Wastewater Pump Station Specifications

Revised – November 7, 2013

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1. Design Basis.

1.1. General Considerations.

The design standards outlined in this section apply to wastewater pump stations discharging 3,000 gallons per minute or less. All such pump stations shall be submersible type stations. For designing pump stations discharging more than 3,000 gallons per minute, the type of pump station and the basis of design shall be reviewed and have approval obtained before proceeding with the design. The developer shall pay all costs associated with pump station design and construction required to serve the proposed development including all future phases. The District may elect to pay oversizing cost, if required, to serve existing or future customers outside of the proposed development.

In this interpretation and application, the provisions of these specifications shall be held to be the minimum requirements. Where the conditions imposed by any provisions of these specifications are either more restrictive or less restrictive than comparable conditions imposed by any other provisions or of any other applicable law, code, ordinance, resolution, rule or regulation of any kind, the regulations which are more restrictive and impose higher standards or requirements shall govern. If an article, section, sentence, clause or phrase of these specifications is adjudged by a court of competent jurisdiction to be invalid, the decision shall not affect the remaining portions of these specifications. The words "shall" and "will" are mandatory; "may" and "should" are permissive.

1.2. Design Flows.

Design flows shall be based upon the total ultimate development flow from all contributory areas to the pump station. The design pumping capability of the station shall be based upon the Peak Design Flow which shall be calculated by multiplying the design average flow with the applicable minimum peaking factors as outlined below:

Design Average Daily Flow	Minimum Peaking Factor for Peak Design Flow
Flows to 100,000 GPD	4.0
100,000 GPD to 250,000 GPD	3.5
250,000 GPD to 1,000,000 GPD	3.0
Flows greater than 1,000,000 GPD	2.5

For design average daily flows above 2,000,000 GPD, peaking factors less than two and one-half may be considered if substantiated by extensive data. Under no circumstances shall peaking factors less than two are allowed.

1.2.1. Number of Pumps.

For pump stations with a peak design flow of 1,000 GPM or less, a minimum of two pump units shall be provided. Where the peak design flow exceeds 1,000 GPM, three or more units shall be provided.

1.2.2. Pump and Motor Selection.

Pump station shall be capable of pumping the peak design flow with the largest pumping unit out of service. Pumps shall be capable of meeting all system hydraulic conditions without overloading the motors. In addition a minimum five HP motor will be required. Head capacity curves shall be prepared and submitted to the utility along with the pump station plans. Head capacity curves shall verify that the pumps are operating at peak or near peak efficiency and are suitable for the design flow application. Pump and motor selection and head capacity curves shall reflect hydraulic conditions in cases where receiving force main systems are interconnected to additional pumping stations. If justifiable, smaller motor sizes will be considered by the utility and/or its Engineering affiliates.

1.2.3. Design Calculations.

Developer's Engineer shall submit signed, sealed and dated design calculations for all wastewater pump stations. Calculations shall include head capacity curves with copies of manufacturers pump curves, hydraulic analysis of force main system, operating cycle calculations with wet well sizing, and buoyancy calculations.

2. Details of Site Design and Construction

2.1. Flooding.

Wastewater pumping station structures and electrical and mechanical equipment shall be protected from physical damage by the 100 year flood. Wastewater pumping stations should remain fully operational and accessible during the 100 year flood. Regulations of Local, State and Federal agencies regarding flood plain obstructions shall be considered.

2.2. Accessibility.

The pumping station shall be readily accessible by maintenance vehicles during all weather conditions. Access driveway to the pumping station shall be concrete with a minimum compressive strength of 4000 p.s.i. Concrete shall be poured a minimum of 4 inches thick with 6 inch by 6 inch #10 wire mesh. The facility shall not be located in road rights-of-way. In a phased development, a stabilized access road may be accepted during the initial phase with driveway installation to be accomplished in the later phase.

2.3. Site Sizing and Easement Requirements.

The Developer shall dedicate pump station site by warranty deed or plat to the District. Dedicated easements shall also be required around the site. In general, the site for the paved access road shall also be dedicated to the utility by Warranty deed or plat. An exception to this requirement may be allowed on a case by case basis in the form of an ingress/egress easement for the access road.

2.4. Site Fencing and Landscaping.

All pump station sites located in open public areas shall be fenced with six foot tall hot dipped galvanized black polymer coated chain link (2" diamond mesh) with a double swing gate for vehicle access. All related hardware and fencing shall be hot dipped galvanized, black polymer coated when available. All posts shall be set in concrete. The pervious area inside the fence shall have a minimum of 3 oz. woven style ground cover installed with a minimum of four inches of ¾" white drainage rock placed over the entire area. Landscape and turf maintenance including irrigation shall be the responsibility of the Developer.

2.5. Signage

All pump station sites shall have signs posted as shown in the Standard Drawings section. Sign shall be 24" x 18" on .080 aluminum with white high intensity reflective sheeting and black vinyl letters.

2.6. Buoyancy.

Buoyancy of the pump station structures shall be considered and adequate provisions shall be made for protection.

3. Pump.

3.1. General Requirements.

Submersible pumps shall be readily removable and replaceable without dewatering the wet well or disconnecting any piping in the wet well. Submersible pumps and motors shall be designed specifically for raw sewage use, including totally submerged operation during a portion of each pumping cycle. Pumps shall be capable of handling raw sewage and passing spheres of at least three inches in diameter. Pump suction and discharge openings shall be at least four inches in diameter.

The equipment covered by these specifications is intended to be standard pumping equipment of proven ability as manufactured by a reputable firm having at least five years' experience in the production of such equipment. The equipment furnished shall be designed, constructed, and installed in accordance with the best practices and methods, and shall operate satisfactorily when installed as shown on the drawings.

All parts shall be so designed and proportioned as to have liberal strength and stiffness and to be especially adapted for the work to be done. Ample space shall be provided for inspection, repairs, and adjustment. The pump volute, motor and seal housing shall be high quality gray cast iron, ASTM A-48, Class 30.All necessary foundation bolts, plates, nuts, and washers shall be furnished by the equipment manufacturer, and shall be of Type 304 stainless steel. All external mating parts shall be machined and Buna N rubber O-ring sealed on a beveled edge. Gaskets shall not be acceptable. Brass or stainless steel nameplates giving the name of the manufacturer, voltage, phase, rated horsepower, speed, and any other pertinent data shall be attached to each pump. The nameplate rating of the motors shall not be exceeded.

The pumps shall be capable of handling raw unscreened domestic wastewater and minimum three inch diameter solid spheres. Pump operation shall be controlled automatically by means of multi-sensored probe sensors in the wet well. Pumps shall be mounted in the wet well as shown on the Drawings.

3.2. Pump Construction Details

3.2.1 Shaft.

The pump shaft shall be of Series 300 or 400 stainless steel. The shaft and bearings shall be adequately designed to meet the maximum torque required for any start-up or operating condition and to minimize vibration and shaft deflection. As a minimum, the pump shaft shall rotate on two permanently lubricated bearings. An upper radial bearing and a lower thrust bearing shall be required. These shall be heavy-duty single row ball bearings that are permanently lubricated by the dielectric oil that fills the motor housing. Double row, sealed grease packed bearings shall not be acceptable. Bearings that require lubrication according to a prescribed schedule shall not be acceptable.

3.2.2 Impeller.

Impeller shall be of the mono-vane, enclosed non-clogging design and have pump-out vanes on the front and backside of the impeller to prevent grit and other materials from collecting in the seal area. Impeller shall not require coating. Because most impeller coatings do not remain beyond the very early life of the impeller, efficiency and other performance data submitted shall be based on performance with an uncoated impeller. Attempts to improve efficiency by coating impeller shall not be acceptable.

Impellers shall be dynamically balanced. The tolerance values shall be listed below according to the International Standard Organization grade 6.3 for rotors in rigid frames. The tolerance is to be split equally between the two balance planes that are the two impeller shrouds.

RPM	Tolerance
3500	.01 in.- oz./lb. of impeller weight
1450	.02 in. - oz./lb. of impeller weight
1150	.026 in. - oz./lb. of impeller weight
870	.03 in.- oz./lb. of impeller weight

The impeller shall be threaded shaft or tapered shaft and key driven. A 300 series stainless steel washer and impeller bolt shall be used to secure the impeller to the shaft for both threaded and tapered shafts. Straight end shafts for attachment of the impeller shall not be acceptable. Each pump shall be provided with a replaceable metallic wear ring system to maintain pump efficiency. As a minimum one stationary wear ring provided in the pump volute or one rotating wear ring provided on the pump impeller shall be required. A two-part system is acceptable.

3.2.3 Mechanical Seal.

The pump shall have two mechanical seals, mounted in tandem, with an oil chamber between the seals. Seals shall be used with the rotating seal faces being carbon and the stationary seal faces to be ceramic. The lower seal shall be replaceable without disassembly of the seal chamber and without the use of special tools. Pump-out vanes shall be present on the backside of the impeller to keep contaminates out of the seal area. Seals shall be locally available.

