

Appendix C

10-17-2006

Sewer Lift Stations

1. SCOPE. All sanitary sewer pumping stations and their associated force main(s) shall be designed and constructed to provide storage and pumping capacity as approved by the Salisbury-Rowan Utilities (SRU). All designs shall be submitted to SRU for review, evaluation and permit. Before a pumping station is turned over to SRU for acceptance of ownership and maintenance, a representative of the pump Supplier shall be present to meet with plants maintenance and inspection personnel to perform system checks and startup operations.
 - 1.01. Acceptable Manufacturers. Submersible pump suppliers acceptable to SRU include Fairbanks-Morse, or approved equal. Suction lift pumps are not allowed.
 - 1.02. Submittals. Complete fabrication, assembly, foundation, and installation drawings, together with detailed specifications and data covering materials, parts, devices, and accessories forming a part of the equipment furnished, shall be submitted in accordance with the submittals section. The data and specifications for each unit shall include, but shall not be limited to, the following:

Pumps

- Name of manufacturer.
- Type and model.
- Size of discharge elbow outlet.
- Net weight of pump and motor only.
- Complete performance curves showing capacity versus head, bhp, NPSH required, and efficiency.
- Data on shop painting.

Motors

- Name of manufacturer.
- Type and model.
- Type of bearings and method of lubrication.
- Rated size of motor, hp.
- Temperature rating.
- Full load rotative speed.
- Net weight.
- Efficiency at full load and rated pump condition.
- Full load current.
- Locked rotor current.

Control Panel and Components

- Name of manufacturer.
- Type and model.

1.02. Control Panel and Components (cont.)

Dimensions and net weight of complete panel.

Overcurrent characteristics and details of motor control.

Liquid level sensors with mounting details and cable lengths, and pump controls.

2. PUMPS. Shall be of the non-clog type. Pump's at a minimum system shall be a duplex pumping system that will be capable of passing a 3-inch diameter object for force mains of 4 inches or greater. Force mains shall be a minimum of 4 inches of ductile iron pipe. Pumps and force mains shall be sized to provide a minimum velocity in the force main of 2.5 fps and a maximum velocity of 10 fps.

Submersible pumps shall be manufactured in accordance with ISO 9000 quality assurance standards. Pumps not manufactured to these standards shall not be considered compatible with the intended service and therefore not acceptable.

Pumps shall be designed to handle peak flow with a single pump. Motors shall be non-overloading over the entire pumping range. Pumping shall be designed to be 45 percent efficient at a minimum.

Pumps shall be furnished complete with mounting assembly and easy lift-out capability, internal piping and controls, accessories, and all else required for complete installation and operation as per manufacturer's requirements or these specifications whichever is more stringent. All lift-out rail systems shall be stainless steel Type 316. All lifting chains shall be adequately sized stainless steel with stainless steel clips. Cables shall not be allowed. All exposed metal items, such as nuts, bolts, supports, etc., shall be made of Type 316 stainless steel. Internal piping shall be Type 316 stainless steel or ductile iron Class 50, flanged pipe.

ALL PUMP SYSTEMS SHALL BE INTRINSICALLY SAFE EXCEPT AS SPECIFIED BY THE SRU MANAGEMENT.

2.01. Painting. All iron and steel parts which will be in contact with the pumped liquid or submerged after installation, including the inside of the casing, the impeller, the discharge elbow, and the pedestal mount, shall be shop cleaned in accordance with the coatings manufacturer's recommendations and painted with an epoxy coating system. The coating shall have a dry film thickness of at least 10 mils and shall consist of a prime (first) coat and one or more finish coats. At least 1 quart of the finish coat material shall be furnished with each pump for field touchup.

3.0. MOTORS. The motor and motor housing shall be designed for use in domestic wastewater. Industrial flows and flows containing components that are not domestic in nature or potentially damaging/explosive in nature shall not be accepted in SRU maintained pumping stations.

Motors shall be protected form water intrusion through the use of a sealed cable system utilizing stainless steel washers.

Moisture detection and telemetry shall be required on all pumps. Moisture detection shall be connected to a detection indicator alarm light on the control panel. Detection shall cause motor shutdown.

Overheat detection and telemetry shall be required on all motors. Overheat detection shall be connected to a separate detection indicator alarm light on the control panel. Detection shall cause a shutdown.

High water detection and telemetry shall be required on all pumping stations. High water detection shall be connected to a separate detection indicator light on the control panel.

The motor shall be protected from moisture intrusion from the pump's hydraulic end. Motor shall be a squirrel cage induction motor, continuous duty NEMA design B, at 40 degrees C ambient, and designed for at least six starts per hour. Motors shall have moisture resistant Class F (155 degrees C) insulation. Motors shall have at minimum 1.15 service factor, shall be oil filled, and shall be designed for continuous operation half-submerged for at least 24 hours under pump cut off conditions, without exceeding the temperature rise limits for the motor insulation system. High efficiency motors should be used in all cases. Air filled motors will also be an allowable alternative to oil filled motors.

