

## **Section XVIII**

### **SANITARY SEWER PUMP STATION**

#### **MATERIALS FOR CONSTRUCTION**

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

#### **A. WETWELLS**

1. Use manhole sections complying with Section X.
2. Wetwell structure and valve vault.
  - a. Comply with Detail XX-2 and XX-6.
3. Wetwell vent:
  - a. Cast iron vent cap – epoxy coated inside and out.
  - b. Ductile iron connection pipe – epoxy coated.
  - c. Approved products:
    - 1) Josam Model 26704.
    - 2) Smith Model 1744.
  - d. Do not use double 90° bend vent.
  - e. Finish:
    - 1) Primer - one (1) coat of Tnemec Polyuraprime.
    - 2) Paint - two (2) coats of Tnemec Industrial Enamel (Gloss).
4. Cable holders:
  - a. Use six (6) hook, 316L stainless steel
  - b. Acceptable manufacturer: Halliday Products.
  - c. Secure with 316L stainless steel anchors.

5. Interior coating:
  - a. High density polyethylene (HDPE) concrete protective liner (CPL), Raven 405 Epoxy Coating System, or other approved equal as determined by the District. Comply with Section X.
6. Other pump station appurtenances.
  - a. Comply with Details in Section XX.

B. SUBMERSIBLE PUMP STATION

1. Acceptable pump manufacturers: Flygt, Pumpex, and ABS.
2. Provide a service engineer for the following periods of time for each pump station.
  - a. Start-up and performance testing: Two days - Two trips.
3. Spare parts:
  - a. Provide the following minimum spare parts:
    - 1) One of each seal assemblies.
    - 2) One complete set of bearings.
    - 3) One set of wear rings.
    - 4) One of each type relay.
    - 5) One pump starter.
    - 6) One float switch with cable.
    - 7) One of each type pilot light.
    - 8) One box of each type lamp.
    - 9) One set of cable grommets.
  - b. Package in one container all spare parts and clearly identify on the outside what the unit is for.
    - 1) Seal tightly and properly protect for long term storage.
4. Warranty:
  - a. The pump manufacturer shall warrant the units being supplied against defects in workmanship and material for a period of five (5) years or 10,000 hours under the Municipal Wastewater Permanent Installation Warranty Policy under normal use, operating and service. The warranty shall be in printed form and apply to all similar units.

- b. The ultrasonic or submersible flow control manufacturer shall warrant the units being supplied against defects in workmanship and material for a period of two (2) years.

5. Pumps:

- a. General:
  - 1) ANSI 125 lb standard cast iron flange fitting or cast with volute.
  - 2) Pump components: cast iron, ASTM A48, Class 30.
  - 3) All exposed fasteners and washers: Type 304L stainless steel.
  - 4) Pump lift handle:
    - a) Type 304 stainless steel.
  - 5) Coating:
    - a) All components coming into contact with sewage.
    - b) Pump exterior: PVC epoxy primer and a chlorine rubber paint finish.
- b. Impeller:
  - 1) Double shrouded non-clog type.
  - 2) Gray cast iron, Class 30 or ductile iron, balanced dynamically to 0.5".
  - 3) Paint with one coat of alkyd resin primer.
  - 4) Provide wear ring consisting of a replaceable stationary ring made of brass or cast iron, drive fitted to the volute inlet.
  - 5) Sliding fit between the impeller and the shaft with one key.
- c. Volute:
  - 1) Single piece, non-concentric design.
- d. Shaft:
  - 1) AISI Type 420 stainless steel.
- e. Bearings:
  - 1) Two (2) permanently lubricated bearings.
  - 2) B-10 bearing life of 50,000 hours.
  - 3) Upper bearing: single deep groove ball bearing.
  - 4) Lower bearing: two row angular contact ball bearing.
- f. Watertight seals:
  - 1) Nitrile rubber o-rings.
  - 2) Fittings:

- a) Accomplished sealing by metal-to-metal contact between machined surfaces.
    - 3) Gaskets, elliptical o-rings, grease or other devices are not acceptable.
  - g. Mechanical seals:
    - 1) Tandem mechanical shaft seal system.
    - 2) Operate the upper of the tandem set of seals in an oil chamber.
    - 3) Upper seal set: one stationary tungsten carbide ring soldered to a holder of stainless steel and one positively driven rotating carbon ring to function as an independent secondary barrier between the pumped liquid and the stator bearings.
    - 4) Lower seal set: a stationary ring soldered to a holder of stainless steel and a positively driven rotating ring, both of tungsten carbide or silicon carbide.
      - a) Hold each interface in contact by its own spring system.
    - 5) Require neither maintenance nor adjustment, easily inspected and replaced.
    - 6) Provide all seal hardware of stainless steel.
6. Pump motor:
- a. General:
    - 1) Submersible type, designed for continuous duty, capable of sustaining a minimum of fifteen (15) starts per hour.
    - 2) Integral motor and pump.
    - 3) Air filled, squirrel cage induction, shell type design, Class F insulation system, Class F materials rated for continuous duty in 40°C (104°F) liquids.
    - 4) Cast iron motor frame and end shields.
    - 5) Stainless steel hardware and shaft.
    - 6) Service factor: 1.15.
    - 7) Stator:
      - a) Heat-shrink fitted to shaft.
      - b) Dip and bake in Class F varnish.
      - c) Do not use bolts, pins or other fastening devices requiring penetration of the stator housing.
    - 8) Aluminum rotor bars and short circuit rings.
  - b. Cable entry water seal system.
    - 1) Single cylindrical elastomer grommet, flanked by stainless steel washers, all having a close tolerance fit against the cable outside diameter and the entry inside diameter and

- compressed by the entry body containing a strain relief function, separate from the function of sealing the cable.
- 2) Bear assembly against a shoulder in the pump top.
- 3) Separate the cable entry junction chamber and motor by a stator lead sealing gland or terminal board to isolate the motor interior from foreign material gaining access through the pump top.
  - a) Do not use epoxies, silicones, or other secondary sealing systems.
- 4) All pump station power cables shall use shielded Viton.
- c. Provide pre-lubricated bearings:
  - 1) Minimum B-10 life of 50,000 hours.
- d. Thermal protection:
  - 1) Motor rated thermally to NEMA MG1-12.42.
  - 2) Three (3) thermostatic switches (one in each phase) in the stator windings.
- e. Junction chamber:
  - 1) Seal from the motor by elastomer compression seal (o-ring).
  - 2) Connect between the cable conductors and stator leads with threaded compressed type binding, post permanently affixed to a terminal board.
- 7. Discharge connection:
  - a. Permanently installed discharge connection system.
  - b. Pump(s) automatically connected to the discharge connection elbow when lowered into place.
    - 1) Easily removed for inspection or service.
  - c. Accomplish sealing of the pump unit to the discharge connection elbow by a simple linear downward motion of the pump.
  - d. Sliding guide bracket to be an integral part of the pump unit.
  - e. Guide the entire weight of the pumping unit by no less than two guide bars and press tightly against the discharge connection elbow with metal-to-metal contact.