4. Motors.

4.1. General Requirements.

All motors shall be built in accordance with latest NEMA, IEEE, ANSI and AFBMA Standards where applicable. The stator, rotor and bearings shall be mounted in a sealed submersible type housing. The stator windings shall have Class F insulation (155°C or 3ll0F) or Class H insulation (180°C or 356°F) and a dielectric oil-filled motor, NEMA B design. Further protection shall be provided by using on-winding thermal sensors. The pump and motor shall be specifically designed so that they may be operated partially or completely submerged in the liquid being pumped. The pump shall not require cooling water jackets. Dependence upon, or use of, water jackets for supplemental cooling shall not be acceptable. Stators shall be securely held in place with a removable end ring and threaded fasteners so they may be easily removed in the field without the use of heat or a press. Stators held by a heat shrink fit shall not be acceptable. Stators must be capable of being repaired or rewound by a local motor service station. Units that require service only by the factory shall not be acceptable. No special tools shall be required for pump and motor disassembly. Pump shall be equipped with heat sensors.

If required by the utility, before final acceptance, a field running test demonstrating this ability, with 24 hours of continuous operation under the above conditions, shall be performed for all pumps being supplied. Motors 25 horsepower and below shall be rated 230/460 volt, 3 phase. Motors greater than 25 horsepower shall be 460 volt, 3 phase. All motors shall be designed with a 1.15 service factor and shall not be less than 5 horsepower unless approved by the utility. Pumps shall be capable of meeting all pump curve conditions without exceeding the motors rated horsepower.

4.2. Heat and Moisture Sensors.

Each motor shall incorporate a minimum of one ambient temperature compensated overheat sensing device and one moisture sensing device. These protective devices shall be wired into the pump controls in such a way that if excessive temperature and moisture is detected the pump will shut down. These devices shall be self-resetting. The sensors shall be connected in series with motor starter coil so that the starter shall be equipped with 3 leg over load heaters, making all normal overloads protected by the starter.

The pump shall be equipped with a seal leak detection probe and warning system. This shall be designed to alert maintenance personnel of lower seal failure without having to take the unit out of service for inspection or requiring access for checking seal chamber oil level and consistency. There shall be an electric probe or seal failure sensor installed in the seal chamber between the two tandem mechanical seals. If the lower seal fails, contaminants that enter the seal chamber shall be detected by the sensor, which sends a signal to operate the specified warning device.

4.3. Cables.

Cables shall be designed specifically for submersible pump applications and shall be properly sealed. All cables shall be continuous, without splices from the motor to the control panel.

4.3.1. Electrical power cord shall be STW-A, water resistant 600V, 60°C, UL and CSA approved and applied dependent on amp draw for size.

4.3.2. The pump shall be triple protected with a compression fitting and two epoxy potted areas at the power cord entry to the pump. A separation between the junction box area of the pump and the motor by a stator lead sealing gland or terminal board shall not be acceptable.

4.3.3. The power cable entry into the cord cap assembly shall first be made with a compression fitting. Each individual lead shall be stripped down to bare wire at staggered intervals, and each strand shall be individually separated. This area of the cord cap shall then be filled with an epoxy compound potting which will prevent water contamination to gain entry even in the event of wicking or capillary action.

4.3.4. The power cord leads shall then be connected to the motor leads with extra heavy connectors having brass inserts with a screwed wire-to-wire connection, rather than a terminal board that allows for possible leaks.

4.3.5. The connection box wiring shall be separated from the motor housing wiring by stripping each lead down to bare wire, at staggered intervals, and separating each strand. This area shall be filled with an epoxy compound potting. Fiberglass terminal boards, which are subject to heat fatigue and cracking and which may lead to possible leaks, shall not be acceptable.

4.3.6. The cord cap assembly where bolted to the connection box assembly and the connection box assembly where bolted to the motor housing shall each be sealed with a Buna N rubber O-ring on a beveled edge to assure proper sealing.

5. Wet Well & Valve Vault Requirements.

Wet well and valve vault shall be constructed as shown on the Standard Drawings and in conformance with the specifications. Wet well shall be minimum six foot diameter and shall have a minimum four and one-half foot depth below the lowest invert. Additional depth shall be provided based on station design and cycle time. Pumping levels shall be set to provide a minimum capacity between operational water levels sufficient to allow a minimum of five minutes between successive starts of the pumps. Pump-off water levels shall provide adequate submergence to preclude pump inlet vortexing, or air binding. Operational maximum water levels shall not exceed the invert elevation of the influent pipe. The wet well floor shall have a minimum slope of 1 to 1 to the hopper bottom. The horizontal area of the hopper bottom shall be no greater than necessary for proper installation and function of the pump inlet. No interior ladders shall be permitted in the wet well. Interior surfaces of the wet well and valve vault shall be lined with a protective coating approved by the District so as to prevent corrosion to structures. Wet well shall be properly vented with a minimum 4” stainless steel air vent extending through the top slab with a 180 degree turn sealed by an approved insect screen.

Both the wet well and the valve vault hatch covers shall be lockable and furnished with ¼” aluminum diamond pattern plate door leaves capable of supporting a live load of 300 pounds per square foot. Angle frames shall be ¼” aluminum with an anchor frame around the perimeter of the assembly. Doors shall be equipped with stainless steel hinges, stainless steel pins, and an automatic hold-open arms with release handle. Hardware shall be stainless steel throughout.an access frame and cover. Doors shall open and automatically lock with stainless steel “hold open” arm with aluminum release handles.

6. Guides.

A sliding guide bracket shall be an integral part of the pump casing and shall have a machined connecting flange to connect with the cast iron discharge connection, which shall be bolted to the floor of the wet well with stainless steel anchor bolts and so designed

as to receive the pump discharge flange without the need of any bolts or nuts. Sealing of the pumps to the discharge connection shall be accomplished by a simple linear downward motion of the pump with the entire weight of the pumping unit guided by no less than two Type 316 seamless tubular stainless steel guides which will press it tightly against the discharge connection. No portion of the pump shall bear directly on the floor of the wet well and no rotary motion of the pump shall be required for sealing. Sealing at the discharge connection by means of a diaphragm or similar method of sealing will not be accepted as an equal to a metal to metal contact of the pump discharge and mating discharge connection specified and required. Approved pump manufacturers, if necessary to meet the above specification, shall provide a sliding guide bracket adapter. The design shall be such that the pumps shall be automatically connected to the discharge piping when lowered into place on the discharge connection. The pumps shall be easily removable for inspection or service, requiring no bolts, nuts or fastenings to be removed for this purpose, and no need for personnel to enter the wet well. Each pump shall be fitted with a one-fourth inch Type 304, stainless steel cable, air craft rating, between the cable holder and the lifting bracket on the pump.

7. Piping, Valves and Accessories

7.1. Piping.

All piping shall meet the requirements of Sections D.2.1. and D.2.6 of the Marion County Land Development Code. The discharge piping material in the valve vault shall be of ductile iron piping or approved equal. The discharge piping material in the wet well shall be of high density polyethylene (HDPE) piping or approved equal with stainless steel pipe supports and hardware.

7.2. Plug Valves.

Plug valves shall meet the requirements of Section D.2.6.h of the Marion County Land Development Code.

7.3. Check Valves.

Check valves for ductile iron pipelines shall be swing type and shall meet the material requirements of AWWA C500. The valves shall be iron body, bronze mounted, single disc, 150 psi working water pressure, non-shock, and hydrostatically tested at 300 psi. Ends shall be 125 pound ANSI B16.1 flanges. Check valves shall have bronze seat and body rings, extended bronze hinge pins and stainless steel nuts on the bolts of bolted covers. When there is no flow through the line the disc shall hang lightly against its seat in practically a vertical position. When open, the disc shall swing clear of the waterway. Check valves shall be so constructed that disc and body seat may easily be removed and replaced without removing the valve from the line. Valves shall be fitted with an extended hinge arm with outside lever and weight. If pump shut off head exceeds 77 feet, then an air cushioned assembly shall be installed.

7.4. Emergency By-pass Pump Operation.

All pump stations shall be provided with District approved coupling device and valving connected to the discharge pipe after the check valves in order to utilize portable pumps and appurtenances during pump or control failures.

7.5. Pressure Gauges.

Pressure gauges shall be installed on each discharge pipe as indicated on the approved drawings. Each pressure gauge shall be direct mounted, stainless steel case, stainless steel sensing element, liquid filled, with a one and one-half inch diameter dial and furnished with a clear glass crystal window, one-fourth inch shut-off (isolation) valve. All gauges shall be weatherproofed. The face dial shall be white finished aluminum with jet black graduations and figures. The face dial shall indicate the units of pressure measured in psi, with a 0-60 psi range.

8. Pump Station Water System.

All wastewater pump stations shall be provided with a water system with adequate capacity and pressure for station wash down. The station water system shall be completely separated from the potable water supply by means of a reduced pressure type backflow preventer and a freeze protection valve shall be installed downstream of the backflow prevention assembly.

9. Pump Station Electrical Power and Control System.

9.1. General.

This section specifies the electrical power and control system requirements for wastewater pump stations. These requirements apply to duplex pump panels. Similar requirements shall apply when more than two pumps are involved except for the quantity of control equipment and panel size shall be increased accordingly. The manufacturer of the control panel shall provide data to indicate that the manufacturer has a minimum of three years' experience in the building of pump control panels.