The motor and pump shall have a shaft of at a minimum 400 series stainless steel that is completely isolated from the pump media by a mechanical seal. No other materials shall acceptable for this application. Mechanical seals of tungsten carbide shall be provided when highly abrasive conditions are anticipated as determined by SRU. Impellers shall be non-clogging in design and be secured from rotation on the shaft through the use of a shaft key or locking collet. Pump impellers shall be ASTM A48 Class 30B cast iron except in designated locations as determined by SRU where pump impellers shall be ductile iron or Type 416 stainless steel as required for the specific application. Pump volutes shall be of at a minimum ASTM A48 Class 30B cast iron having a minimum Brinell hardness rating of 180. The volute shall be further protected from wear through the use of a replaceable wear ring. Lesser grades of cast iron or materials having a Brinell hardness ration less than 180 shall not be acceptable as compatible with the normal grit contaminate of the service. Lower seals shall be carbon to ceramic. Pumps shall be equipped with a plug on the outside of the oil chamber, in order to inspect lower seal condition. Bearing shall be lubricated per manufacturer's specifications and have a B-10 bearing life at a minimum 50,000 hours. B-10 bearing lives of less value shall not be accepted as compatible with the normal overall station life expectancies.

4. VALVES AND VALVING PIT. All plug valves and check valves shall be installed in a concrete valving pit with a SRU approved cover **outside** of the wetwell and inside the pumping station lot. Plug valves shall be operated by a hand wheel having an open left stem operation. Check valves shall be of the lever weight reset type. All valves shall be manufacturer's recommended type unless otherwise detailed and approved by SRU. There shall be an eccentric plug valve, with pipe nipple, flange, and

pressure gauge installed on the force main side of the check and plug valves of the size and pressure required for the force main as a bypass pump feed in the event the existing pumping station motors are inoperable. The adapter provides for connection to a bypass pumping system shall be sized based on the peak design flow capacity of the pumping station. The piping and valving arrangement shall be arranged in a horizontal alignment. Stacking of components is not permitted. A sign shall be posted stating Confined Space.

Some pumping station installations may necessitate the use of surge relief valves as determined by SRU. If applicable, the surge relief valve shall be supplied with the pumping station and located in the valve vault or an alternate location as approved by SRU. Surge relief valves acceptable to SRU include Golden Anderson or the approved equal.

All valve pit boxes shall be sized to provide 12-inch minimum overall clearance (top, bottom, sides) between the walls of the box and internal components. A 3" or 4" plug valve for the drain between the wet well and valve vault shall be required. The floor of the box shall be shaped/sloped to drain. All piping through the walls of the pit shall be of ferrous material. All valve pit boxes shall be set on a minimum of 18 inches of stone. Over-excavation areas below 18 inches shall be filled with concrete. Valve pit shall have a 6-inch minimum diameter screened vent.

5. WETWELL/STORAGE BASINS-MANHOLES. Wetwell and storage basins shall be designed and sized to accommodate required inflow amounts plus be able to accept extra flow amounts to allow storage for a 2 hour minimum energy detention based on ultimate peak flow in the event of failure. Deviation from this requirement shall be allowed only upon the prior approval of SRU Management. The design engineer must provide in writing a detailed explanation of all-extenuating circumstances and design constraints before any modifications will be considered. Approval of staged capacities based on phased development may be allowed, but provisions, requirements, facilities, and costs shall be delineated and accounted for in the initial design. In no case shall emergency detention be less than 1 hour. The wet well and storage basins shall be marked on a highly visible sign, "Confined Space".

The bottom slab of the wetwell shall be set on a minimum of 18 inches of stone. All over excavated areas over 18 inches below the wet well bottom shall be filled with concrete. The top elevation of the wet well to be a minimum of 6 inches above the last manhole on the gravity sewer line to the wet well and shall be protected from damage by the 100 year flood.

Stations shall be designed to have only one wet well inflow inlet. Pumping station facilities shall be designed so that trash collection baskets are installed in the wet well. Baskets shall be located so that a minimum of 12 of sewer spillage will drop through the basket. Inlet pipe will stub 3 inches into the basket. There shall be no baskets installed in manholes. Pumping stations shall be designed with water on site to provide for routine cleaning and pump wash down. A ¾ inch non-freeze hose bib to be installed on site.

Hoisting assemblies shall be provided for lifting the trash baskets out of the wet well. This item shall be positioned so lifting will be direct and free. The steel sleeve for the hoist stanchion shall be cast in place and not drilled.

