over the next 24 hours the leakage must be one inch or less of wet well depth. A vacuum test method, prior to backfilling, may be used in lieu of a hydraulic test.

10.28 *Pump Testing*

a. Factory Testing

(1) All pumps shall be tested by the manufacturer in accordance with the appropriate Hydraulics Institute standard prior to shipment for installation and the results of all factory testing shall be maintained as part of the construction record documentation.

b. Drawdown Testing

(1) Following installation, each pump in the pump station shall be subjected to drawdown and “shut-off” head tests to verify that pump performance meets the design criteria with a full, operational force main. Surge pressure will also be measured.

(2) These tests shall be performed in the presence of City representatives and in conjunction with other instrumentation and control testing.

(3) The results shall be maintained as part of the construction record documentation.

10.29 *Force Main Testing*

a. Prior to testing any segment of force main, care shall be taken to prevent the pipe from moving while under pressure.

b. All testing shall be performed in the presence of the City.

c. Testing shall conform to the requirements of Appendix B for water mains except test pressures must be at least 125% of the expected high pressure in the force main or 100 psi minimum.

d. The results of all testing shall be delivered to the City.

10.30 *Contractor Qualifications*

a. Any contractor that will install wastewater collection improvements must have a valid North Carolina General Contractor License for utility construction.

b. Contractor shall present proof of licensure prior to the preconstruction meeting.

10.31 *Acceptance for Maintenance*

a. The City may accept the pump station upon activation providing all tests of equipment are successfully passed, City staff has received training from the manufacturer's representative, operation and maintenance manuals have been received and approved, and record drawings have been submitted. Activation is defined as the point in time when the first sanitary service connection of a tributary sewer line has placed in service.

b. Record drawings for the pump station shall be submitted prior to acceptance in full sized paper copy and digital formats. The required digital formats include both AutoCAD and Adobe PDF formats. Digital files shall be provided on CD labeled with name of pump station and/or development, date of record drawings, name of contractor, and name of design professional.

c. The acceptance requirements and procedures are contained in Appendix E of this Manual.

d. Upon acceptance, the Developer shall provide one year written warranty on the workmanship, materials and installation of the wastewater pump station.

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