A pump station control panel shall be provided for each wastewater pump station. The control panel shall respond to a multi-sensored probe to automatically start and stop pumps as well as sound an alarm upon high or low wet well levels. The control panel shall operate two electrical submersible pumps at the power characteristics stipulated. The control function shall provide for the operation of the lead pump under normal conditions. If the incoming flow exceeds the pumping capacity of the lead pump, the lag pump shall automatically start to handle this increased flow. As the flow decreases, pumps shall be cut off at elevation as shown on the plans. Pumps shall alternate positions as lead pump at the end of each cycle. A failure of the alternator shall not disable the pumping system. Control switches shall provide means to operate each pump manually or automatically. When operated in the automatic mode, the control assembly shall provide means to manually select or automatically alternate the position of the "lead" and "lag" pumps after each pumping cycle. The alternator shall include a safe, convenient method of manual alternation and also have provisions to prevent automatic alternation without disturbing any wiring. Should the "pump off"

regulator fail, the system shall keep the station in operation and provide a visual indication of the regulator failure

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The control panel shall consist of main circuit breakers, a motor circuit breaker and generator breaker with mechanical interlock, an emergency power receptacle, a circuit breaker and magnetic starter for each pump motor, and 15 ampere, 120 volt circuit breakers as required. For pumps equal to or greater than 20 hp, the starter for each pump shall be reduced voltage, solid state, with isolated contactors and phase monitor capability. All pump control operations shall be accomplished by a multi-sensored probe type level control system with all control components mounted in one common enclosure.

The level control system shall be a multi-sensored probe in conjunction with a controller. Systems using multiple probe devices, bubbler type, mercury float, pressure reducers or ultrasonics are not permitted. The system shall operate using extra low voltage AC as a method of determining liquid level. The level is sensed when the electrical conductivity of the liquid allows a small current to flow, which activates the controller. The exposed surfaces of the multi-sensored probe shall be constructed from premium quality uPVC extruded tube and high grade stainless alloy. Ten sensor points of high grade stainless alloy are to be spaced equally along the length of the probe assembly with the corresponding individually numbered control cables accessible in the attached flexible multi-cored support cable. The flexible probe cable shall be capable of carrying the weight of the probe without the need for additional support and shall be sealed and secured to the tip of the probe by a synthetic rubber compression fitting. The probe shall be pressure injected with an epoxy resin encapsulant to form a rigid homogeneous unit. The length of the probe shall be determined by the design engineer. The probe shall be suspended using the stainless steel hook from the stainless steel mounting bracket and cleaning squeegee positioned at an appropriate place at the top of the wet well. This shall be done in accordance with the manufacturer's instructions. The probe cable shall be routed from the wet well to the control panel via a separate dedicated conduit.

The panel mounted pump controller shall operate in conjunction with the multi-sensored probe by providing extra low voltage AC (12 VAC, 0.8 m A.max.) via the numbered probe cables. It shall be capable of controlling and monitoring two pumps and alarm by activating the pump starters and alarm device. The pump controller shall incorporate a LCD indicator panel to monitor status and a keypad to facilitate changes, resets and manual operation of the station.

The pump controller shall be mounted on the internal hinged door of the electrical control panel for the pump station and wired in accordance with the manufacturer's installation and operating instructions.

9.2. Panel Construction.

The duplex pump panel shall be housed in a NEMA 3R, Type 304, 14 Gauge stainless steel enclosure with 30 percent extra mounting space for additional equipment.

Enclosure shall have provisions for padlocking the door and a dead front inner door unit for mounting controls. All exterior hardware and hinges shall be stainless steel. The enclosure shall be equipped with a stainless steel drip lip and 3 point latch.

There shall be permanently affixed to the interior side of the exterior enclosure door both a nameplate, a ten inch by 12 inch pocket for log sheet storage, and laminated electrical schematics. The nameplate shall contain the following information, voltage, phase, rated horsepower, speed, date manufactured and pump and control panel manufacturer's name, address and telephone number, pump data, including impeller data, operating point and head, KW input, and amps at the operating point and at least two other points on the pump curve. The control panel enclosure shall be Underwriters Laboratories (UL) 50, Type 3R listed.

9.3. Conduit and Fittings.

All above ground and underground conduit at a minimum shall be schedule 80 PVC. When approved by the District liquid tight flexible non-metallic conduit may be used in lengths no greater than 3 feet. Conduit wall seals shall be used for all conduits penetrating walls below grade or other locations. Seal offs shall be installed on all conduits connecting electrical panels and wet well / valve vault.

9.4. Electrical Equipment Mounting

All electrical panels shall be mounted to stainless steel channel strut using stainless steel hardware. Channel strut shall be mounted to concrete post, sized appropriately to support load with a minimum size of 4 inch by 4 inch. The channel strut shall be mounted to concrete post by means of bolting through entire concrete post with stainless steel all thread and hardware.

9.5. Power Supply and Main Disconnect.

Power supply to the control panel shall be either 240 volt, 3 phase, 4 wire or 480 volt, 3 phase, 4 wire. Minimum service shall be 100 AMP. Single phase power shall not be accepted. Non-fusible safety service main disconnects shall be installed at all stations. In all 240 volt systems, disconnects should be installed between the meter and the panel and on all 480 volt systems, disconnect should be installed ahead of the meter. The Automatic Transfer Switch (ATS) shall be positioned after the Main Disconnect but not prior to the meter can.

9.6. Circuit Breakers

9.6.1. Main Breakers.

The panel shall have an inter-lock system between the normal power main breaker and the emergency breaker to ensure only one breaker is in the "on" position at a time. Both breakers shall be equal in size.

9.6.2. Circuit Breakers.

All circuit breakers shall be heavy duty molded case breakers. The handle on the circuit breakers shall be operational through the inner door.

9.7. Motor Circuit Protectors.

Each pump motor shall be protected by a 3-pole motor circuit protector. The Motor Circuit Protector shall be operated by a toggle-type handle and shall have a quick-make, quick-break over center switching mechanism that is mechanically trip-free from the handle so that the contacts cannot be held closed against a short circuit and abnormal currents which cause the Motor Circuit Protector to trip. Tripping shall be clearly indicated by the handle automatically assuming a position midway between the normal ON and OFF positions. All latch surfaces shall be ground and polished. All poles shall be so constructed that they open, close, and trip simultaneously. Motor Circuit Protector must be completely enclosed in a high-strength glass polyester molded case. Ampere ratings shall be clearly visible. Contacts shall be of non-welding silver alloy. Arc extinction must be accomplished by means of arc chutes. A manual push-to-trip button shall be provided for manual exercising of the trip mechanism. Each pole of these Motor Circuit Protector's shall provide instantaneous short circuit protection by means of an adjustable magnetic-only element.

9.8. Motor Starter and Selector Switches.

The motor starters shall be across the line magnetic starter with individual overload protection on each power leg with reset installed through the inner door unit. The motor starter for pumps equal to or greater than 20 hp shall be reduced voltage solid state with insulated contactors and phase monitor capability. Local Power Company Regulations shall govern.

Selector switches shall be installed on the face of the inner door unit. Selector switch shall be a heavy duty oil tight "Hand-Off-Auto" three position switch to control the operation mode of each pump motor starter.

9.9. Pump Alternation.

The pump station controller shall have pump alternation capabilities.

9.10. Lights and Alarms.

9.10.1. Indicator Lights.

There shall be installed on the face of the inner door unit, heavy duty oil tight indicator lights as shown on the Standard Drawings.

9.10.2. High Level Alarm.

A vapor proof red light and horn shall be mounted on top of the panel for high level alarm. Also, there shall be an alarm silence push button on the inner door and a silence relay which will silence the horn and automatically reset when these signals are restored to normal. The push button shall be heavy duty oil tight. The red globe shall be the screw-on type. This alarm relay shall be wired to a single float which operates separate from the probe system.

9.10.3. Sight Lighting.

Sight lighting shall be 120 volts mounted on concrete poles with a minimum height of 15 feet above grade (other pole material may be provided in lieu of concrete if approved by the utility) and shall be operated by a one way switch mounted on the internal hinged door of the electrical control panel. The exact locations and quantity needed will be determined during plan review and approval.

9.10.3.1. Fluorescent Lamp

Fluorescent lamps shall be medium bi-pin and recessed double contact, rapid start, standard cool white. Fluorescent electronic ballasts shall be Class P, rapid start, high power factor, energy saving, CBM certified by E.T.L. and listed by Underwriters Laboratories, Inc., for operation on 120 volts.

High pressure sodium or metal halide ballast shall be of the constant wattage auto – transformer type of the correct size and voltage.

9.10.3.2. Incandescent Lamp

Incandescent lamps shall be inside frosted, extended service 2500 hour life with medium base.

9.11. Emergency Power Receptacle.

The panel shall have an external mounted generator receptacle. Generator receptacle shall be 200 amps for 240 volt stations and 100 amps for 480 volt stations.

9.12. Pump Station Controller

Pump station controller shall be Multitrode Multismart with motor protection and flow calculation functionality or approved equal. Required components include three square foot mount current transformers for each pump sized appropriately for application, one 12 volt 12 amp backup battery, controller power supply, and battery trickle charger sized appropriately for application.