Concrete surfaces inside the wet well shall be protected from sewer gas attack by a coating especially formulated to resist such attack (21 mils Koppers "300M" or approved equal). Said coating shall be installed having a smooth surface. Any coatings shall be cleared from any area not supposed to have such coating. Wet wells shall be vented to the atmosphere and shall be screened to prevent vermin access. Vents shall be located as far as possible from maintenance work stations. Wet wells using an 8-foot diameter or larger manhole shall utilize a 6-inch minimum diameter vent.

Support steps shall **NOT** be used in wet well or storage basins.

When needed and approved, steps shall be protected from corrosion by use of non-corrosive material or approved protective non-corrosive coating. All exposed metal items, such as nuts, bolts, cables, supports, rails, etc., shall be made of non-corrosive materials or shall have a protective coating. Also, all such metal items shall be configured, covered, protected, or made so as to present non-sparking surfaces. The supplier shall review this protection with SRU for approval before installation. Exceptions to this are manufacturer "package systems" that are approved for use by SRU management.

6. ACCESS HATCHES AND DOORS. Access doors/hatches to below ground pump station components shall be sized and located so as to provide easy and direct access for maintenance crews and equipment. Placement shall also factor non-interference with other station components and safety concerns as relating to working in close proximity when in the open position. As far as possible, all hatches and doors shall be located to avoid traffic loading.

Access doors and all appurtenances to the valve pit shall be of a heavy-duty aluminum or stainless steel type that is weatherproof and rated for either a 300 PSF live loadings or a H20 wheel loads from maintenance vehicles in potential traffic applications. Access frames and covers shall be provided with a continuous concrete anchor, as part of the one-piece extrusion. All access doors shall be mounted in such a way that concrete (or other material used for the basin) completely supports the bottom face of the frame, and the basin material shall be designed to support the hatch support loading. The frame shall be self-draining channel with a 1 ½ inch draining coupling located in the channel frame and drained to the outside of the wet well or vault. The doors shall be provided with tamperproof fasteners.

6. ACCESS HATCHES AND DOORS. Continued.

The doors shall open to 90 degrees and lock automatically in that position with a positive locking arm and a release handle. Doors shall close flush with the top of the frame, resting on ½ inch minimum wide lip around the entire inside of the frame.

All accessory components of access hatches (hinges, handles, locking arms, etc.) shall be of manufacturer's recommendations and specifications to meet the required loadings and serviceability. All nuts, bolts, washers, and miscellaneous hardware shall be stainless

steel Type 316. In no case shall carbon steel components be allowed that will present a rusting or sparking condition.

Any aluminum embedded in concrete shall be coated with bitumastic where directed by SRU during station construction.

All access doors at the pumping station facility shall be made as to be lockable. Elevation of the top of all accesses shall be at least 6 inches above final grade and installed level. Finished grade shall be such as to leave no voids under the top slab and shall be stable as to erosion potential.

7. CONTROLS. Controls for operation of the duplex pumping system shall be furnished by the supplier of the pumping station in accordance with the following requirements. All controls and accessories shall be of the pump manufacturer's model and type specified and approved by SRU. Controls shall be intrinsically safe.

7.01. Pump Control Panel. Each submersible pump system shall be furnished with pump control panel, control devices, and level switches as indicated on the drawings and specified herein.

The control panel shall be designed to operate from a single 240, 120/208, 480 volt, 60 Hz, 1, 3, phase external source. Terminals shall be provided for terminating up to #1/0 AWG size cable per phase. Panel shall be intrinsically safe.

7.01.01. Wiring. All internal device wiring shall be as normally furnished by the manufacturer. All interconnecting wiring and wiring to terminals for external connection shall be stranded copper, insulated for not less than 600 volts, with a moisture-resistance and flame-retardant covering rated for not less than 90 C.

Power distribution wiring on the line side of panel fuses shall be minimum 12 AWG. Secondary power distribution wiring and wiring for control circuits shall be a minimum 14 AWG. Indicating light circuits shall be a minimum 16 AWG. Wiring for ac power distribution, and control circuits shall have different colors and each wire shall be numbered and marked to correspond with the supplier's panel wiring diagrams.

Terminal blocks for external connections shall be suitable for 12 AWG wire and shall be rated 30 amperes at not less than 300 volts. Terminal blocks shall be fabricated complete with marking strip, covers, and pressure connectors.

7.01.01. Wiring. Continued

Terminal shall be labeled to agree with identification shown on the supplier's submittal drawings. A terminal shall be provided for each conductor of external circuits. All wiring shall be grouped or cabled and firmly supported to the panel. Not less than 8 inches of clearance shall be provided between the terminal strips and the base of vertical panels for conduit and wiring space. Not less than 25 percent spare terminals shall be provided. The panel fabricator shall provide such additional circuits as required for proper operation.