- f. A diaphragm, o-ring or other devices to interface sealing of the discharge are not acceptable.
  - g. No portion of the pump to bear directly on the floor of the sump.
- 8. Discharge elbow:
  - a. Gray cast iron: ASTM A48, Class 30.
  - b. Vertical leg:
    - 1) ANSI Class 125 lb. flange.
  - c. Provide integral cast iron base.
  - d. If necessary size elbow with a reducer to reduce the maximum velocities and to match discharge piping.
- 9. Guide rails (per pump):
  - a. Provide two lengths of minimum 2", Schedule 40, Type 316L stainless steel pipe.
  - b. 316L stainless steel bottom and top pilots.
    - 1) Acceptable manufacturer: Halliday Products.
- 10. Pump guides:
  - a. Attach to pump volute with stainless steel hex head cap screws.
- 11. Lift chain:
  - a. Provide each pump and motor with adequately sized Type 316L stainless steel lifting chain.
    - 1) Minimum 1/4" welded stainless steel link chain.
  - b. Length to reach top of station plus an additional 6'.
  - c. Attach upper end of chain to wetwell access frame with Type 316L stainless steel clip and stainless steel eye nut.
  - d. Connect chain to pump using Type 316L stainless steel screw pin and shackle.

12. Hardware:

- a. All bolts, machine screws, nuts, washers, and lockwashers for complete assembly of wetwell items, including but not limited to, access cover, guide rails, and discharge elbow are to be Type 316L stainless steel.
- b. All piping from the wetwell through the valve pit shall be Type 316L stainless steel.
- c. Use "non-seizure" bolt thread dressing.

13. Wetwell access:

- a. Fabricate from welded aluminum sections.
- b. Provide dual hinged door of 1/4" aluminum treadplate for each set of pumps.
- c. Flush upper surface.
- d. Fit door with recessed latch.
- e. Stainless steel safety chain or nylon coated stainless steel wire rope.
- f. All hardware: Stainless steel.
- g. Type 304L stainless steel support bracing with a self-locking hinge mechanism.
- h. Acceptable manufacturer: Halliday Products or equal.

14. Jib crane socket:

- a. Provide two (2) stainless steel jib crane drop in sockets for 3" crane post.
  - 1) Cast in wetwell top.
- b. Provide a stainless steel socket cover for each socket.
  - 1) Weld 1" long 3" stainless steel pipe to 4 1/2" diameter, 1/4" beveled edge stainless steel plate.
  - 2) Drill \_" hole in center of plate.
- c. Acceptable manufacturer: Halliday Products.

15. Pump control panel:

a. Enclosure:

- 1) Code gauge stainless steel or reinforced fiberglass: NEMA 4X, gasketed with drip shield.
  - a) Provide for wall mounting with exterior flanges.
- 2) Single 3-point locking latch.
  - a) Attach with stainless steel screws.
- 3) Removable aluminum inner swing panel.
  - a) Minimum thickness of 0.125".
  - b) Continuous stainless steel piano type hinge.
  - c) Minimum horizontal swing of 90°.
- 4) Use removable aluminum back panel.
  - a) 0.125" minimum thickness.
  - b) Attach to enclosure on collar studs.
  - c) Do not use self-tapping screws.
- 5) Engraved nameplates on door mounted hardware.
  - a) Attach with stainless steel screws.
- 6) Equip enclosures containing solid state motor controllers with a closed-loop air conditioner.
  - a) Air conditioner enclosure shall be constructed of stainless steel.
  - b) Suitable for maintaining proper interior operating temperature with a 40°C ambient outside temperature and direct sunlight on enclosure.
  - c) Completely wire and power air conditioner.
  - d) Provide air conditioner specifically certified for use in highly corrosive environments.
  - e) Enclosure of all air conditioned control panels shall be insulated to manufacturer's recommendations.

b. Motor starting components:

- 1) NEMA rated magnetic motor starters.
- 2) Use motor starter contacts easily replaceable without removing the motor's starter from its mounted position.
- 3) Provide phase failure, undervoltage release and overload protection on all three phases.
  - a) Acceptable product: Allen Bradley 813S or Diversified SLA-230-ASA.
- 4) Use manual reset overload relays. Do not provide means for converting to automatic reset.
- 5) For motors less than 20 Hp in size:



- a) Provide open frame, across the line, non-reversing type starters.
  - b) Acceptable products: Square D (Class 8536).
- 6) For motor 20 Hp or larger in size:
  - a) Provide UL listed solid state, soft start, reduced current inrush motor controller.
  - b) Six (6) SCR solid state power configuration.
  - c) Equip controller with a control unit for field configurable setup.
  - d) Provide 120 volt control power supply and auxiliary contacts.
  - e) Acceptable products: Allen Bradley "SMC Flex" or Square D, "Altistart 48".
- 7) Circuit breaker and operating mechanism:
  - a) Provide thermal magnetic air circuit breaker having a minimum symmetrical RMS interrupting rating of 10,000 amperes at 240V or 14,000 amperes at 480V.
  - b) Provide padlockable operating mechanism on each motor circuit breaker.
  - c) Locate mechanism operator handles on exterior of the inner swing panel with interlocks which permit the panel to be opened only when circuit breakers are in the OFF position.
  - d) Provide Square D or General Electric.
- c. Components:
  - 1) Provide "H-O-A" switches for each motor.
    - a) UL rated, heavy duty, 600 VAC, NEMA 4X, oil-tight switches.
    - b) Acceptable products: Allen Bradley 800H or Square D Class 9001 SK.
    - c) "Hand" position not to override motor overload shutdown.
  - 2) Provide the following components with the panel:
    - a) Pilot run light for each motor.
    - b) Lockable enclosure.
    - c) Condensation heater.
    - d) High level alarm indication light.
    - e) Alarm bell silence.
    - f) GFI 20A duplex receptacle with stainless steel cover.
    - g) Control relays.
    - h) Remote alarm terminals.
    - i) "Seal failure" indicator lamp.

- j) "High temperature" indicator lamp.
  - k) "Power on" indicating lamp.
  - l) Temperature failure test push-button.
  - m) Seal failure test push-button.
  - n) Seal failure reset.
- 3) Provide spring-loaded test switches.
  - a) Return to normal position when released.
  - b) Provide a "Momentarily On" switch for the high level alarm float.
- d. Pump level control:
  - 1) Pump level control shall be in the SCADA RTU.
  - 2) Backup level controls shall be provided by the low-level and high-level alarm floats.
- e. High temperature shutdown:
  - 1) Provide high temperature shutdown for each motor utilizing the temperature switches embedded in the motor windings.
    - a) Under high temperature conditions the switch shall open, de-energize the motor starter and stop the pump motor.
    - b) Motor shall remain inoperative until problem is corrected and the control circuit is manually reset.
- f. Moisture detector control (seal failure):
  - 1) Provide for each pump a float switch sensor, or probe type sensor, to detect moisture in the stator chamber.
  - 2) Detection of moisture by the sensor shall disrupt the motor starting circuit of the pump.
  - 3) Motor shall remain inoperative until problem is corrected and the control circuit is manually reset.
- g. Provide overload reset device:
  - 1) Operable without opening the inner swing panel.
- h. Provide the following components mounted on the back plate:
  - 1) 120V control circuit transformer (open core and coil type) with primary circuit breaker and secondary circuit breakers for:
    - a) Control
    - b) Duplex receptacle
    - c) Condensation heater
    - d) Remote light
  - 2) Automatic shut-off timer for alarm bell.