Features of the pump station controller shall include:

- Operator interface for pump control shall be at minimum a 320x240 backlit LCD screen.
- Operator user interface home screen shall include control for auto/manual/off, next pump to start, alternation status, level display, pump available, hours run, and fault indicator. Additional configuration screens shall include set points (start/stop, alarms, and delays), level sensing device, I/O and fault setup, station optimization, motor protection and insulation resistance testing, communication, profiles, data logger setup, and flow setup.
- Under-current monitoring (well has run dry, impellor fallen off, etc.)
- Over-current monitoring (locked rotor)
- Phase failure monitoring (supply fluctuations)

- Earth fault monitoring (leakage in the winding)
- Phase rotation monitoring
- Insulation resistance testing (1000v winding test) with data logging of values, and fault indication when it falls below a user-defined preset value.
- Monitoring of KW, power factor, and kVA as well as accumulated values in tariff periods.
- Data logger shall be 10 MB for storage up to 50,000 events with site history review screen including detailed faults and events. The data logger captures alarms and change of state of I/O,
- Ethernet 10MBit/s and 3x 115kBit/s RS232 serial ports
- Compact Flash Port – for save/load of configuration and firmware.
- Maximum run time to switch from inefficient pumps.
- Maximum off time for odor reduction.
- Sump clean out function (drawdown below off point).
- Configurable fault handling.
- Pump start delays to prevent water hammer and electrical overload.
- Advanced alternation options (e.g. based on hours run or starts).
- Flow functionality shall include inflow, pump flow rates, and total station volume.
- Firmware/application upgrade capability - Local via serial, ethernet from PC, or compact flash card and remote over any communications media.
- RTU/communications protocols shall be DNP3 level 2.

9.13. Additional Requirements.

9.13.1. Wiring.

All power wires shall be THW or THWN 75° C insulated stranded copper conductors and shall be appropriately sized for the given load application. All control circuit wire shall be type THW; Size 14, stranded type. All wiring within the enclosure shall be neatly routed by the use of slotted type wiring duct with snap on type covers. Wiring on the rear of the inner door shall be neatly bundled with nylon ties and include sufficient loop across the hinges to prevent wire damage, with each end of conductor marked (I.D.), Color: Red, 24 volt; white, neutral; black, 120 volts. All SCADA wiring, signal wiring, and liquid level wiring shall be in conduit separate from any AC power lines.

9.13.2. Communications

Wastewater pumping stations shall be provided with fiber optic communications with terminations located inside the control panel and connection provided to the pump station controller.

9.13.3. Terminal Points.

Terminal points of all terminal strips shall be permanently identified. All terminal numbers and identifying nomenclature shall correspond to and be

shown on electrical diagrams. All wiring shall be permanently shown on electrical schematic diagrams.

9.13.4. Engraved Nameplates.

All circuit breakers, control switches, indicator pilot lights and other control devices shall be identified with permanently affixed legend plates and lamicoid-type engraved nameplates where applicable.

9.13.5. Surge Protector.

A surge protector shall be included and wired to protect motors and control equipment from lightning induced line surges. All surge protectors shall be U.L. approved and installed per respective power company requirements and manufacturers' specifications. Surge protectors shall be attached to the main disconnects.

9.13.6. Elapsed Time Meters.

Elapsed time meters shall be 115 volt not-reset type and shall totalize pump running time in hours and tenths of hours to 99999.9 hours.

9.13.7. Convenience Receptacle.

On the face of the inner door unit, there shall be installed a 15 AMP 120 volt, duplex convenience receptacle. It shall be provided with its own single pole, 15 AMP circuit breaker for protection. Ground fault interrupt type shall be required.

9.13.8. Control Terminal Blocks.

Control terminal blocks shall be of the clamp screw type, rated for 600 volts. Amperage rating shall accommodate the control circuit amperage. An additional 30 space terminal strip shall be installed in the cabinet for future use, with RTU equipment.

9.13.9. Control Power Transformers.

There shall be a control power transformer with a minimum size of 500VA to provide 120VAC power for: coils for starters, 15A duplex receptacle, indicator pilot lights, alarm horn, alarm light, pump alternator, elapsed time meters etc. The secondary side shall have one leg fused and the other grounded. The signal required by the float switches and relays shall be 24VAC. This shall be provided by a 24VAC control power transformer properly sized with a fused secondary.

9.13.10. Control Relay.

The level control relays shall operate from 24VAC. They shall be enclosed, plug-in 8 pin type with octal-style screw terminal sockets.

9.13.11. Electrical Schematic.

There shall be permanently affixed to the interior side of the exterior enclosure door an electrical schematic diagram and a copy supplied to District personnel at start-up. The schematic diagram shall include the rated amperage and voltage for all components.

9.13.12. Phase Monitor.

The pump station controller shall have phase monitoring capabilities.

9.13.13. Pump Start Delay Timers

The pump station controller shall have pump start delay timer feature.

9.13.14. Flow Meters.

Indicating, totalizing and recording flow measurement shall be provided at pumping stations designed to handle peak flows of 1,000 GPM or more. Bypass piping around the meter shall be provided for all stations with flow meters to facilitate meter maintenance.

9.13.14.1. Flow Monitoring System

When required a flow monitoring system capable of indicating, recording, and totalizing wastewater flows shall be provided consisting of a magnetic meter (other proposed flow metering will require submittal and approval by the District), interconnecting cable, remote microprocessor based electronic transmitter and accessories required for installation. It shall be the Contractor's responsibility to provide and install such equipment resulting in a completely operational flow monitoring system.

9.13.14.2. Transmitter Requirements.

The transmitter shall contain all the circuitry necessary to produce a 4-20 mA DC signal linear with the flow rate. The transmitter shall be capable of measuring and totalizing forward and reverse flow. It shall be microprocessor controlled. The microprocessor shall be of a single chip design. The transmitter shall be housed in foam molded polycarbonate enclosure suitable for wall or panel mounting rated NEMA 4X. The display on the enclosure will be a 24 character, 2-line alpha numeric LCD clearly indicating instantaneous flow rate and totalized flow in formation. The transmitter shall utilize menu-driven sequencing of the internal functions from the front panel switches without the need or use of external equipment. The functions shall include: rate indication, totalization, on-line meter status, self-test, meter identification and tag number, 4-20 mA span adjustment, flow damping, 4-20 mA zero adjustment, meter re-scale and meter recalibration. Meter output shall be isolated 4-20 mA signal linearly proportional to the flow rate operating into a maximum of 1,000 ohms. The power requirements for the meter shall be a maximum of five watts operating on 120 VAC 50/60 Hz. It

shall be capable of operating on 12VDC continuous or battery back-up. The temperature range of the transmitter shall be 32° to 140° F. For installations at wastewater treatment plants, the installation shall also include a remote chart recorder to be located in the operations building.

9.13.14.3. Performance Specifications.

The meter shall measure, indicate, totalize and record the flow within the following parameters:

- Accuracy: 1% +/- of actual flow above 1 foot per second
- Linearity of the units: 0.5% +/-
- Repeatability: to within 0.25% +/-
- Sensitivity: 0.005 feet per second

9.13.14.4. Flowmeter Maintenance.

The flowmeter manufacturer shall incorporate trouble shooting guides with the instruction manuals. In addition the meter shall be designed to provide a continuous on line indication of meter status via the LCD display. The front panel shall have a menu with a user operated self-test program which can be activated to check signal strength, transmission status as well as electronic circuitry to assure reliable operation of the motor.

9.13.15. Electrical Grounding System

A grounding system shall be installed as per National Electrical Code, Local Codes and Ordinances. The drawings shall clearly show the Electrical Grounding System. The drawings shall show details of material and installation to construct a completely functional and operational Electrical Grounding System. An underground perimeter cable grounding system shall be installed with connections to at least the following equipment:

- Wet Well Cover
- Valve Vault Cover
- Control Panels
- Generator
- Utility Company Transformer
- Main Disconnect Switch
- Fence

9.13.16. Fall Arrest Anchor

An anchor post with a minimum height of three feet shall be installed for the purpose of an anchor point for a fall arrest system. The anchor post shall have a minimum of two separate anchor points designed to support a minimum of 5,000 pounds per attached worker. The anchor post shall be of corrosion resistant material or protected with appropriate coating as approved by the District. All

related hardware shall be 316 stainless steel. The exact locations and mounting quantity needed will be determined during plan review and approval.

10. Standby Power Generator System

10.1. General.

A standby power generator system shall be installed at all pump stations for electrical power during the loss of normal power.

10.2. Generator Set

The generator set shall consist of a diesel fuel engine directly coupled to an electric generator, together with the necessary controls and accessories to provide continuous electric power to the pump station for the minimum duration of a 48 hour failure of the normal power supply.

A complete engine generator system shall be furnished and installed with fuel transfer pump, double lined fuel tank, battery, battery charger, muffler, radiator, control panel, remotely mounted automatic transfer switch, and all other accessories required for an operational system. All materials and parts of the generator set shall be new and unused. Each component shall be of current manufacture from a firm regularly engaged in the production of such equipment. The set shall be of a standard model in regular production at the manufacturer's place of business. Units and components offered under the specifications shall be covered by the manufacturer's standard warranty on new machines.