7.01.02. Nameplates. Nameplates shall be provided on the face of the panel or on the individual device as required. Panel nameplates shall have approximate dimensions and legends consistent with the control description included in the following paragraphs for each device, and shall be made of laminated phenolic material having engraved letters approximately 3/16 inch high extending through the black face into the white layer. Nameplates shall be secured firmly to the panel.

7.01.03. Cabinet. Cabinet shall be a custom engineered enclosure, suitable for mounting at a maximum of 6 feet from the edge of the wet well as indicated on the Drawings, which contain the systems components indicated on the Drawings and specified herein. In all applications, unless specifically approved by SRU, all controls, meters, and devices associated with the pump control system, shall be placed within the interior of this control panel enclosure. The enclosure NEMA 4X waterproof, dustproof, and weatherproof. Condensation protection space heaters with thermostat control shall be provided for enclosure internal temperature control as recommended by the manufacturer. The enclosure shall be equipped with full size gasketed doors with a three-point latch and hinges. The doors shall be capable of being locked in an open position. The control panel enclosure shall include a non-corrosive aluminum backplate.

7.01.03. Motor Starters. The pump Supplier shall match the sizes of control power transformers, overload devices, heaters, and starters to the equipment furnished, as they may differ from the values indicated on the drawings. The 120-volt control power transformers shall have both primary leads fused, one secondary lead fused, and one secondary lead grounded.

One bimetallic, ambient temperature compensated thermal overload relay shall be provided in each phase lead. Each starter shall be provided with an external, manually reset push button for resetting the thermal overload relays. The external reset buttons shall be accessible by opening the outer door to the control panel enclosure, and mounted on hinged interior panel front within the enclosure.

Each starter shall include auxiliary **RUNNING** status contacts wired to terminals for external connection by others for remote indication, plus one spare **NO** and one spare **NC** contact. Each starter shall be provided with interlocking mechanism which, when the disconnect handle is moved to the **OFF** position, discounts all external sources of power from the terminal blocks within the starter.

7.01.04.01. THREE PHASE STARTERS. Three phase starters shall be circuit breaker combination type consisting of 3 phase, 60 Hz. Contactors with electronic adjustable overloads, a 120 volt ac coil, a dry type control power transformer where required, and a circuit breaker disconnect. Overload relay shall be provided with one normally open dry contact. The contact shall close on motor overload and open when manually reset. Control power transformers shall be sized to handle all simultaneous loads. Starters shall be a least NEMA Size 1 or shall be sized as indicated on the Drawings and motor sizes.

Circuit breakers shall be 600-volt magnetic motor circuit protectors. If an inverse time thermal magnetic circuit breaker is used, the thermal characteristic shall be externally adjustable from the face of the breaker. Each breaker shall be manually operated with a quick-make, quick-break, trip-free toggle mechanism.

The complete 3-phase starter shall have an interrupting rating of at least 14,000 amperes at 208 volts, and 25,000 amperes at 480 volts.

7.01.04.02. Single Phase Starters. Single phase starters shall consist of single phase, 60 Hz contacts with thermal overloads and an integral or separately enclosed short-circuit protection device. Starters shall be at least NEMA Size 0 or shall be sized as indicated on the Drawings and motor sizes.

Integral short-circuit protection devices for single-phase starters shall be 120/240 volt, magnetic motor circuit protectors.

The short-circuit protection devices shall have an interrupting rating of at least 10,000 amperes at 120 volts, and 18,000 amperes at 240 volts.

7.01.05. Convenience Receptacle. A single 120-volt, 20-ampere, ground fault interrupting convenience receptacle shall be provided with the control panel enclosure. A step-down transformer to provide 120-volt power to the receptacle shall be provided as necessary. If the receptacle cannot be located within the control panel enclosure, then it shall be located on one exterior side of the control panel enclosure, within its own lockable access receptacle box, which shall be waterproof, dustproof, and weatherproof. Placement shall be in accordance with SRU.

All pumping stations shall be wired for an auxiliary power receptacle and a manual transfer switch. On stations where the voltage is 120/208 and 120/240 will require a Killark Receptacle, Cat # VR 20422-S39, rated at 200 amperes with a 3 wire and 4 pole. On stations where the voltage is 240/480 will require an Appleton Receptacle, Cat # ADJA 20034250 RS, rated at 600 amperes with a 3 wire and 4 pole.

7.01.06. Area Light Control. Pumping station compound shall be lighted by a high-pressure sodium light to illuminate the complete area.

7.01.07. Control Operation. Control operation shall correspond to the Drawing and as specified herein. The pumps shall be controlled in a typical duplex lead-lag manner. This includes automatic alternation on successive starts to include the stand by pump, automatic failover in the event of pump failure to start the stand by pump and override to start two pumps if level continues to increase.