- a) 0-20 minute adjustable.
  - b) Provide timer bypass switch.
- 3) Lightning arrestor.
  - a) Acceptable product: Delta Type "LA".
- 4) Provide power terminals and control terminals.
- i. Design control sequence so that panel is functioning automatically again after a power failure and manual reset is not necessary.
  - 1) Provide a time delay relay to prevent both pumps from starting simultaneously after power failure.
- j. Provide a terminal board for connection of line, pump leads and level sensors.
- k. Provide elapsed time meter wired to each motor starter at the bottom of the heater block.
  - 1) Six digit, non-resettable.
  - 2) Indicate total run time in hours and tenths.
- l. Provide high water and low water alarm activated by level control system and backup float switch.
  - 1) Front panel mounted silence switch.
  - 2) 120V AC.
  - 3) Utilize industry standard LED bulb, vapor tight, alarm light with red globe, guard and mounting hardware.
    - a) Mount on side of panel.
    - b) Provide threaded type globe.
  - 4) 120V AC alarm bell
    - a) Weatherproof housing
    - b) Mounting lugs
    - c) Conduit tap
    - d) Acceptable product: Edwards No. 340-4N5/348
  - 5) Bell and light
    - a) Light to operate under all alarm conditions.
    - b) Bell to operate at high level only.
- m. Provide a motor ammeter:
  - 1) Panel mounted.
    - a) Scale range greater than pump rating.
    - b) Provide an "Off-L1-L2-L3" selector switch.
    - c) Provide a "Pump 1 - Pump 2" selector switch.
    - d) Acceptable manufacturer: General Electric.

- n. Control relays:
  - 1) Provide general purpose, tube base, plug-in relays.
  - 2) Provide appropriate sockets for din rail mounting.
  - 3) Acceptable products:
    - a) Allen Bradley, Bulletin 700, Type H.
    - b) Square D, Class 8501, Type K.
- o. Electrical schematic:
  - 1) Provide a laminated electrical schematic diagram of the pump controls including terminal board connections.
  - 2) Permanently mount on the inside of the enclosure door.
- p. Attachment screws.
  - 1) Stainless steel.
- q. Wiring:
  - 1) Factory wired completely, except for power supply, motor, temperature switches and moisture sensor, connections, and, micro float switches.
    - a) Comply with applicable standards of National Electric Code.
    - b) Color code and number as indicated on factory wiring diagram.
    - c) Control wire: MTW 90°C #14 AWG.
  - 2) Electrically ground all components to a common ground screw mounted on the removable back panel.
  - 3) Group all wiring in plastic wire troughs except wiring from the 14 gauge backplate to the door shall be done in separate bundled harnesses for control circuits.
  - 4) Provide sufficient motor lead wiring and float control wiring to make connections in the junction box.
- r. Level control and motor power cable:
  - 1) Provide cable of adequate length to terminate in control panel junction box without splicing.
- s. Acceptable manufacturer:
  - 1) Control panel: Carotek, Inc., Sta Con, or Control Interface.
  - 2) Switches, push-buttons and indicator lamps:
    - a) Allen Bradley Series 800H or Square D Class 9001 SK.

16. Valve vault:

- a. Construct of cast-in-place concrete or pre-cast concrete.
  - 1) Wall thickness and reinforcing per Detail XX-7.
  - 2) Precast vaults of adequate depth to allow installation of floor drain.
- b. Manhole steps:
  - 1) Comply with Section X.
  - 2) Straddle the outlet pipes.
- c. Drain:
  - 1) Acceptable products: Smith Model 2041A.
  - 2) Provide with float type backwater valve.
- d. Provide cushioned swing check valve and plug valve on each pump discharge line. Comply with items F and G herein.

17. Pressure gauges:

- a. Provide on the discharge side of each pump prior to the check valve.
- b. Range - nearest available upper range above pump shut off head.
- c. Provide rounded type, stainless steel case, 4½" nominal diameter with phosphor-bronze bourdon tubes, glycerin filled, ½" NPT bottom male threaded connections, stainless steel rack and pinion movement, black micro-adjusted corners and black figures with white plastic dials, and a threaded ring.
- d. Gauge accuracy:
  - 1) Within ½% of the total scale range.
- e. Provide diaphragm isolators on all gauges.
  - 1) Provide diaphragm material resistant to chemicals in the process line being measured.
- f. Gauge connections to consist of the following:
  - 1) ½" Type 316 stainless steel shutoff valve with Viton seals.
  - 2) ½" stainless steel piping connections.
    - a) Acceptable product: Whitey ball valve.

C. SELF-PRIMING PUMP STATION

1. Acceptable pump manufacturer: Gorman-Rupp Company of Mansfield, Ohio.
2. Provide a service engineer for the following periods of time for each pump station:
  - a. Erection and installation - One day.
  - b. Start-up and training - Two one-day trips.
3. Source quality control:
  - a. Operational test: Factory test the assembled unit, consisting of pumps, motors and controls, complying with standards of the Hydraulic Institute.
    - 1) Conduct tests at the design head, capacity, suction lift, speed and horsepower specified herein.
  - b. Certified re-prime performance tests:
    - 1) Each pump must be capable of a re-prime lift at the specified speed and impeller diameter.
    - 2) Additional standards under which re-prime tests shall be run are:
      - a) Incorporate a discharge check valve down stream from the pump. Check valve size: equal (or greater than) the pump discharge diameter.
      - b) Install a 10' length of 1" pipe between pump and discharge check valve. This line shall be open to atmosphere at all times.
      - c) No restrictions shall be present in pump or suction piping which could serve to restrict the rate of siphon drop of the suction leg.
      - d) Suction pipe configuration for re-prime test: minimum horizontal run of 4.5' and one 90° ell.
      - e) Set impeller at the clearances recommended by the manufacturer.
      - f) Demonstrate re-prime lift repeatability by five sequential re-prime cycles.
      - g) Use water for re-prime test.
4. Conduct tests for each pump size and configuration.

5. Provide Operation and Maintenance manuals.
6. Product handling:
  - a. Carefully transport, store, handle and set each unit in place to prevent distortion, misalignment or other damage.
  - b. Follow manufacturer's handling recommendations during storage prior to installation and following installation, but prior to placing in service.
7. Spare parts:
  - a. Provide the following:
    - 1) One complete rotating assembly: shaft, mechanical seal, impeller with all gaskets, seals, sleeves, o-rings, and packs required to be replaced during replacement of the seal.
    - 2) One spare pump mechanical seal (complete), all gaskets, seals, sleeves, o-rings, and packs required to be replaced during replacement of the seal.
    - 3) One set of impeller clearance adjustment shims.
    - 4) One quart of seal lubricant.
    - 5) One of each type relay.
    - 6) One float switch with cable.
    - 7) One of each type pilot light.
    - 8) One box of each type lamp.
  - b. Package in one container and clearly identify on the outside.
    - 1) Seal tightly and properly protect for long term storage.
8. Warranty:
  - a. Provide one year warranty.
9. Fiberglass enclosure:
  - a. Enclosure base:
    - 1) Completely encapsulated structural steel frame.
    - 2) Frame to provide adequate structural support for pumps, motors and piping.
    - 3) Encapsulated frame to extend to lift points provided and assure adequate strength to resist deformation of structure during shipping, lifting or handling.