10.3. Requirements.

The emergency generator set and accessories shall be of a type that complies with the latest edition of the National Electrical Code and all applicable state and local building codes.

The material and workmanship used in the manufacture of this equipment shall be of the highest quality consistent with the current standards for like equipment, and the equipment shall be manufactured in such a manner so as to conform to the latest applicable IEEE, ANSI, ISA, NEMA, and EEIA Standards.

The equipment supplier shall be liable for any latent defects due to faulty materials or workmanship in the equipment which may appear within five years from the date of substantial completion.

10.4. Tests.

Equipment shall be completely assembled and tested at the factory prior to shipment. Certified copies of the data obtained during these tests shall be submitted to the District.

Final tests shall be conducted at the site, after installation has been completed, in the presence of the Districts and Developer's representatives. The emergency generator manufacturer shall furnish a service representative to operate the engine during the tests, to check all details of the installation and to instruct the utility's representatives in proper equipment operation.

Field tests shall include operating the diesel generating set for one hour, carrying full generator design load.

10.5. Ratings.

The rating of the generator shall be as shown on the drawings. These ratings must be substantiated by the manufacturer's standard published curves. Special ratings shall not be acceptable. The diesel generating set shall be capable of supplying the specified usable KW for the specified duration, including the power required for the pump start-up, without exceeding its safe operating temperature.

10.6. Engine.

The engine shall be water cooled, four stroke cycle, compression ignition diesel. The engine shall be equipped with fuel, lube oil, and intake air filters; lube oil coolers, fuel transfer pump, fuel priming pump, and gear-driven water pump.

The engine and generator shall be torsionally compatible to prevent damage to either engine or generator.

An engine instrument panel shall be installed on the generator set in an approved location. The panel shall include oil and fuel pressure and water temperature gauges. An engine hour meter shall be provided.

The engine governor shall be of the isochronous electronic type. Frequency regulation shall not exceed plus/minus 0.25 percent under steady state conditions. The engine shall start and assume its rated load within 10 seconds, including transfer time.

10.7. Generator.

The generator shall be a three-phase, 60 hertz, single bearing, and synchronous type, built to NEMA Standards. Epoxy impregnated Class F insulation shall be used on the stator and the rotor. The excitation system shall employ a generator-mounted volts per hertz type regulator. Voltage regulation shall be plus/minus two percent from no load to full load. Readily accessible voltage drop, voltage level and voltage gain controls shall be provided. Voltage level adjustment shall be a minimum of plus/minus five percent.

10.8. Engine Generator Controls.

Engine generator controls shall be located inside the generator weatherproof enclosure and include, but not be limited to, the following equipment:

10.8.1. Control Equipment.

Control equipment shall consist of all necessary exciter control equipment, generator voltage regulators, voltage adjusting rheostat, and speed control equipment and automatic starting controls, as required to satisfactorily control the engine/generator set. In addition an automatic safety shut down shall be provided for low oil pressure and/or high temperature conditions in the engine. An emergency shutdown control switch shall be provided.

10.8.2. Metering Equipment.

Metering equipment shall include dial or digital type frequency meter, two percent accuracy voltmeter, and ammeter and ammeter-voltmeter phase selector switch. The control panel shall also include the engine water temperature, lube oil pressure and hour meter.

10.8.3. Fault Indicators.

Individual fault indicator lights for low oil pressure, high water temperature, low water level, over speed, over crank, high and low fuel level shall be provided.

10.8.4. Function Switch.

A four position function switch marked "Auto, "Manual", "Off/Reset", and "Stop" shall be provided.

10.8.5. Emergency Stop Switch

Actuators of emergency stop devices shall be colored RED. The background immediately around pushbuttons and disconnect switch actuators used as emergency stop devices shall be colored YELLOW. The actuator of a pushbutton-operated device shall be of the palm or mushroom-head type. Emergency stop switch shall be mounted on the exterior of the generator weatherproof enclosure facing the control panel.

10.9. Trickle Battery Charger.

The battery charger shall be so designed that it shall not be damaged and shall not trip its circuit protective device during engine cranking or it shall be automatically disconnected from battery during cranking period. The charger shall be mounted in the emergency generator enclosure or automatic transfer switch.

10.10. Battery.

The battery shall be lead-acid type with sufficient capacity to provide 90 seconds total cranking time without recharging. The battery shall be adequately rated for the specific generator set. The battery shall be encased in hard rubber or plastic and shall be furnished with proper cables and connectors, together with rack and standard maintenance accessories. The battery shall be provided with a 48 month warranty for the replacement of the battery if found to be defective. Batteries shall be designed to fit alongside the engine. Batteries under the generator are not acceptable.

10.11. Base and Mounting.

Generator set shall be mounted to a 10” thick 3000 psi concrete pad with rubber vibration pads installed between generator set and concrete using a minimum 304 stainless steel hardware securing generator to concrete.

10.12. Utility Connections.

All connections to the generator set shall be flexible.

10.13. Cooling System.

The generator set shall be equipped with an engine mounted radiator sized to maintain safe operation at 110 degree F maximum ambient at the pump station altitude. A blower type fan shall be used directing the air flow from the engine through the radiator. The entire cooling system shall be filled with 50 percent glycol-water solution.

10.14. Fuel System.

An above ground, double wall (UL Listed) closed top dike design main fuel storage tank with float switch and fuel level indication or approved equivalent shall be furnished and installed. The emergency system shall include low fuel level contacts for remote alarm. If necessary to guard against loss of prime to pump, a check valve shall be mounted on pump intake. The emergency system shall include a float switch, fuel level gauge and standard control panel.

In the event a double wall fuel tank is not provided a fuel containment system shall be provided to prevent the accidental release of fuel to the environment. The containment area shall be of sufficient size to contain 110 percent the volume of the largest fuel tank. A minimum two inch drain and valve shall be provided for drainage of the containment area. An approved epoxy coating shall be applied to any concrete area.

Fuel oil piping, including mounting of any required fuel tanks, shall be furnished and installed by the contractor.

10.15. Exhaust System.

The generator set supplier shall provide a critical-type silencer, with flexible exhaust fittings, properly sized and installed, according to the manufacturer's recommendation. The silencer shall be mounted so that its weight is not supported by the engine.

Exhaust pipe size shall be sufficient to ensure that measured exhaust back pressure does not exceed the maximum limitations specified by the generator set manufacturer. The exhaust system shall include a flexible, seamless, stainless steel connection between the engine exhaust outlet and the rest of the exhaust system. The exhaust system shall be a part of generator enclosure.

10.16. Weatherproof Enclosure.

For generator installation in the outdoors, the weatherproof enclosure and all other items shall be designed and built by the engine manufacturer as an integral part of the entire generator set and shall be designed to perform without overheating in the ambient temperature specified.

Factory sound attenuated weatherproof enclosure shall:

- Constructed of 14 gauge aluminum or other approved material by the District suitably reinforced to be vibration free in the operating mode.
- The enclosure at a minimum must reduce engine noise by 20 dbA.
- The enclosure shall be white or District approved color.
- The size of the enclosure shall be large enough to allow for access to the equipment for maintenance.
- Lockable access doors. Hinged doors shall be provided to allow complete access without their removal. Stainless steel flush fitting latches and hinges tested and proven to withstand extreme conditions of corrosion. Each door shall have at least two satch-bearing points. Side and rear panels shall be completely and simply removable for major service access.
- Fuel fill and battery can only be reached via lockable access doors.
- Exhaust silencing system totally enclosed for operator safety.
- Roof shall be peaked to allow drainage of rain water.
- Baked enamel finish with primer and finish coat shall be painted before assembly.
- All fasteners shall be stainless steel, in the event a fastener is not available in stainless steel rust resistant materials shall be used, if approved by the District. Unit shall have sufficient guards to prevent entrance by small animals.

Unit shall have coolant and oil drains outside the unit to facilitate maintenance. Each drain line shall have a high quality valve located near the fluid source. Fuel filter shall be inside the base perimeter and located so spilled fuel cannot fall on hot parts of engine or generator. A cleanable primary fuel strainer shall be used to collect water and sediment between tank and main engine fuel filter. Crankcase fumes disposal shall terminate in front of the radiator to prevent oil from collecting on the radiator core and reducing cooling capacity.

10.17. Automatic Transfer Switch.

The transfer switch shall be provided with the following features:

- Complete protection, close differential voltage sensing relays monitoring all three phases (pick-up set for 95 percent of nominal voltage, drop-out set for 85 percent nominal voltage).Voltage sensing relay on emergency source (pick-up set for 95 percent of nominal frequency).
- Time delay on engine starting--adjustable from 1 second to 300 seconds (factory set at three seconds.) Time delay normal to emergency transfer--adjustable from zero second to 300 seconds (factory set at one second). The contractor shall request time delay settings in accordance with the priority rating or their respective loads. Time delay emergency to normal transfer--adjustable 30 seconds to 30 minutes (factory set at five minutes), and time

delay bypass switch shall be provided on door of the switch cabinet. Unload running time delay for emergency engine generator cooling down-adjustable from zero to five minutes (factory set at five minutes) unless the engine generator control panel includes the cool down timer.