HAND-OFF-AUTO pump mode selector switches shall be connected to allow manual start or stop of each pump and to select automatic operation of each pump under control of the level control system. Pump alternator shall be capable of being manually selected to alternate between pumps or individually select a pump to perform pumping duty in response to the level switch contacts of the level control system. In AUTO, pump

controls shall also allow for an external RUN command, via telemetry system, to initiate pump operation.

Each pump unit shall be provided with a seal leakage and high temperature detection and alarm systems in the control cabinet for protection of each individual pump motor. A moisture-sensing device shall be provided in the stator housing for seal-leakage protection and, if necessary, a monitoring module shall also be provided within the control panel for alarm transmittal and motor shutdown. This monitoring unit shall be provided with the necessary auxiliary relays and terminals for wiring of sensor leads and external alarm/control functions. Operating voltage power supply requirements required to interrogate the moisture-sensing device within each motor shall be provided as necessary within the control panel enclosure.

Each 3-phase motor shall be protected by a microprocessor-based motor protection relay. The relay shall protect against phase loss, reversal, voltage unbalance, and low voltage on any one or more phases, causing a shutdown of the pump if any such abnormality is detected. The relay shall re-activate after power line conditions return to an acceptable level. Trip and reset delays shall prevent nuisance tripping due to rapidly fluctuating power line conditions. The relay shall be “Motor Saver Model SP3 by SymCom, Inc., Time Mark Phase Loss Relay, or equal. Motor protection relay shutdown alarm shall be connected to a separate detection indicator light on the control panel. A dry, resistive contact shall also be provided and wired by others for remote notification.

The level control system shall consist of **FIVE** level sensing “floats” with cable and cable supports provide. The floats shall be connected to a stainless steel chain with enough anchor weight to provide no movement during normal flows or high flow conditions. Each level sensor shall be a weighted pear-shaped enclosure, hermetically sealed, housing a double-pole mercury switch. The switch shall be cushioned, mounted approximately at 65 degrees inclination from the enclosure main axis and connected to a special three-conductor cable. The cable shall be insulated and heavily sheathed with PVC for resistance to immersion, corrosion, and abrasion. Cable lengths shall be sufficient to extend into the handhole or junction box outside the pumping station and to allow all floats to be set within 2 feet of the bottom of the pumping station.

7.01.07. Control Operation. The cord connection for the control shall be numbered 16-2, rated for 13 amperes and shall be type SJTO. To ensure optimum longevity, contacts shall be rated for 20 amperes at 115 VAC and shall be sealed in a heavy-duty glass enclosure. No junction boxes or cables splices of any kind will be allowed in the wet well.

Levels and alarms shall be as follows:

- a. All pumps OFF.
- b. Lead pump ON.
- c. Lag pump ON.
- d. High level alarm.
- e. Low level alarm.

Level switch elevations shall be as indicated on the Drawings.

Each control panel shall be equipped with heavy-duty, oil-tight pilot lights, reset buttons, commons alarm acknowledge push button and selector switches as required, and mounted on an interior hinged panel door within the control panel enclosure. All operating controls and instruments shall be securely mounted in a logical manner and arrangement and such that any standard options offered by submersible pump manufacturer may be added in the field. All controls, pilot lights, selector switches shall be clearly labeled to indicate function.

Six digit elapsed time meters (non-reset type) shall be provided to indicate running time of each pump in "hours". Green "Pump Running" indicator lights and elapsed time meters for each pump shall be mounted on the face of the interior hinged panel door.

Individual red alarm lights mounted on the hinged interior dead front panel within the control panel shall be provided for the following alarms:

- Pump No. 1 Overload
- Pump No. 2 Overload
- Pump No. 1 Moisture Detected
- Pump No. 2 Moisture Detected
- Pump No. 1 Over Temperature
- Pump No. 2 Over Temperature
- Pump No. 1 Phase Protection Trip
- Pump No. 2 Phase Protection Trip
- High Wet Well Level
- Low Wet Well Level

Any of the above alarms shall close a spdt dry; 120-volt ac rated resistive contact, wired to terminals for connection by others, for remote indication. In addition, any alarm will illuminate a flashing red vaportight alarm beacon and alarm horn. The alarm beacon shall be furnished with a minimum 60-watt lamp, located on the top of the control panel as to be readily visible from the main road or street. The alarm horn shall be side mounted to the control panel enclosure and shall have minimum 103 dB at 10 feet distance from the panel.