- 4) Completely encapsulate the structural steel base within a molded fiberglass reinforced polyester base shell.
  - 5) Wall thickness to be a minimum 3/16" and base height a minimum of 4".
  - 6) Interior of base:
    - a) Fill with a foamed-in-place rigid polyurethane structural foam.
    - b) Foam to be closed cell type with a minimum density of 2.5 lbs/S.F.
  - 7) Provide holes through the base for air release lines, suction lines and discharge lines.
    - a) Provide openings with grout dams incorporated in grout retention cavities.
    - b) Fill at installation with grout to seal each pipe-to-base joint.
  - 8) Station base to incorporate a flange designed for securing the pump station to the concrete pad.
  - 9) Provide four (4) Type 316 stainless steel anchor bolts meeting Gorman-Rupp assembly 4111-410 foundation bolt requirements.
- b. Enclosure cover:
- 1) Minimum dimensions: 7' wide, 10' long, and 6' high.
  - 2) Molded fiberglass reinforced orthophthalic polyester resins with a minimum of 30% fiberglass, and a maximum of 70% resin.
    - a) Glass fibers: minimum average length of 1¼".
    - b) Do not use resin fillers or extenders.
    - c) Polyester laminates: impervious to micro-organisms, mildew, mold, fungus, corrosive liquids, and gases.
  - 3) K factor: 1.5 BTU/hr/°F/s.f./inch.
  - 4) Coatings:
    - a) Interior surfaces of housing: white gel with a polyester resin.
    - b) Outside of enclosure: pigmented resin compound with ultraviolet light protection.
  - 5) Cover movable without lifting.
  - 6) Cover completely removable.
  - 7) Provide a hasp and staple locking device.
  - 8) Provide gasketing between the enclosure cover and end panels and base.
  - 9) Provide a hinged fiberglass reinforced polyester access door.
    - a) Minimum dimensions: 27" wide by 56" high.
    - b) Minimum ¾" door thickness.



- c) Full length stainless steel piano hinge.
    - d) Drip shield over door casing.
    - e) Locking handle connected to a three point latching mechanism.
      - i) Latch to engage door casing to top, side and bottom.
    - f) All hardware to be stainless steel.
    - g) Conceal all mounting hardware for door casing and door.
  - c. Ventilating fan and intake louver:
    - 1) Exhaust fan complete with aluminum damper.
      - a) Minimum capacity of 550 cfm.
    - 2) Mount in the wall opposite to the air intake.
    - 3) Provide aluminum gravity damper type intake louver.
    - 4) Provide screen and cowl on both intake and exhaust openings.
    - 5) Fan circuit to be fused.
    - 6) Provide disconnect switch.
  - d. Station light:
    - 1) Provide an enclosed and industry standard LED light fixture.
    - 2) Vapor tight, universal type.
    - 3) Centrally locate.
    - 4) Shall not constitute a physical hazard to personnel.
    - 5) Light circuit to be fused.
    - 6) Provide disconnect switch.
10. Pumps:
- a. Suction and discharge size: minimum 4".
  - b. Serviceability:
    - 1) Removable cover plate allowing access to pump interior without removing suction or discharge piping.
    - 2) Replaceable wear plate.
    - 3) Design for replacement of the wear plate, impeller, seal and suction check valve through the removable cover plate.
    - 4) Entire rotating assembly, including bearings, shaft, seal and impeller removable as a unit without removing the pump volute or piping.
    - 5) Incorporate a suction check valve that can be removed or installed through the removable cover plate opening, without disturbing the suction piping.

- 6) External adjustment of the clearance between the impellers and wear plates.
  - c. Construction:
    - 1) All areas of the pump casing and volute which are exposed to sewage: Cast iron ASTM A48, Class 30.
    - 2) Two vaned, semi open, non clog impeller.
      - a) Ductile iron.
      - b) Integral pump out vanes on the back shroud.
    - 3) Mechanical seal:
      - a) Stationary and rotating seal members: tungsten titanium carbide alloy.
      - b) Matte finished mated carbide surfaces.
        - i) Flat when polished to at flatness tolerance not to exceed one half light band, or 5.8 millionths of an inch.
      - c) Double floating and self-aligning stationary seal seat.
      - d) Lubricate with oil from an oil filled reservoir between pump and motor; the oil serving as both a lubricating and cooling media.
  - d. Bearings: anti-friction or tapered roller bearings impeller shaft bearings.
    - 1) Sized to withstand all radial and thrust loads which can reasonably be expected during normal operation.
    - 2) Lubricate bearings from a separate oil reservoir.
  - e. Provide one piece cast iron suction spool.
    - 1) Flanged on each end with one 1¼" NPT and one ¼" NPT tapped hole with pipe plugs.
  - f. Internal passages:
    - 1) Provide all openings, internal passages, and internal recirculation ports large enough to permit the passage of a sphere 3" in diameter and any trash or stringy material which can pass through the average house collection system.
11. Drive motors:
- a. Horizontal, totally enclosed, fan cooled (TEFC), induction type, with Class F insulation, normal starting torque and low starting current characteristics, NEMA Design B, 1.15 service factor.

- b. Non-overloading motors at the design condition or at any head in the operating range.
  - c. NEMA design cast iron frame with copper windings.
  - d. Minimum efficiency rating of 90%.
  - e. Minimum power factor rating of 85%.
  - f. Drive transmission:
    - 1) V-belt drive assembly:
      - a) No less than 2 V-belts.
    - 2) Minimum drive system safety factor - 1.5:1.
  - g. Belt guards:
    - 1) Enclose drive transmissions on all sides.
      - a) Permit complete removal without interference with any unit component.
    - 2) Fabricated from any one or combination of expanded, perforated or solid sheet metal.
    - 3) Maximum opening:  $\frac{1}{2}$ ".
    - 4) Provide continuously welded structural joints:
      - a) Tack welds: where permissible do not exceed 4" spacing.
    - 5) Cover panels:
      - a) Rivet to frame.
      - b) Maximum rivet spacing: 5".
12. Pump base:
- a. Provide for mounting of complete pump and motor assembly.
  - b. Fabricate from  $\frac{1}{4}$ " steel plate, minimum:
    - 1) Provide openings for access to all internal cavities.
  - c. Provide perimeter flange and reinforcements.
  - d. Provide drilling for hardware.
13. Valves:
- a. Provide cushioned swing check valve and plug valve on each pump discharge line. Comply with items F and G herein.

14. Air release valves:
  - a. Provide visible indication of valve closure.
  - b. Operate solely on discharge pressure.
  - c. Construct parts exposed to sewage of cast iron, stainless steel or similar corrosion resistant materials.
    - 1) Fabric reinforced neoprene diaphragms.
    - 2) Serviceability: Provide 3" diameter or larger cleanout port.
      - a) Field adjustable for varying discharge needs.
    - 3) Provide stainless steel tubing connection and clamps for air release lines.
15. Piping and fittings:
  - a. Suction and discharge pipe:
    - 1) Use ductile iron: ANSI/AWWA C151/A21.51, Thickness Class 53.
    - 2) Use flanged pipe ends: ANSI/AWWA C110/A21.10.
  - b. Fittings:
    - 1) Flanged ductile iron: ANSI/AWWA C110/A21.10.
  - c. Couplings:
    - 1) Provide cast iron flanged coupling adapters.
      - a) Provide with retainer set screws.
16. Factory finish:
  - a. Clean pumps, piping and exposed steel framework with industrial grade chemical cleaner.
  - b. Prime coat: zinc base synthetic primer.
  - c. Finish coat: acrylic enamel.
17. Gauge kit:
  - a. Supply with each pump:
    - 1) Glycerin filled compound gauge to monitor suction pressures.
    - 2) Glycerin filled pressure gauge to monitor discharge pressures.