- The Automatic Transfer Switch shall have the capability of running the generator in test mode without interruption of domestic service and have an automatic exercising program capable of operating under load.
- The Automatic Transfer Switch shall be mounted in a stainless steel enclosed cabinet keeping controls locked out form unauthorized personnel.

10.18. Tools and Parts.

One set of all special tools required for normal operation and maintenance shall be provided. All such tools shall be furnished in a suitable steel tool chest complete with lock and duplicate keys.

11. Submittals

11.1. Engineering data covering all equipment and fabricated materials, which will become a permanent part of the work under this development, shall be submitted to the District, for review. This data shall include drawings and descriptive information in sufficient detail to show the kind, size, arrangement, and operation of component materials and devices; the external connections, anchorages, and supports requires; performance characteristics; and dimensions needed for installation and correlations with other materials and equipment.

11.1.1. Data on the characteristics and performance of each pump. Data shall include guaranteed performance curves, based on actual shop tests of similar units, which show that they meet the specified requirements for head, capacity, efficiency, NPSHR, submergence and horsepower. Curves shall be submitted on eight and one-half inch by 11 inch sheets, at as large a scale as is practical. Curves shall be plotted from no flow at shut off head to maximum manufacturer recommended pump capacity. Catalog sheets showing a family of curves will not be acceptable.

11.1.2. Complete layouts, wiring diagrams, elementary or control schematics, including coordination with other electrical control devices operating in conjunction with the pump control system. Suitable outline drawings shall be furnished for approval before proceeding with manufacture of any equipment. Standard preprinted sheets or drawings simply marked to indicate applicability will not be acceptable.

11.1.3. A drawing showing the layout of the pump control panel shall be furnished. The layout shall indicate all devices mounted on the door and in the panel shall be completely identified.

11.2. All submittals, regardless of origin, shall be stamped with the approval of Contractor and identified with the name and number of this development, Contractor's name, and references to applicable specification paragraphs. Each submittal shall indicate the intended use of the item in the work. When catalog pages are submitted, applicable items shall be clearly identified. The current revision, issue number, and date shall be indicated on all drawings and other descriptive data.

11.3. Contractor's stamp of approval is a representation to the District that Contractor accepts full responsibility for determining and verifying all quantities, dimensions, field construction criteria, materials, catalog numbers, and similar data, and that the Contractor has reviewed or coordinated each submittal with the requirements of the work and the specifications.

11.4. All deviations from the specifications shall be identified on each submittal and shall be tabulated in Contractor's letter of transmittal. Such submittals shall, as pertinent to the deviation, indicate essential details of all changes proposed by Contractor (including modifications to other facilities that may be a result of the deviation) and all required piping and wiring diagrams.

11.5. Contactor shall accept full responsibility for the completeness of each submission, and, in the case of a resubmission, shall verify that all exceptions previously noted by the District have been taken into account. In the event that more than one resubmission is required due to failure of contractor to account for exceptions previously noted, Contractor shall reimburse the District for charges for review of the additional resubmissions.

11.6. Resubmittals shall be made within 21 days of the date of the letter returning the material to be modified or corrected, unless within 21 days the Contractor submits an acceptable request for an extension of the stipulated time period, listing the reasons the resubmittal cannot be completed within that time.

11.7. Contractor's letter of resubmittal shall list the date of his original submittal letter, the date of the Districts letter returning the submittal, and the dates of submission and return of any previous resubmittals. In addition the Contractor shall reimburse the District for any time spent on reviewing the resubmittal and each of any subsequent resubmittals as defined in the Adopted Rate Schedule.

11.8. The Districts review of drawings and data submitted by Contractor will cover only general conformity to the drawings and specifications, external connections, and dimensions which affect the layout. The Districts review does not indicate a thorough review of all dimensions, quantities, and details of the material, equipment, device or item shown. The Districts review of submittals shall not relieve Contractor from responsibility for errors, omissions, or deviations, or responsibility for compliance with the specifications.

11.9. Three copies of each submittal shall be submitted to the District, plus additional copies as deemed necessary by the Contractor for vendors and sub-contractors. The District will not accept submittals from anyone but the Developer or Developers engineering firm. Submittals shall be consecutively numbered in direct sequence of submittal and without division by subcontracts or trades. Resubmittals shall bear the number of the first submittal followed by a letter (A, B, etc.), to indicate the sequence of the resubmittal. The Contractor will receive one copy of the reviewed submittals from the District. The District will retain the remaining submittals for file.

11.10. When the drawings and data are returned marked Not Acceptable or Returned For Correction, the corrections shall be made as noted thereon and as instructed by the District and three corrected copies resubmitted.

11.11. When corrected copies are resubmitted, Contractor shall in writing direct specific attention to all revisions and shall list separately any revisions made other than those called for by the District in previous submissions.

11.12. When the drawings and data are returned marked No Exceptions Noted, Make Corrections Noted, or Record Copy, no additional copies need to be furnished.

12. Testing / Startup.

12.1. Contractor shall provide a competent field services technician for the equipment furnished to supervise installation, adjustment, initial operation and testing, performance testing, final acceptance testing, and startup of the equipment.

12.2. After fabrication of the control panel in the manufacturer's plant, an operational test shall be performed to verify proper operation of the entire panel before delivery. Three phase source voltage for which the panel is intended, shall be used for the testing.

12.3. After installation of the equipment has been completed and the equipment is presumably ready for operation, before it is operated by others, the manufacturer’s field service technician shall inspect, operate, test, and adjust the equipment. The inspection shall include at least the following points where applicable:

- Soundness (Without crack or otherwise damaged parts)
- Completeness in all details, as specified and required.
- Correctness of setting, alignment and relative arrangement of various parts.
- Adequacy and correctness of packing, sealing, and lubricants.

12.4. The operation, testing, and adjustment shall be as required to prove that the equipment has been left in proper condition for satisfactory operation under the conditions specified.

12.5. Upon completion of this work, the manufacturer’s field service technician shall submit a signed report of the results of his/her inspection, operation, adjustments, and tests.

12.6. Field performance and acceptance tests shall be performed in the presence of the District, Developer's representative, Contractor's representative, Engineer's representative.

12.7. All performance tests and inspections shall be scheduled at least three working days in advance or as otherwise specified with the District. All performance tests and inspections shall be conducted during the work week of Monday through Friday (7:00am through 3:30pm), unless otherwise specified.

12.8. Upon completion of the wastewater pump station and its related systems, all channels, basins, and tanks shall be flushed and hydraulically checked for leaks, cracks, and defects.

12.9. All mechanical and electrical equipment shall be checked to ensure it is in good working order and properly connected. Preliminary run-ins of the various pumps, compressors, and other related equipment shall be made. All systems shall be cleaned and purged as required. All sumps, tanks, basins, chambers, pump wells, and pipeline which is hydraulically checked shall be drained and returned to their original condition once the testing is complete.

12.10. All instruments and controls shall be calibrated through their full range. All other adjustment required for proper operation of all instrumentation and control equipment shall be made.

12.11. No testing or equipment operation shall take place until it has been verified by the Engineers representative that all specified safety equipment has been installed and is in good working order.

12.12. In the event of failure to demonstrate satisfactory performance of the pump station on the first day or any subsequent attempt all necessary alterations, adjustments, repairs and replacements shall be made. When the pump station is again ready for operation, it shall be brought online and a new test shall be started. This procedure shall be repeated as often as necessary until the pump station has operated to the satisfaction of the District.

12.13. At no time during startup shall the Contractor allow the pump station to be operated in a manner which subjects equipment to conditions that are more severe than the maximum allowable operating conditions for which the equipment was designed.

13. Operation & Maintenance Manuals.

Developer shall provide three (3) Operations and Maintenance Manuals for all equipment furnished including electrical schematics (11" x 17"), pump station as-built (11"x 17") cut sheets and related manuals in a binder with table of contents and tabbed sections.

14. Service.

The control panel manufacturer shall maintain a service organization locally that is available for service.