8. ELECTRICAL. Motor rated voltage shall be as follows unless indicated otherwise on the drawings:

- a. All single phase pumps five horsepower or less shall be rated for 240 volts electric power. The motors shall be designed in such a way as to be able to operate with voltage levels 10 percent above or 10 percent below the nameplate rating indicated above.
- b. All 3 phase pumps 5 to 10 horsepower shall be rated for 208Y/120 volts electric power, unless otherwise specified. The motors shall be designed in such a way as to be able to operate with voltage levels 10 percent above or 10 percent below the nameplate rating indicated above.
- c. All 3 phase pumps above 10 horsepower shall be rated 460 volts, 3 phase for

operation from a 480 volt, 3-phase external electric power supply. The motors shall be designed to be operational over a power supply voltage range of plus or minus 10 percent of the nominal voltage.

- d. Pumps requiring horsepower and voltage levels other than those specified above shall, on a case by case basis, be approved by SRU.

At both single and three phase, underground service, overhead service, a surge arrester shall be furnished and installed within the service disconnect enclosure and connected to the incoming service conductors for surge protection.

An area security light, minimum 100 watt, HPS lamp with multi-tap ballast, shall be furnished and installed on a 30 foot, Class 5 Southern Yellow Pine wood pole, and installed at a location on the Drawing. The area light shall be supplied by the local power company.

8.01. Auxiliary Power. An auxiliary stand by power source connection shall be provide on the outside of the control panel mounting assembly in a separate receptacle cabinet that shall be at a minimum dust and weatherproof and shall be designed to be compatible with a standard and commercial auxiliary generator and its supply connection as detailed by these Specifications or by special notes in the construction Drawings. Final acceptance of the stand by power source connection receptacle will be made by SRU as part of start up. Auxiliary stand by power will be provided by SRU unless directed otherwise.

Auxiliary power source connections will be rated to accept 3 phase, 208, 230, or 460 volt (plus or minus 10 percent) from a stand by power source.

For 3 phase, 208Y/120 volt, or 277/480 volt connection receptacles, a fusible disconnect of the required voltage and amperage shall be provide with a Killark, Cat No. VR 20422-S39 200 amperes, 4 wire or, a Appleton, Cat. No. ADJA20034250RS 200 amperes, 4 wire. For all 480 volt, 200 amp services, receptacles/services shall be specified on a case-by-case basis by SRU.

8.01. Auxiliary Power. Continued.

All auxiliary power source connections are to be wired and installed with a fused, double throw safety switch with designated positions of NORMAL-OFF-STANDBY, where OFF is the center position, to prevent auxiliary power from backfeeding into the regular power supply system. Lockout provisions shall be furnished on the switch handle. The double throw safety switch shall be operable only after first opening the outer doors of the cabinet.

The standby power connection receptacle and its associated receptacle box shall be provided at a point close to and below the double throw safety switch on the outside of the enclosure cabinet as is convenient and approved by SRU Management.

All receptacles/receptacle boxes shall be dust and weatherproof, waterproof, and where specified by SRU, explosionproof.

If so directed by SRU, the Developer/Contractor shall provide an auxiliary stand by generator of the type specified by SRU, together with all appurtenances, as part of the public acceptance of the pumping station. If so required, this item shall have the capability for changing voltage. A selector switch on the control panel for allowing such changing of voltage will be supplied as part of the equipment. Placement and housing shall be specified by SRU.

All required onsite generators shall become the property of SRU upon final acceptance of the pumping station facility by SRU.

9. MONITORING EQUIPMENT, SENSING EQUIPMENT, AND ALARMS.

As directed by SRU, either of the monitoring and accessory equipment describe below shall be furnished.

9.02. Automatic Dialer. Pump station monitoring equipment shall be Motorola Moscad type “L” units. The programming of the units will be done by Wireless Communications. The Developer/Contractor shall make arrangements for the programming of the Moscad units.

ALL REMOTE SENSING OPERATIONS SHALL BE COMPLETE AND TESTED AT STARTUP.

9.03. Flowmeter. The differential pressure transmitter shall have “smart” electronic circuitry and shall be of the two-wire type. Process fluid shall be isolated from the sensing elements by AISI Type 316 stainless steel, or cobalt-chromium-nickel all diaphragms, and a silicone oil fluid fill. Transmitter shall be enclosed in a NEMA Type 4X housing and shall be suitable for operation at temperatures from 0 to 180 degrees F, with relative humidity of 0 to 100 percent. All parts shall be stainless steel, or other corrosion-resistant materials. Vents shall be provided on the sides of the diaphragm housing body. Transmitter shall have positive over-range protection.

9.03. Flowmeter. Continued.

Transmitter shall be configurable as either square root or linear. The transmitter shall have an accuracy of 0.15 percent of flow span and a stable 4-mA dc output at no-flow conditions. The effect of static pressure changes on accuracy shall be negligible. The transmitter shall have minimum 15:1 field rangeability. Transmitter output shall be 4-20 mA dc without the need for external load adjustment. Transmitter shall not be damaged by reverse polarity. The transmitter shall be provided with a stainless steel, three-valve manifold and a mounting bracket. Manifolds shall have test ports on the instrument side of the valves and shall be Anderson-Greenwood “M4T”, or equivalent.

The transmitter shall be factory calibrated to a range of 0 to 300 gpm, shall be the indicating type with a LCD type digital indicator, and provide with the manufacturer’s standard hand-held communications/calibration device. The transmitter shall be Bailey “Series PTH-Smart”, Foxboro “Model IDP10-D”, Fuji “FCX-C”, or Rosemount “Model 1151DP-Smart”, or equivalent.

10. INSTALLATION REQUIREMENTS. The enclosure cabinet shall be grounded with a shielded ground in accordance with local, state, and federal codes.

The parking area of the pumping station shall be large enough to provide a turn around and also an area to set a portable generator. The parking area shall be fenced to provide a secure location.

Control panels shall have a minimum of two separate 2-inch or larger conduits running from the panel box to a watertight junction box mounted to the outside top of the wet well for access to cables and cords. Terminations of motor control cords shall be made in the junction box. Hard wiring between junction box and control panel to have seal-offs at control panel. Motor cords shall be placed in the right-hand conduit (facing the control panel access door) and the float control cables shall be placed in the left-hand conduit.

All conduits shall be rigid galvanized steel.

Seal fittings shall be provided to prevent sewer gas from having an access pathway into the enclosure cabinet. These seal-offs shall be located at the control cabinet. In addition, duct seal shall be added to the conduit entries into the wetwell and into the bottom of the control enclosure.

Piping and conduit penetrations in wetwell/storage manholes and valve vaults shall be coredrilled in the field to facilitate orientation of piping entry and exit holes such that a straight installation of piping between the manhole and vault can be achieved without fittings. The pipe or conduit shall be sealed at the wall of the wetwell/storage manhole or valve vault with non-shrink grout.

The floor of the enclosure cabinet shall be located 2 feet above the 100-year flood zone and is to be designed to be lockable to prevent access and/or use by unauthorized personnel.

10. INSTALLATION REQUIREMENTS. Continued.

All electrical work required for the installation of the pump station and associated connections to the power source shall be the responsibility of a licensed electrical contractor.

All electrical hookups associated with the pump and controls inside the wetwell shall be the responsibility of the pump Supplier and the Contractor's electrician. All connections, receptacles, etc., that have the potential to be affected by moisture, dust, water, and weather shall be protected from such. There shall be no electrical connections inside the wetwell of any kind.

Installation of all utilities at the site, including power, shall be coordinated with SRU.

Erosion control measures meeting all NCDENR Division of Land Resources requirements shall be installed and maintained at the site during construction. At the completion of construction and at such time that SRU determines that adequate

permanent erosion control measures have been established, the Contractor shall remove the temporary erosion control measures and dispose of them off site.

Adequate compaction of backfill around wetwell/storage manholes and valves vaults shall be achieved to prevent erosion around these structures after the pumping station facility is in service. Backfill materials shall be deposited in layers not to exceed 8 inches in uncompacted thickness and shall be compacted to at least 95 percent of maximum density at optimum moisture content as determined by ASTM D698. Compaction of structure backfill by rolling will be permitted, provided the desired compaction is obtained and damage to the structure is prevented. Compaction of structure backfill by inundation with water will not be permitted.

11. STATION LOT AND ACCESS REQUIREMENTS. As directed by SRU, either the chain link fencing described below and gate described in the subsequent paragraph shall be provided at the pumping station lot. All pumping station lots shall be deeded to the City of Salisbury.

11.01 CHAIN LINK FENCE. Lots shall be enclosed by an 8-foot high chain link security fence (all materials shall be Class 1 galvanized coated, 9 gauge mesh), ends twisted and barbed. Fencing shall be topped with three rows of outward facing barbed wire. Wire shall be 12.5 gauge galvanized line wire with four-point, 14 gauge barbs spaced 5 inches on centers. Bottom tension wire shall be 7-gauge spring coil wire with galvanized coating. End, corner, and pull post shall be 2.5 inch OD galvanized coated. Top and line posts shall be 2 inch galvanized coated. All post footings shall be sloped to drain.

The access gates shall be a pair of 6-foot long, 7-foot high sections constructed of 2-inch OD pipe. Gates shall be equipped with a latch and hasp assembly and center post. Gatepost shall be 3 inch OD galvanized coated.

11.01. CHAIN LINK FENCE. Continued.

A ground anchor cast in concrete shall be provided. All gates shall be factory fabricated and equipped with gate holdbacks. Panel shall have a horizontal brace center of fabric height. The location shall be coordinated and approved by SRU.

11.02. YARD HYDRANT AND WASHDOWN PAD. A convenience yard hydrant (lockable) supplying potable water for a wash down capability shall be supplied by the Contractor inside the security fencing adjacent to the wash down pad. The water service line shall be a ¾ inch or 1 inch line. The service line shall be a double check valve assembly backflow preventer per SRU specifications. The dimensions of the wash down pad shall be as indicated on the drawings but in no case shall be less than 3 by 3 feet square. A 4-inch curb/lip shall be poured as an integral part of the pad. The pad shall be 4 inches thick with wire.

11.03. VEGETATION CONTROL. The entire site inside the fence shall be covered with an “anti-weed” fabric that prohibits the growth of vegetation yet allows rainwater to pass through. Covering shall be 2 inches of crushed stone (ASTM C33, Gradation 67). This covering shall extend to 1 foot outside the fenced area.

11.04. SITE AND ACCESS ROAD REQUIREMENTS. All portions of the lot surface and access road to the facility shall be above the 100-year flood (FEMA and local) level.

Provision shall be made to protect side slopes from flood erosion and wave action as necessary. Access service road shall have at a minimum a 4-inch compacted layer of ABC stone travel surface 12 foot wide. An access security gate and/or all weather travel surfaces may be stipulated by SRU on an individual site basis.

The grade of the site access road shall be no more than 8 percent. A vehicle turnaround area shall be provided at the termination of the site access road. At the option of SRU Management, the vehicle turnaround area may be omitted if the site access road length is less than 100 feet. If a vehicle turnaround area is provided, the turning radii used in layout of the area shall be sufficient to accommodate the largest vehicle with a portable generator to access the facility.

11.05. LANDSCAPING AND FINAL STABILIZATION. Landscaping or screening requirements may be required by the City of Salisbury. Reference City of Salisbury Zoning Ordinance and Subdivision Regulations for specifics. Cost associated with this shall be the responsibility of the Developer/Contractor.

At sites with severe perimeter slopes, riprap shall not be used by the Developer/Contractor for final stabilization by SRU. Ground cover plants and/or shrubs as listed in Appendix 8 of the NCDENR Erosion and Sediment Control Planning and Design Manual shall be planted on these slopes. A list of proposed plant materials and planting densities shall be submitted by the Developer/Contractor to SRU for review approval.

11.05. SIGNS. Signs of the metal reflective type stating CITY OF SALISBURY, PUMP STATION NUMBER (as given) PROBLEMS: CALL 638-5373 and the STREET ADDRESS shall be provided by the Contractor. Required specifics of said sign shall be provided by SRU. Cost shall be borne by the Developer.

12. FORCE MAINS AND AIR RELIEF/RELEASE VALVES. Minimum force main diameter shall be 4 inches DIP without solids removal/handling facilities, such as mechanical bar screens, or baskets.

Sanitary sewer force main piping shall be rated equal to water main piping standards or greater depending on pressure requirements. Ratings shall be reviewed and approved by SRU. Consideration for erosion due to soil friction and chemistry shall be considered by relating to wall thickness.

Termination points for force mains shall be in such a manner as to prevent splashing action of the effluent in the receiving manhole.

Air relief (release, dual function, universal, air and vacuum, etc.) valves shall be vented into a 4-foot manhole cone section with riser ring and rim. The floor of the assembly shall be covered with a minimum of 6 inches of washed stone. The air jet shall be directed down onto a splash pad. Gate valve attachments shall be rotated to provide easy

operation. The force main valves shall have stainless internals and trim. The assembly shall be secured by anchorage to the manhole wall to prevent flexing and vibration under surge.

Valve size (s) and orifice diameter shall be designed to fit the range of working pressure and discharge/intake of air relating to filling and draining operations. In no case shall required air capacity through the valve to relieve vacuum be less than 5 psi. Valve shall be positioned at all high points with elevation differentials 10 feet or greater and at spacings approximately 2,000 feet apart on long ascending or descending runs. All valves shall be capable of venting air or breaking vacuum.

All force mains shall have a bypass port to facilitate the pumping of the pumping station due to line breaks or power failures. The bypass port shall be sized to SRU specifications.

Back flushing attachments are required on systems that are projected to remain in use more than 3 years if so designated by SRU.

13. SPARE PARTS. The following shall be supplied on or before final inspection:

- Seal assemblies-top and bottom.

- Bearings; one complete set of bearings for each pump.

- Three complete sets of record drawings and O&M Manual copies of certified test and inspection data, and termination schedule.

- Level switches, four additional floats.

- O-ring and gasket kit.

14. START UP OPERATIONS. Upon construction installation of SRU maintained sewer pumping stations, startup operations and testing shall be conducted prior to final acceptance and release of sewer flows by SRU Management. At a minimum, a representative of the pump Supplier, a representative of the Contractor, a representative of the SRU Plants Maintenance, and SRU Inspector will be present for startup testing.