- b. Gauges: minimum 4" diameter.
  - c. Compound gauges: graduated -34' to 34' water column, minimum.
  - d. Pressure gauges: graduated 0' to 140' water column, minimum.
  - e. Accuracy of gauges:
    - 1) One (1%) percent of full scale reading.
  - f. Mount gauges on resilient steel panel and frame assembly.
  - g. Install a stainless steel T-handle ball valve in each gauge line at the point of connection to suction and discharge pipes.
  - h. Gauge installations complete with hoses and fittings.
18. Electrical control components:
- a. Mount all motor branch components and all other electrical control components in one weatherproof enclosure.
  - b. Panel enclosure:
    - 1) NEMA 1, gasketed door.
      - a) Continuously weld all seams and make free of burrs and voids.
      - b) There shall be no holes through the external walls.
    - 2) Provide removable back panel:
      - a) Painted steel, attached to enclosure on collar studs.
      - b) Adequate size to accommodate all basic and optional components.
    - 3) Securely mount operating controls and instruments in such manner that any or all standard options offered by the pump station manufacturer may be added in the field without rearrangement of existing controls and instruments.
      - a) Label all controls and instruments clearly to indicate function.
    - 4) Provide terminal blocks for all connections from the back panel to door mounted or remote devices.
    - 5) Provide a laminated control wiring diagram.
      - a) Mount to inside of outer enclosure door.
    - 6) Equip enclosures containing solid state motor controllers with a closed-loop air conditioner.

- a) Air conditioner enclosure shall be constructed of stainless steel or fiberglass.
  - b) Suitable for maintaining proper interior operating temperature with a 40°C ambient outside temperature and direct sunlight on enclosure.
  - c) Completely wire and power air conditioner.
  - d) Provide air conditioner specifically certified for use in highly corrosive environments.
  - e) Enclosure of all air conditioned control panels shall be insulated.
- c. Motor branch components:
- 1) General:
    - a) Use high grade industrial quality.
    - b) Operating coils of AC control devices: 120V,  $\pm 10\%$ , 60 Hz.
  - 2) Circuit breaker and operating mechanism:
    - a) Provide thermal magnetic air circuit breaker having a minimum symmetrical RMS interrupting rating of 10,000 amperes at 240V or 14,000 amperes at 480V.
    - b) Provide breakers calibrated by the manufacturer.
    - c) Provide padlockable operating mechanism on each motor circuit breaker.
    - d) Locate mechanism operator handles on exterior of the control compartment door, with interlocks which permit the door to be opened only when circuit breakers are in the OFF position.
    - e) Provide Square D or General Electric.
- d. Motor starters:
- 1) NEMA rated magnetic motor starters.
  - 2) For motors less than 20 Hp in size:
    - a) Provide open frame, across the line, non-reversing type starters.
    - b) Acceptable products: Square D (Class 8538).
    - c) Undervoltage release, phase failure and overload protection on all three phases.
      - i) Diversified SLA-230-ASA or Allen Bradley 813S.
  - 3) For motors 20 Hp or larger in size:
    - a) Provide UL listed solid state, soft start, reduced voltage motor controller.

- b) Acceptable manufacturers: Allen Bradley "SMC Flex" or Square D "Altistart 48".
    - c) Six (6) SCR solid state power configuration.
    - d) Equip controller with a control unit for field configurable setup.
    - e) Provide 120 volt control power supply and auxiliary contacts.
  - 4) Furnish motor starter contacts easily replaced without removing the motor's starter from its mounted position.
  - 5) Use manual reset overload relays, do not provide means for converting to automatic reset.
- e. Overload relays:
- 1) Provide block type.
    - a) Melting alloy type spindles.
    - b) Visual trip indication with trip free operation.
  - 2) Pressing of the overload reset lever shall not actuate the control contact until such time as the overload spindle has reset.
  - 3) Resetting of the overload reset lever will cause a snap action control contact to reset, thus re-establishing a control circuit.
  - 4) Use manual reset overload relays and do not provide means for converting to automatic reset.
  - 5) Trip setting shall be determined by heater element not by adjustable overload relays.
- f. Switch controls:
- 1) Provide switches to accomplish the following minimum functions:
    - a) Disconnect the control circuit.
    - b) Select the mode of operation for each pump.
    - c) Select the sequence of pump operation.
    - d) Operate the level control system as described below.
    - e) Override all controls except motor overload relays.
  - 2) Provide main circuit breaker allowing control power to be disconnected from all control circuits.
  - 3) Connect pump mode selector switches to permit manual start and stop of each pump individually.
  - 4) Connect each switch to one or more indicators showing the selected mode of operation.
  - 5) Manual operation shall not override shutdown systems supplied with the level control system.
  - 6) Pump sequence selector switch:

- a) Permit selection of automatic pump alternation.
    - b) Selection of either pump to run as lead pump for each cycle.
  - 7) Connect override switches to bypass the level control system and all shutdown systems supplied with it, to provide manual start of each pump individually in the event of level control system malfunction.
  - 8) Provide alarm silence switch.
  - 9) Provide heavy duty, oil tight, rotary selector switches, push-button switches.
    - a) Provide UL rated heavy-duty , 600 VAC, NEMA 4, oil-tight.
    - b) Acceptable products: Allen Bradley 800H or Square D Class 9001 SK.
  - 10) Provide spring loaded test switches for testing of float operation.
    - a) Return to normal position when released.
    - b) Provide "Momentarily On" switch for the high level alarm float.
- g. Pump level control:
- 1) Provide level control system as specified herein.
    - a) Provide in SCADA RTU.
    - b) High and low level alarm floats shall provide backup level control.
  - 2) Provide for duplex operation.
  - 3) Utilize "LEAD/LAG" principal using the ultrasonic level control system.
  - 4) Provide unit capable of automatic pump alternation and selection of either Pump No. 1 or No. 2 as the "LEAD" pump.
  - 5) Design circuitry so that operation of the "LAG" pump start circuit is not contingent on proper operation of the "LEAD" pump start circuit.
- h. Indicator lamps:
- 1) Provide indicator lamps for the following:
    - a) Run indicator for each motor.
    - b) Alarm.
  - 2) Provide UL rated heavy-duty, 600 VAC, NEMA 4, oil-type switch.
  - 3) Acceptable products: Allen Bradley 800H or Square D Class 9001 SK.