15. Warranty.

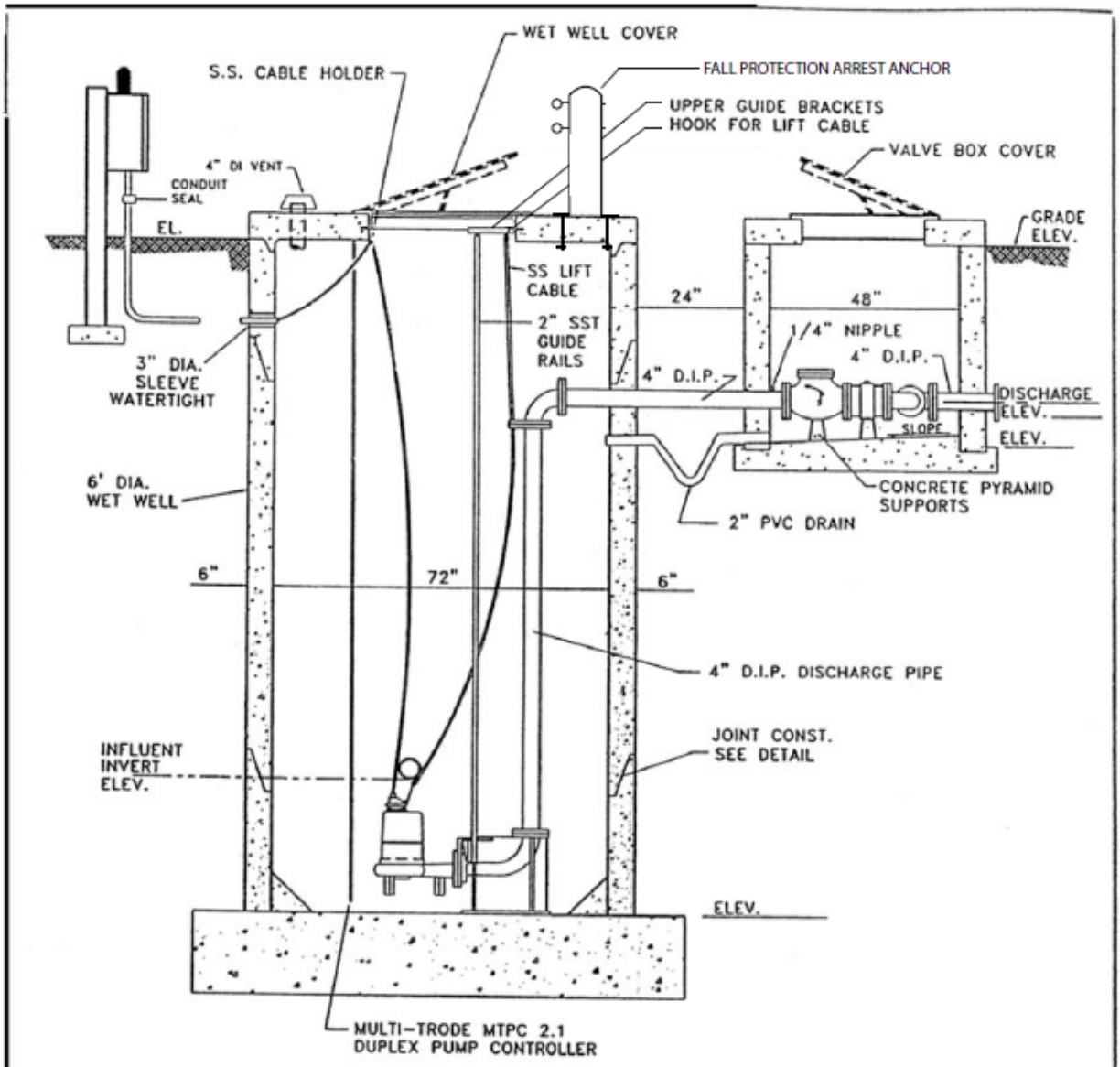
All mechanical and electrical equipment, together with the devices of whatever nature and all components, which are furnished and/or installed by the contractor shall be guaranteed. The guarantee shall be against the manufacturing and/or design inadequacies, materials, and workmanship not in conformity, improper assembly, hidden damage, failure of devices and/or components, excessive leakage, or other circumstances which would cause the equipment to fail under normal design and/or specific operating conditions for a period of one year unless otherwise listed below and after the date of Substantial Completion.

- Pump Station Controller – 5 years
- Level Sensing Probe – 10 years
- Pumps – 18 Months
- Generator – 5 Years (Comprehensive)
- Automatic Transfer Switch – 5 Years (Comprehensive)

Each piece of equipment, device or component which shall fail within the above specified term of the guarantee shall be replaced and installed within reasonable promptness by the Contractor. Failure of the Contractor to provide timely repairs as specified herein shall result in a claim issued by the District.

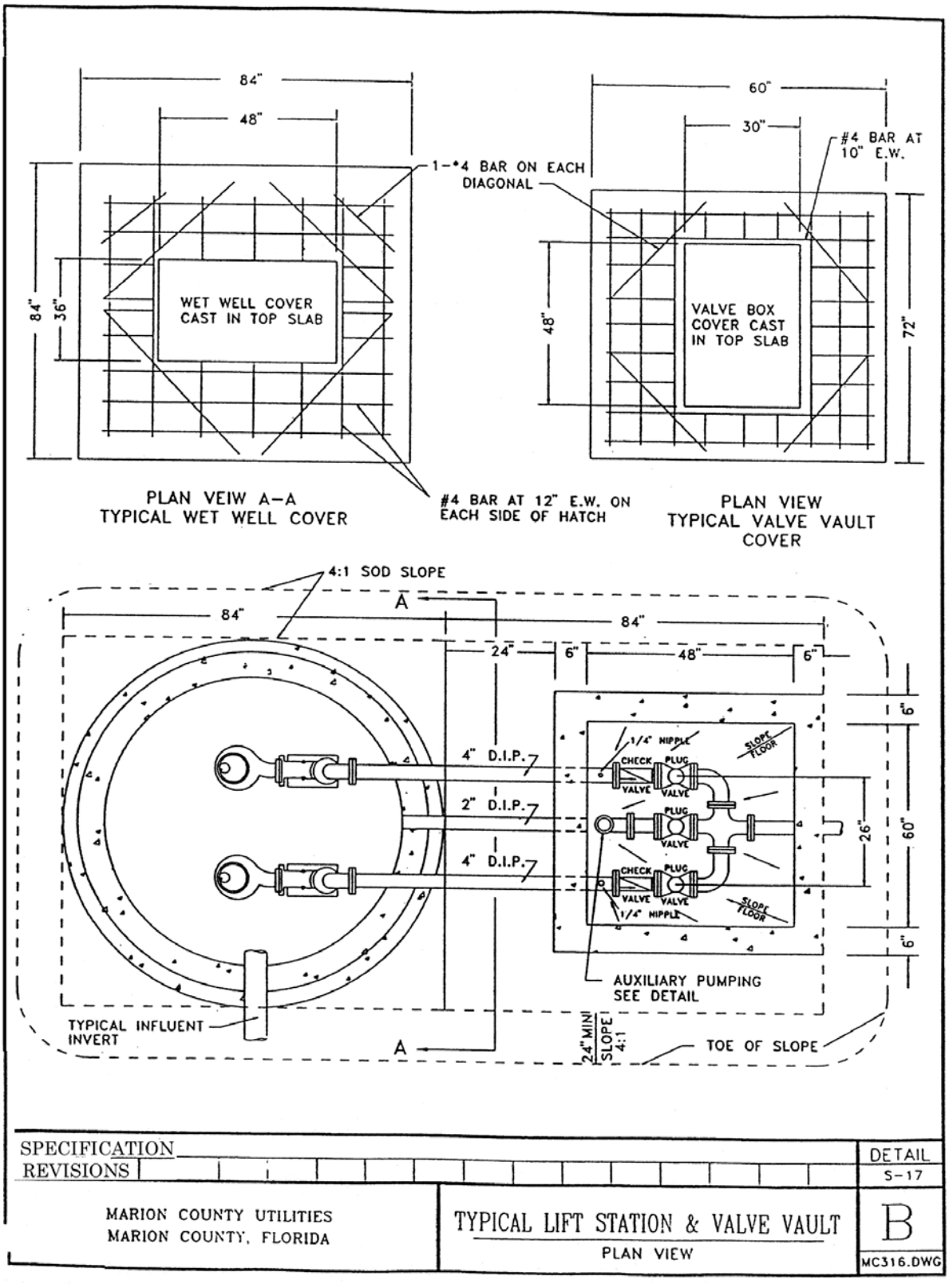
Standard Drawings

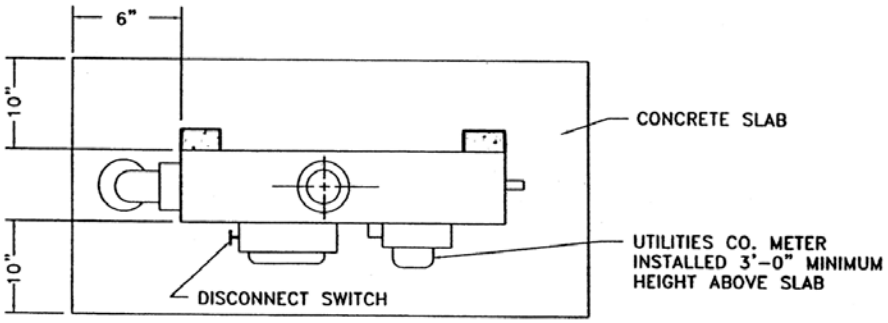
The purposes of the drawings below are for guidance during the layout design process. Refer to Bay Laurel Center C.D.D. Wastewater Pumping Station Specifications for specific requirements.