- i. Wiring:
- 1) Furnish pump station factory wired except for power feeder lines and final connections to level control and alarm devices.
    - a) Provide panel wiring to allow a single connection to the main power and control wiring.
    - b) Provide a numbered terminal strip.
  - 2) Wiring, workmanship and schematic wiring diagrams: comply with applicable standards and specifications for industrial controls set forth by the Joint Industrial Council (JIC), National Machine Tool Builders Association (NMTBA), and National Electrical Code (NEC).
  - 3) Use Type MTW or THW, 600V wire for user, serviceable wiring, color coding as follows:
    - a) Line and Load Circuits, AC or DC Power **Black**
    - b) AC Control Circuit at less than line voltage **Red**
    - c) DC Control Circuit **Blue**
    - d) Interlock Control Circuits, wired from External Source **Yellow**
    - e) Equipment Grounding Conductor **Green**
    - f) Current Carrying Ground **White**
    - g) Hot with Circuit Breaker Open **Orange**
  - 4) Use 16 gauge, minimum, control circuit wiring, Type MTW or THW, 600V.
  - 5) Use 14 gauge minimum wiring in conduit.
  - 6) Do not load motor branch or other power conductors above 60°C temperature rating.
  - 7) Number each wire at each end, clearly, to match wiring diagram.
  - 8) Use ring tongue connectors with nylon insulated shanks, on all wires.
  - 9) Place all sub-plate wiring in wire troughs with removable covers.
  - 10) Terminate all unshielded wires extending from door mounted components on a back panel mounted terminal block.
  - 11) Do not use solder-type lugs, or splice any wiring in the panel enclosure.
  - 12) Place all wiring outside the panel in conduit.
  - 13) Bundle and tie all control conductors connecting components mounted on the door.
    - a) Make bundles flexible at hinged side of enclosure.
    - b) Provide adequate length and flex so that door can swing to full open position with no undue mechanical stress or abrasion on conductors or insulation.

- j. Control relays:
  - 1) Provide general purpose, tube base, plug-in relays.
  - 2) Provide appropriate sockets for din rail mounting.
  - 3) Acceptable products:
    - a) Allen Bradley, Bulletin 700, Type H.
    - b) Square D, Class 8501, Type K.
- k. Pump start delay:
  - 1) Provide time delay to prevent simultaneous start of any two pumps.
    - a) Delay period shall be adjustable from 1/20th to 60 seconds.
    - b) Accurate to approximately ten (10%) percent.
- l. High temperature protection:
  - 1) Provide circuitry to shut down the pump motor(s) when required to protect the pump from damage caused by excessive temperature.
  - 2) Furnish each pump with a solid state, temperature sensitive transistor module which shall signal the level controller to shut down and lock out the pump motor when the temperature of the pump volute or housing exceeds 131°F.
  - 3) Such occurrence shall visually trip an indicator to alert the operator.
  - 4) Indicator shall remain tripped and the pump motor locked out until the pump has cooled and the circuit has been manually reset.
  - 5) Do not provide automatic reset of this circuit.
- m. Elapsed time meters:
  - 1) Provide six digit elapsed time meters.
  - 2) Mount in panel door.
  - 3) Connect to pump motor starter at the bottom of the heater block.
  - 4) Non-reset type.
  - 5) Indicate "hours" and "tenths" of hours.
- n. Auxiliary power transformer:
  - 1) Equip panel with a 3 KVA step down transformer to supply 120V for the control and auxiliary circuits.

- 2) Protect the primary side of the transformer by a thermal-magnetic air circuit breaker, specifically sized to meet the power requirements of the transformer.
  - 3) Install a mechanical operating mechanism on the circuit breaker to provide a means of disconnecting power to the transformer.
  - 4) Locate the operator handle for the operating mechanism on the exterior of the control panel with interlocks which permit the door to be opened only when the circuit breaker is in the "OFF" position.
  - o. Provide 3-pole lightning arrestor.
    - 1) Acceptable product: Delta LA-303.
  - p. Pump ammeter:
    - 1) Panel mounted.
      - a) Scale range greater than pump rating.
      - b) Provide an "Off-L1-L2-L3" selector switch.
      - c) Provide a "Pump 1 - Pump 2" selector switch.
      - d) Acceptable manufacturer: General Electric.
19. Enclosure conduit:
- a. Use UL listed conduit and fittings.
  - b. Size conduit complying with National Electric Code.
  - c. Use flexible metal conduit.
    - 1) Smooth, flexible galvanized steel core.
    - 2) Smooth, abrasion resistant, liquid tight, PVC cover.
    - 3) Support Articles 348 and 350 of the NEC.
20. Provide high water and low water alarm activated by the level system and backup float switches.
- a. Provide 120V AC, vapor tight alarm light.
    - 1) Provide threaded type red globe
    - 2) Utilize standard 40 watt bulb
    - 3) Guard
    - 4) Mounting hardware
  - b. Provide 120V AC, alarm bell.
    - 1) Weatherproof

- 2) Mounting lugs
  - 3) Conduit top
  - 4) Acceptable product: Edwards No. 340-4N5/348.
- c. Bell and light.
- 1) Light to operate under all alarm conditions.
  - 2) Bell to operate at high level only.

21. Pump drain kit:

- a. Provide kit consisting of:
- 1) 10' length of plastic hose.
  - 2) Quick connect aluminum female Kamlock fitting on one end of the hose.
  - 3) Two sets of fittings for pump drain.
- b. Mount on each pump drain:
- 1) Schedule 40 stainless steel pipe nipple and bushing.
  - 2) Stainless steel T-handle ball valve.
  - 3) Aluminum quick connect male Kamlock fitting.

D. REMOTE TELEMETRY UNIT (RTU), LEVEL TRANSDUCER, AND INTERFACE TO EXISTING SCADA SYSTEM

1. General

- a. The Contractor/Developer shall provide and install a PLC-based remote telemetry unit (RTU) and level monitoring system to allow monitoring of the remote station from the existing supervisory control and data acquisition (SCADA) system located at the Hilton Head No. 1 Public Service District Administration and Operations Center. The RTU shall be supplied complete with all appurtenant equipment and accessories as indicated, specified, and as necessary for a complete, operational, reliable, and fully functioning system. The RTU shall be fully integrated into the existing telemetry system. Communications between the remote site RTU and the existing telemetry system shall occur using 900 MHz radio signals.
- b. The Contractor/Developer shall procure the services of the approved Instrumentation and Control System Integrator to perform the following services:

- 1) Provide, install, and commission all RTU hardware and control items as indicated, specified, and required by the drawings, loop descriptions, and written specifications to comprise a complete and fully functional system.
- 2) Provide a “Birdcage” submersible pressure transducer as manufactured by Blue Ribbon Industrial Components Corporation of Winter Park, Florida. This unit shall be ranged to cover the entire operating range of the wet well. This transducer shall be installed by the Contractor/Developer.
- 3) Provide all project management, project engineering, mechanical design, electrical design, drafting, PLC programming, software development, field service engineering, hardware and software installation, field instrument installation supervision, instrument calibrations, system startup services, training, and development of operations and maintenance manuals.
- 4) Prepare and submit detailed shop drawings as submittals for approval.
- 5) Provide the onsite supervisory services of a factory trained field service engineer to assist the Contractor in the location of sleeves, methods of installing conduit and special cable, mounting, piping, and wiring of one of each type of service, and the methods of protecting all of the equipment prior to placing it into service.
- 6) Provide the onsite services of a factory trained field service engineer to startup, calibrate, and place into service all instrumentation, the PLC-based Remote Telemetry Unit, and other ancillary devices and equipment as required to achieve a fully operational and functional telemetry system.
- 7) Perform operational demonstrations and acceptance tests.
- 8) Perform all necessary modifications and additions to the existing human-machine interface (HMI) software application. Modify and expand the system database, three dimensional (3D) color graphics displays, reports, etc. as required to integrate data collected from the new pump station into the existing system.
- 9) Develop and fully annotate all PLC logic and control strategies.

10) Prepare Operation and Maintenance Manuals, Record Prints, Record PLC Programming Documentation, and Record Applications Software Documentation.

11) The Contractor/Developer via the Instrumentation and Control System Integrator shall warrant the equipment and services furnished to be free of defects for a period of one year after acceptance by the Owner.

- c. The Contractor's/Developer's attention is directed to the fact that the existing radio telemetry system and SCADA system was furnished and installed by M/R Systems, Inc. of Norcross, Georgia. In order to insure complete compatibility with the existing system, the services of M/R Systems, Inc. shall be obtained by the Contractor/Developer to perform the work defined herein.
- d. These specifications cover the intended functionality of the equipment, but do not necessarily cover all details necessary for a complete, operable and functional system. The Instrumentation and Control System Integrator shall supply all devices and appurtenances necessary to provide a complete, operable and satisfactory system as indicated or specified.
- e. The Contractor/Developer shall be fully and solely responsible for the work of the Instrumentation and Control System Integrator and solely responsible to the Owner for having supplied to the Owner the complete supervisory control and data acquisition system.
- f. The Contractor/Developer shall provide personal superintendence and direction to the work, maintaining and supplying complete supervision over and coordination between all subcontractors employed by him.
- g. The Contractor shall be responsible for defining the limits of the Instrumentation and Control System Integrator's work.

## 2. PRODUCTS

- a. It is the intent of this specification that the Remote Telemetry Unit (RTU) be a truly "open architecture" design using off-the-shelf components and a non-proprietary communications protocol.
  - 1) The Instrumentation and Control System Integrator shall make use of readily available products which have a proven history of reliable service when used in municipal water and wastewater applications.

- 2) The Remote Telemetry Unit (RTU) shall be comprised of a programmable logic controller (PLC), radio, modem, surge arrestors, relays, power supplies, terminal strips, solar shields, heater and thermostat, circuit breakers, utility light, GFI utility outlet, enclosure, and other appurtenances as required for a fully functioning and fully operational system.
- 3) In order to insure the ease of future system expansions, the RTU shall communicate with the existing computer process control and monitoring (i.e. SCADA) system using the Modbus ASCII protocol over the existing radio system.
- 4) As a minimum, the RTU shall be capable of supporting the following I/O complement: 16 Digital (discrete) Inputs, 12 Digital (discrete) Outputs, 4 Analog Inputs (4-20 mA or 1-5 VDC), and 2 Analog Outputs (4-20 mA, isolated, into 750 ohms minimum).
- 5) All field wiring terminations shall be made to terminal strips capable of accommodating up to #12 AWG wire. Terminal strips shall be mounted using DIN rails.
- 6) All analog inputs, including spare analog inputs, shall be protected from surges using three separate levels of surge/transient suppression. The first level of protection shall be via a 1/4 Amp 3 AG size fast acting fuse. Secondary and tertiary protection shall be fulfilled using combination gas discharge tube and metallic oxide varistor (MOV) surge protection with current limiting resistors. Terminals shall be installed to allow each of the four analog inputs to be configured for 2-wire or 4-wire process transmitters and to produce either 4 to 20 mA or 1 to 5 VDC outputs to the PLC and any future display or signal conversion devices. Terminals shall be installed adjacent to the analog surge protection to provide 24 VDC power for connections of future 2-wire transmitters.
- 7) All digital inputs, including spare digital inputs, shall be isolated via electro-mechanical relays. Minimum contact rating for relays shall be 5 Amps at 250 VAC. A minimum of eight digital inputs shall be connected to field wiring via DIN rail mounted terminal strips. A 2 Amp 3 AG size fuse shall protect digital inputs. A minimum of eight (8) relays shall be provided and shall be fully wired to the eight (8) digital outputs. Additional inputs shall be wired via interposing relays and terminals if required to accommodate additional field signals.

- 8) Digital outputs shall be isolated from field wiring through terminal strips and electro-mechanical relays with contact ratings of 10 Amps at 250 VAC minimum. A minimum of four (4) relays shall be provided and shall be fully wired to four (4) of the digital outputs. Additional outputs shall be wired if required to accommodate additional field signals.
  - 9) Separate DC power supplies shall be provided for the PLC, radio (if provided), and for field analog and digital inputs. All DC power supplies shall be protected via indicating 3 AG size fast acting fuses. Indicating fuse holders shall be utilized and shall be DIN rail mounted.
  - 10) A single pole limit switch shall be mounted on the door frame of the RTU enclosure and shall be wired to a non-relay-isolated input of the RTU to provide an intrusion signal to the SCADA system.
  - 11) Surge protectors shall be provided internal to the RTU enclosure to provide transient and surge protection for the phone line (where telephone line communications are used.)
  - 12) A Microwave Data Systems (MDS) radio with internal modem and diagnostics shall be supplied integral to the RTU enclosure. The radio shall match the existing radios.
  - 13) A 450 VA (minimum) Uninterruptible Power Supply shall be provided integral to each RTU enclosure.
  - 14) Two (2) circuit breakers shall be provided integral to the RTU. One circuit breaker shall provide protection to the RTU's internal power supplies and the other circuit breaker shall provide protection to a Ground Fault Interrupt (GFI) duplex utility outlet.
  - 15) A Square D AC power surge protector shall be installed integral to the RTU to provide transient and surge protection for incoming AC power. A separate GFI duplex utility outlet shall be protected by the surge protector and shall be used only for the UPS system.
- b. RTU enclosures shall be constructed in accordance with the following requirements:
- 1) All RTU components shall be housed in a single padlockable enclosure suitable for wall or floor mounting as shown on the contract drawings.



- 2) The RTU enclosure shall be constructed to meet or exceed the NEMA 4X rating. Access doors shall have continuous stainless steel hinges and approved latching. Provide internal bracing as required for rigidity. Heat load calculations shall be performed by the Instrumentation and Control System Integrator to insure that the enclosure is properly sized to allow adequate cooling. NEMA 4X enclosures shall be constructed of #316 stainless steel.
  - 3) RTU enclosures to be installed outdoors shall be provided with top, front, and side solar shields. Solar shields are to be constructed of aluminum and shall be painted white. The top solar shield shall overhang the side solar shields. Solar shields shall be mounted to enclosures using minimum 1-1/2" standoffs. Silicone sealant shall be used to caulk the standoff holes both inside and outside the panel.
  - 4) An electronic heater and thermostat shall be supplied inside each RTU enclosure to prevent the condensation of water.
  - 5) Anti-corrosion inhibitor blocks shall be mounted inside each RTU enclosure to reduce corrosion. Corrosion inhibitors shall be Hoffman Model A-HCI10E.
- c. A Security Access System shall be supplied integral to each RTU to monitor and authorize site and/or panel accesses. A security key reader shall be supplied either within or externally to the RTU panel. The security system shall be interfaced to the PLC and via the radio telemetry system to the SCADA system.

#### 1) Operational Description

Upon a site or panel intrusion, the security key reader LED will begin flashing. The flashing security key reader LED indicates that authorized personnel has a user-selectable period of time to place their identification key or card on the reader at the control panel. If the user-selectable time period expires before a key is placed on the security key reader, an intrusion indication will be set and the security key reader LED will turn off. When a key is placed in the security key reader within the user selectable time period, the key ID number is read and the security key reader LED will stop blinking and illuminate. The HMI system will read the key ID from the RTU and verify that the key ID is authorized to gain access. If the HMI matches the key ID, the event will be logged identifying the individual, location and time.

An intrusion indication from the RTU or unmatched key ID will generate an unauthorized access alarm. An unauthorized access alarm can be configured to automatically generate an alarm locally at the SCADA system HMI and remotely via an alarm annunciation system, alphanumeric pagers, cell phones, faxes or e-mail. Upon departure from the station, personnel will re-arm the security system by either closing the control panel door or pushing an "Exit" pushbutton. At this point, the RTU will clear out the key ID, indicating to the HMI that the personnel has left the station. The HMI will log the event, again identifying the individual, location and time. The RTU can also be configured to automatically re-arm itself after a pre-determined amount of time. The SCADA system's HMI shall log all access events, both authorized and unauthorized. The System Access Monitoring and Control system shall be series MR-Eye as manufactured by M/R Systems. Inc., Norcross GA or pre approved equivalent.

## 2) Access Identification Key

The system shall be provided with twenty-five, 25, access identification keys. The access identification keys shall include a unique, factory-lasered serial number. The serial number shall be a 64-bit registration number. The identification key shall be non-powered and not require a battery to maintain its identification number. The identification key shall include an angled, plastic fob. The key fob shall be suitable for attaching to a key ring.

## 3) Security Key Reader

An electronic security key reader shall be supplied at the designated control panels. The security key reader shall be suitable for mounting on the exterior of the control panel. The key reader shall provide the electrical contact for the access identification key data transfer. The key reader shall include a solid metal housing shaped to self-align with the key. The key reader shall include an LED for user feedback housed in the center of the contact. The LED shall be rated for 20 mA DC at 2.7V typical. The key reader shall include a brass M18 x 1 nut and 30-cm cable for connection to the serial converter.

## 4) Serial Converter

At each reader location a serial converter shall be supplied to interface the security key reader to the local PLC.

- d. In order to match existing equipment and minimize the number of spare parts required to be maintained by the Owner, the PLC-based Remote Telemetry Unit (RTU) shall be M/R Systems, Inc. Model 315R (for radio communications) housed in a NEMA 4X, #316 stainless steel, enclosure with solar shields. The level sensing systems shall be the "Birdcage" submersible pressure transducer as manufactured by Blue Ribbon Industrial Components Corporation of Winter Park, Florida.

E. BACKUP LEVEL CONTROL SYSTEM (HIGH-LEVEL AND LOW-LEVEL ALARM):

- 1. Use two (2) micro float switches.
  - a. Single action design.
  - b. Capable of withstanding water penetration under 25' of water.
  - c. 3 to 1 safety factor, minimum.
- 2. Use integrally weighted floats:
  - a. Do not use a float switches that requires pole mounting.
- 3. Switches:
  - a. Mechanical micro type.
  - b. Seal in a polypropylene housing.
  - c. No less than 40' of cable.
  - d. Polypropylene cord grips and mounting hardware.
- 4. Cable holder:
  - a. 316L stainless steel, six hook design.
  - b. Mount with 316 stainless steel anchors.
  - c. Acceptable manufacturer: Halliday Products.

F. OTHER ELECTRICAL

1. Rigid aluminum conduits above ground. PVC schedule 80 conduits below ground.
  - a. Required number per Details in Section XX.
2. NEMA 4X junction box between conduits from wetwell and control panel.
  - a. Use power lugs for connection of motor leads and control wiring.
3. Seal conduit between control panel and junction box:
  - a. Use seal offs with sealant.
  - b. Acceptable product: O.Z. Gedney, Type EY.
4. Provide standby power/main transfer unit:
  - a. NEMA 4X enclosure
  - b. Circuit breaker type with walking beam interlock. Breakers to be General Electric or Square D.
  - c. Unit shall be UL approved for service entrance and contain insulated groundable neutral and ground lugs or bars.
  - d. Do not provide in control panel.
5. Emergency generator receptacle.
  - a. 200 amp, 4 pole, 4 wire.
  - b. Wire to emergency breaker of transfer unit.
  - c. Acceptable product: Crouse Hinds No. AR 20416-S22.
6. Electrical support:
  - a. Construct of pressure treated wood.
  - b. Minimum 4"x6" posts, marine grade SP22.
  - c. Horizontal slats: minimum, 2"x6", pressure treated No. 2 pine.

- d. Set posts in concrete.
- 7. Provide a industry standary LED flood light.
  - a. Mount on top of the control panel support structure.
  - b. Locate at adequate height to light wetwell and valve vault area.
  - c. Provide weatherproof switch.
- 8. Wiring in junction box and control panel.
  - a. Label clearly.
  - b. Match control panel schematic.

G. CUSHIONED SWING CHECK VALVES:

- 1. Cast iron body with bronze seating ring and stainless steel shaft for attachment of weight and lever with non-corrosive adjustable air cushioned shock chamber.
- 2. Mount the cushioned chamber to the side of the valve body with piston operating in the chamber which will prevent valve closing without any hammering action.
- 3. Shock absorption by air:
  - a. Adjustable closing speed.
- 4. Approved manufacturer: G. A. Industries, Inc.

H. PLUG VALVES:

- 1. One on each discharge pipe to permit either or both pumps to be isolated from the header.
- 2. Use non-lubricated, tapered type:
  - a. Semi-steel body.
  - b. Flanged ends, ANSI 125 lbs. standard.

3. Use drip tight shutoff plug mounted in stainless steel bearings.
4. Provide \_" thick hand welded in overlay, no less than 90% nickel content on all surfaces contacting the plug face.
  - a. Seat to be raised from the valve body and machined to a smooth finish.
5. Provide bolted bonnet design:
  - a. Allow repacking without removing the bonnet or actuator, packing should be adjustable.
  - b. Packing to be replaceable:
    - 1) Under pressure, valve open or closed with pressure on either side of the plug.
  - c. O-ring seals are not acceptable.
6. Furnish lever actuator.
7. Approval manufacturer: DeZurik.

I. WATER SOURCE AT PUMP STATION

1. 1" industrial quality brass spigot with vacuum breaker on 1" schedule 40 stainless steel riser.
2. Underground piping to spigot riser.
  - a. Schedule 80 PVC.
3. Reduced pressure zone (RPZ) backflow prevention device.
  - a. Locate prior to riser.
  - b. Install in meter box on clean, washed stone, above ground.
  - c. Provide with curb stop.
    - 1) Acceptable product: Ford Model B11-444.

*revised January 2024*

- d. Install faucet down stream of the curb stop to drain faucet riser section.
- e. See Detail XX-12.