L.S. MANUFACTURER	_____	VOLTAGE/PHASE	_____	ALARM	_____
L.S. MODEL NUMBER	_____	PUMP RATE – G.P.M.	_____	BOTH PUMPS ON	_____
PUMP MODEL NUMBER	_____	T.D.H.	_____	LEAD PUMP ON	_____
PUMP H.P.	_____	F.M. LENGTH	_____	BOTH PUMPS OFF	_____
PUMP R.P.M.	_____	F.M. SIZE	_____		
IMPELLER SIZE	_____	TYPE OF F.M. PIPE	_____		

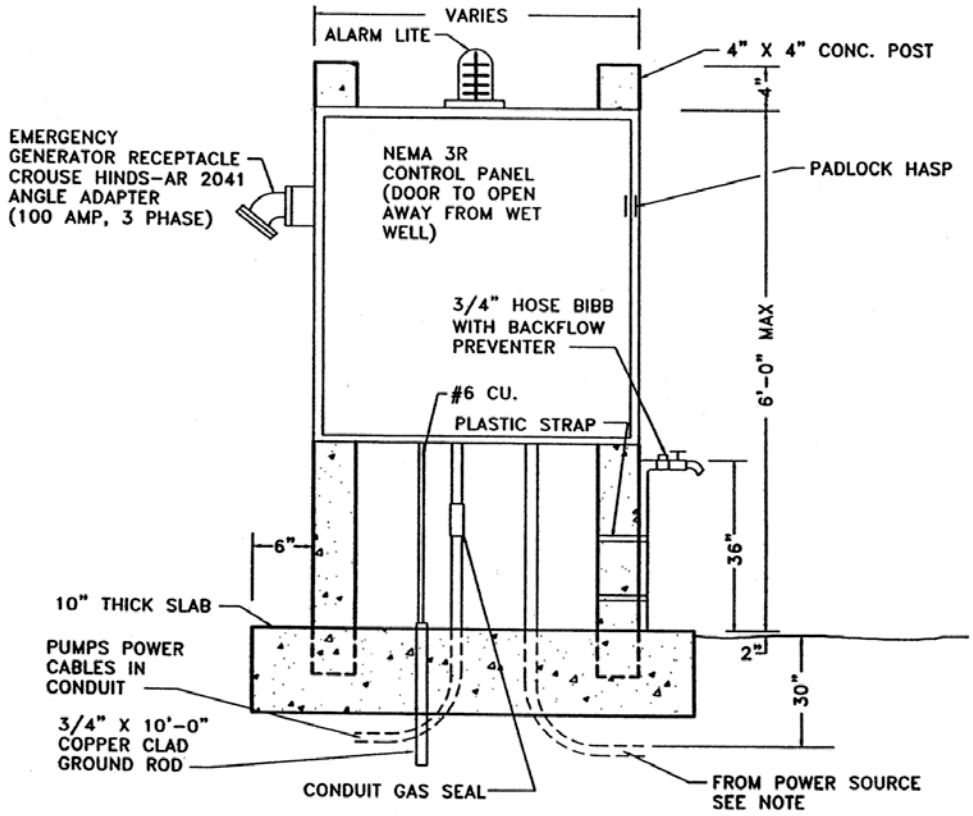
SPECIFICATION


84"
48"
84"
36"
WET WELL COVER
CAST IN TOP SLAB
1-#4 BAR ON EACH
DIAGONAL
#4 BAR AT 12" E.W. ON
EACH SIDE OF HATCH
PLAN VEIW A-A
TYPICAL WET WELL COVER
60"
30"
#4 BAR AT
10" E.W.
48"
72"
VALVE BOX
COVER CAST
IN TOP SLAB
PLAN VIEW
TYPICAL VALVE VAULT
COVER
4:1 SOD SLOPE
A
84"
84"
24"
6"
48"
6"
4" D.I.P.
2" D.I.P.
4" D.I.P.
1/4" NIPPLE
CHECK VALVE
PLUG VALVE
SLOPE FLOOR
6"
60"
26"
6"
AUXILIARY PUMPING
SEE DETAIL
TYPICAL INFLUENT
INVERT
A
24" MIN
SLOPE
4:1
TOE OF SLOPE
SPECIFICATION
REVISIONS
DETAIL
S-17
MARION COUNTY UTILITIES
MARION COUNTY, FLORIDA
TYPICAL LIFT STATION & VALVE VAULT
PLAN VIEW
B
MC316.DWG



PLAN VIEW

FIELD DRILL MOUNTING & WIRE HOLES SEAL WATERTIGHT AFTER INSTALLATION



ELEVATION

SPECIFICATION REVISIONS		DETAIL S-18
MARION COUNTY UTILITIES MARION COUNTY, FLORIDA	SERVICE PEDESTAL	B MC317.DWG

Signage Detail

Sign shall be 24" x 18" on .080 aluminum with white high intensity reflective sheeting and green vinyl letters. Information in image is intended only as a representation of format required, actual pump station identification number, address, and emergency phone number will be provided by the District upon request.

Pump Station Start-up Inspection Checklist

SITE

- ☐ Inspect asphalt or concrete, check slope for proper drainage, puddles.
- ☐ Inspect grounds.
- ☐ Inspect fencing and gate. Insure correct operation of gate (Full swing).
- ☐ Inspect for correct material (Vinyl coated black) posts and fabric.
- ☐ Insure that all debris has been removed from site.
- ☐ Insure that all required signage has been installed (Station I.D. sign).

WETWELL

- ☐ Inspect interior coating (cracks, blisters, loose material, exposed concrete, etc.).
- ☐ Inspect exterior coating (Coal Tar Epoxy).
- ☐ Inspect concrete penetrations (discharge piping, conduits, etc.).
- ☐ Insure that all penetrations are cored and link–sealed then finished with epoxy grout.
- ☐ Check proper operation of aluminum hatch and placement per standard design.
- ☐ Check and verify opening of hatch to accommodate pump extraction.
- ☐ Verify operating range of probe and floats as per design.

☐ Inspect alignment of discharge piping.

☐ Insure that stainless bolts are utilized in ductile piping.

☐ Inspect paint used on piping.

☐ Inspect grating platform and supports (stainless and Fiberglass grating) w/SS fasteners if applicable.

PUMPS

☐ Check for ease of removal and proper sealing at disconnect flange and alignment of rails.

☐ Inspect for any damage to paint on pump.

☐ Inspect cord and cord placement.

VALVE VAULT

☐ Check coating for any cracks, blisters, etc.

☐ Inspect paint on all mechanical piping (cracks, blisters, loose paint).

☐ Inspect alignment of discharge piping.

☐ Verify pressure gauges are in place and the correct type.

☐ Check and verify opening of hatch.

☐ Inspect and insure that drain line is at grade to wet well from valve vault

PIPING

☐ Insure alignment of discharge piping between wet well and valve vault

ELECTRICAL

☐ Verify that seal offs are sealed with CHICO.

☐ Verify that pump motor leads are a continuous run from pump to control panel.

☐ Verify the usage of stainless steel strain reliefs on all pump and float cords.

☐ Verify that probe and float wires are sealed off in conduit.

☐ Verify seal offs are located in vault. All conduit penetrations to be grouted.

☐ Insure that ground rods are accessible and have risers installed as per spec for access.

CONTROL PANEL

☐ Insure that wiring schematic is in door pocket.

☐ Insure that Control side of panel is oriented to face the wet well.

☐ Verify UL labeling.

☐ Inspect enclosure for chipped paint or other damage.

☐ Verify all lights are operational.

☐ Verify all wires are labeled.

☐ Verify all placards are in place.

☐ Verify all wiring debris has been removed from enclosure.

☐ General inspection of field wiring.

☐ Conduct operation test of controls.

☐ Panel Manufacturer to conduct O&M training

TELEMETRY SYSTEM

☐ Visually verify all components have been provided and pre–wired (radio, antenna, all associated wiring, alarm set points, etc.)

☐ Check communication link to SCADA base station (Data fails).

☐ Inspection of field wiring

☐ Insure that standard mast and antenna are supplied–Standard anchoring method if applicable.

OPERATIONS TEST–PUMP SYSTEM

☐ Insure contractor and contractor's representatives are present during start up. Electrician, Control Panel builder, mechanical, pump manufacturer's representative, Generator representative optional.

☐ Verify pump rotation–reverse leads as required.

☐ Throttle valves while filling FM, if applicable.

☐ Draw down test. Calculate actual GPM and compare to design specifications. Check both pumps.

☐ Add water to system and/or simulate flow and confirm operation of liquid level control system.

☐ Inspect sealing flange of pump for proper seal (No leaks).

☐ Pull pumps and extract from wet well. Insure clearances are maintained and pumps travel smoothly on rail system. Check pump cords–avoid obstructions.

☐ Test high water and low water alarms.

☐ Note any unusual noises/vibration.

OPERATIONS TEST–GENERATOR

☐ Verify Diesel tank is fully fueled after factory representative has performed load run.

☐ Run generator in Manual mode. Check hertz, voltage, etc. Verify operation of load bank.

☐ Verify certified affidavit from Generator Manufacturer/Representative of startup and load testing.

☐ Receipt of Manufacturer's warranty–5 year.

☐ Test auto–shut down on over speed circuit.

Operation & Maintenance Manuals

☐ Three (3) Operations and Maintenance Manuals for all equipment furnished including electrical schematics (11" x 17"), pump station as-builts (11"x 17") cut sheets and related manuals in a binder with table of contents and tabbed sections.

Utility Representatives: