Specifications

2016 City of Alamosa Golf Course Front Nine Irrigation Pump

Part 1 – General

General:

To provide single source responsibility for the manufacture, warranty, service and operation of a prefabricated, skid-mounted, fully automatic variable speed pumping system for irrigation water. The pumping system shall automatically maintain a constant discharge pressure regardless of varying flow demands within the design point of the pumping system. The pumping system shall conform to the following Specifications in all respects. This Specification covers the minimum requirements; however, it should not be construed as all inclusive. It is the manufacturer's responsibility to include all necessary appurtenances to provide for a complete, fully automatic and reliable pumping system. The manufacturer shall supply a complete set of general arrangement drawings, electrical power schematics, and control schematics in the Installation, Operation & Maintenance Manual. See the attached system curve for the required operating point for the main pump.

Manufacturer:

Metron Inc.
Rain Bird Corporation
ITT Flotronex
Watertronix

Bidders shall furnish the following information to the City accompanying their bid:

- A complete Specification of the pumping system;
- A Statement of Full Conformance to the following Specifications signed by an officer of the manufacturer;
- A General Arrangement Drawing showing the overall dimensions, piping, and components;
- A complete Submittal, with Data Sheets, for all major equipment: pumps, motors, variable frequency drive (VFD), programmable logic controller (PLC), valves, and motor starters;
- An Electrical Schematic showing power wiring, and controls;
- Manufacturer's Industrial Electrical Control Panel UL 508A File Number;
- Manufacturer's Packaged Pumping Systems UL QCZJ File Number;
- Manufacturer's Buildings built to meet NEC UL QRNZ File Number;

- A copy of manufacturer's Certificate of Insurance showing as a minimum, a general liability coverage of $1,000,000.

Part 2 – Mechanical

Scope:

The packaged pumping system shall be skid-mounted, with vertical turbine pumps, variable frequency drive (VFD), fully automated, and built by a single manufacturer. All equipment, including but not limited to, pumps, motors, piping, filters, valves, instrumentation and controls shall be mounted on a common structural steel base to form a complete, self-contained, automated pumping system

The pumping system shall consist of one main vertical shaft turbine pump with variable frequency drive start and control, and one submersible pressure maintenance pump with across-the-line start. The pumping unit shall be so configured as to allow the future addition of another main pump and filter in the most efficient manner possible. The suggested arrangement of the pumping machinery and adjoining works is as shown on the accompanying drawing. The bidder may propose a different arrangement, and different dimensions for the pumphouse. Power available to the site is 480 volt, 3-phase, 60 hertz.

The main pump shall be capable on delivering a peak flow of 650 gpm at a head of 246 feet when operating as a single pump supplying the back half of the golf course, and a peak flow of 675 gpm at a head of 265 feet when operating in parallel with a future second pump, together supplying both halves of the golf course. See the attached system curve for the delivery main hydraulics.

The pumping system shall be efficiently designed to minimize space, and to allow access to all critical components from no more than two adjacent sides of the skid, allowing the system to be located in a corner of a pump house, if required. Critical components shall include the control panel, wet well access hatch, filter elements, auxiliary controls and electrical components.

Pumping System Base (Skid):

The pumping system skid shall be designed, fabricated and assembled to provide proper structural support for all attached equipment. The skid shall provide sufficient rigidity to withstand the stresses of reasonable and competent transportation to site, off loading, installation, and operation. All welds shall be continuous. The skid shall completely cover the wet well with an integral access hatch.

Discharge Piping:

All piping shall be constructed from ASTM A53 schedule 40 pipe, or heavier as required to maintain a 3 to 1 pressure safety factor (including 1/16" corrosion allowance). All piping shall be hydrostatically tested to 150% of maximum system design. All welds shall be completed by a certified welder per ASME Code Section IX or AWS Code Section 9.10.

Paint:

All structural steel and piping shall be grit blasted per SSPC-6 to a near white metal finish, and evenly coated with a dry thickness of (4-6) mils of a fast drying multi-purpose epoxy. Exterior surfaces shall be coated with a gloss aliphatic polyurethane topcoat with a dry thickness of (3-4) mils. An amine-cured coal tar lining on the underside of the structural skid shall be applied with a dry mil thickness of 6-8 mils.

The control panel shall be made from cold-rolled steel and have a two (2) mil polyester powder coated, baked-on finish applied after a phosphoric acid wash and phosphate coat, in accordance with UL Requirements.

Hardware:

All bolts used in the assembly of the pumping system shall be grade 5 zinc coated steel to retard corrosion.

Vertical Turbine Pumps.

The main Irrigation water pumps shall be of the vertical turbine type with flow and head defined in the attached system curve. The vertical turbine pumps should be manufactured according to the Standards of the Hydraulic Institute and to ANSI Specifications No. B58.1, and ANSI/AWWA E101.

The discharge head shall be made of cast iron or steel. The discharge shall have a working pressure of not less 175 PSIG, and incorporate a 125# ANSI flat faced discharge flange. A lubricated high pressure stuffing box containing at least six rings of packing and two lantern rings shall be provided. Packing shall be compressed around the shaft by adjusting a two-piece gland ring. The discharge head shall have a minimum clearance for adjusting and replacing the packing rings. The discharge head stuffing box area shall also include a drain, which will be piped back to the wet well. The discharge head shall incorporate an integral air separation chamber allowing air to be discharged.

The head shaft shall be the two-piece type, 416 stainless steel, and shall be turned and ground. The pump manufacturer shall include a method for adjusting the impeller running clearance at the top of the head shaft. Adequate space shall exist to couple the head shaft and the line shaft above the stuffing box. Coupling shall be 416 SS.

Column pipe shall be A53, Grade B schedule 40 material, in inter-changeable sections not more than 10 feet in length. Pump line shaft shall be 416 SS. The size of the shaft shall be no less than determined by ANSI/AWWA Specification E101, Section A-4.15 with rubber bearings.

The pump bowls shall be ASTM A48 Class 30 cast iron free of detrimental defects. All pump bowls shall have porcelain lined water passageways for high efficiencies.

The impellers shall be bronze and of the enclosed type design. Semi-open type impellers are not acceptable. The pump shaft shall be AISI 416 SS turned and ground. The pump shaft shall be supported by bronze bearings above and below each impeller. The suction bell bearing shall be extra long and permanently grease packed and sealed with a bronze sand collar.

The main pump shall be manufactured by Fairbanks Morse, Peerless or Goulds.

A pressure maintenance pump (PMP) shall be provided to maintain system pressure during non-use periods. The PMP shall be the submersible type with stainless steel housing, and stainless steel impellers.

Motors.

The motor for the main pump shall be of the vertical hollow shaft high thrust design. The motor shall have a WP-I enclosure, 1.15 service factor at 60 hertz, and class F insulation. The design pump brake horsepower shall not exceed 98% of the motor horsepower exclusive of the service factor. All motors shall be non-overloading throughout the entire impeller operating curve, including pump run-out, exclusive of the service factor. Maximum pump run-out horsepower shall not be greater than 8% higher than the motor rating exclusive of service factor. The motor shall be rated for continuous duty and be designed to carry the maximum thrust load of the pump and will have an L10 bearing life of five (5) years of service. Motors shall be inverter ready and sized for proper ambient temperature and altitude. The motor shall use a non-reversing ratchet (NRR).

The motor for the pressure maintenance pump (PMP) shall be a stainless steel submersible type with a 1.15 service factor. The PMP will be sized and rated to provide continuous flow over the entire range of service.

Pump Check Valves.

The pump check valve shall be bolted directly to the pump discharge heads. They shall be of the silent operating type that begins to close as forward velocity diminishes, and be fully closed at zero velocity preventing flow reversal. The check valve bodies shall be ASTM A126 Grade B cast iron, or better, and shall be free from blowholes, sand holes, and other impurities. The check

valve design shall be center guided, spring loaded poppet guided at opposite ends, and have a short linear stroke that generates a flow area equal to the pipe diameter. The internals shall include a machined bronze disc seat, and stem guide. The seat shall be bronze to provide resilient sealing. The valve shall be sized to permit full pump capacity to discharge through it without exceeding a pressure drop of 2.0 PSIG.

Pump Isolation Valves

The pump discharge isolation valve shall be lever operated, butterfly valve with grooved ends to provide for expansion, and vibration dampening. Lug style pump discharge isolation valve are not acceptable. The valve body shall be constructed of ductile iron with a polyamide coating. The valve disc shall be rubber coated ductile iron. The valve shall be rated at 300 PSIG.

Pressure Relief Valve (PRV).

A pilot operated modulating pressure relief valve shall be included. The PRV shall be setso as to relieve when the inlet pressure exceeds the spring setting on the pilot. The PRV shall be field adjustable, quick opening, and slow closing, to minimize surging. The discharge of the PRV shall be piped back to the wet well. The PRV body shall be cast iron with 125 pound inlet and outlet flanges, and shall be rated for 200 PSIG. A wye strainer shall be installed on the inlet side of the PRV body to provide clean water to its relief pilot. PRVs larger than 2" shall have a wafer style butterfly valve installed on the inlet side of the PRV. PRVs 2" and smaller shall have a brass ball valve installed on the inlet side of the PRV. The Pressure Relief Valve shall be a Cla-Val 50-01.

Pressure Gauge.

A pressure gauge shall read pressure from the discharge meter run. All gauges shall be silicon filled to reduce effects due to vibration and incorporate isolation ball valves for maintenance. Accuracy of the pressure gauge shall be within two percent. The gauge diameter shall be 2-1/2" minimum. The pressure gauge range shall be 0 – 200 PSIG. They shall have a stainless steel back, and bronze internal parts.

Drain Lines.

One ¾" drain line, valve, and hose barb with clear acrylic hose draining to the wet well shall be located beneath the end of the discharge meter run. Another ¾" drain line, and valve shall be located beneath the discharge manifold with a clear acrylic hose draining to the wet well. The drain valves shall be of a ball valve type with a hand lever, made of brass, with threaded connections.

Part 3 - Electrical

Scope.

The electrical system shall provide complete instrumentation and controls to automatically start, stop and modulate pump speed to smoothly, efficiently and reliably deliver variable flow rates at a constant discharge pressure. The electrical system shall provide alarms, and safety features needed to protect the equipment, personnel, and irrigation water piping system. All elements of the control system shall be so configured as to allow the future addition of a second main pump.

Control Enclosure.

Controls shall be housed in a UL508 listed NEMA 4 enclosure with integral door latches. The control enclosure shall be constructed of 12 gauge steel, and the back plate assembly shall be constructed of 12 gauge steel. The enclosure shall be painted as specified in the paint specifications listed under Mechanical Section 2.30 “Paint”. All indicating lights, reset buttons, speed potentiometer, selector switches and the operator interface device shall be mounted on the enclosure door and also be rated NEMA 4. All internal components shall be mounted and secured to the removable back plate assembly. Pilot devices shall run from secondary, control voltage (24 VDC or 120 VAC). A closed type cooling system shall be included to maintain a temperature below 100 degrees F in the enclosure based on a water temperature of 75oF and reject heat from the VFD. Open type cooling systems allowing outside ambient air to enter the panel is not acceptable. No water line connections shall be permitted inside the control enclosure. The minimum ambient temperature where the panel is installed shall not drop below 40 degrees F.

Lightning and Surge Arrestor.

All electrical equipment shall be protected by a UL approved category “C” surge arrestor to suppress voltage surges on incoming power. The surge arrestor should be intended for use on three-phase, 600 VAC systems and designed to discharge the following amperages: 1.5kA @ 1640 V; 5 kA @ 2340 v; 5 kA @ 2510 V; 10 kA @ 2920V.

Main Disconnect.

A non-fusible main disconnect shall be provided to completely isolate controls, and motor starting equipment from incoming power. The main disconnect shall have an interlocked, through-the-door, operator.

Control Power.

Power for the controls shall be provided by a control power transformer (CPT), which will provide 120 volt, single-phase power for the pumping system control operation. The CPT shall not be used for any other external load. It shall be protected on the primary side by current limiting fuses of adequate size and voltage rating. All controls will be protected by time delay circuit breakers of adequate size.

Phase Monitor.

A phase monitor shall be included to provide protection of all three-phase equipment against phase loss, under voltage, and phase reversal; when fault is sensed the monitor output relay opens to turn the equipment off and/or cause an alarm; automatic reset; LED indicator light.

Motor Starting Equipment

Unless specified otherwise, all motor starters for the pumping station shall be mounted on a back pan in the single NEMA 4 enclosure as specified in Section 3.10. Each main irrigation water motor shall have dual contactors that are both electronically and mechanically interlocked to allow the VFD to operate on any of the main motors. Motor starters shall meet I.E.C. Standards, be UL Listed, and shall be rated for a minimum of 1,250,000 operations. Motor overload relays shall be I.E.C. rated class 10 ambient compensated. Fuses shall supply short circuit protection to each motor, and shall be rated for a minimum 200,000 amp interrupting capacity. Motor starters and overload relays shall be UL Listed.

VFD Bypass Starter.

The VFD shall have a bypass, across the line, starter to allow for continued manual system operation while maintenance is performed on the VFD. The VFD Bypass Starter shall be as manufactured by Square D.

Variable Frequency Drive.

The variable frequency drive (VFD) shall be digital, pulse width modulation (PWM) with IGBT transistors. The VFD shall be 98% efficient or better at full speed and load and shall be rated to operate from 3-phase power at 480 VAC +10/-10, 48 to 63 HZ. The overvoltage trip level shall be a minimum of 30% over nominal, and the undervoltage trip level shall be a minimum 35% under the nominal voltage. Any VFD error messages shall be displayed on a 4 x 20 character LCD readout in English. The following fault protection circuits shall be included: Over-current (200%),

Over-voltage (130%), Under-voltage 65%, Over-temperature (70 DEG. C), Ground fault, and Motor-overload. The VFD shall have automatic extended power loss ride through circuit that will utilize the inertia of the pump to keep the drive powered. Minimum power loss ride-through shall be one cycle based on full load and no inertia. The VFD shall be configured for a 3 kHz carrier frequency to reduce motor noise. The VFD shall provide a "tripless" operation. The following operating information shall be displayed on the VFD's LCD: kWh, elapsed time, output frequency (Hz), motor speed (RPM), motor current (amps), and voltage. DC swinging choke will be installed on input of VFD to protect against voltage transients.

Pressure Transducer.

The pressure transducer shall provide pressure signals for the control logic. The accuracy shall be ±1.0% of full scale, and constructed of 316L SS wetted parts. It shall be rated for the discharge pressure, and shall provide gauge pressure output. The Pressure Transducer shall be a Dwyer Series 628.

Flowmeter (Sensor).

The pumping system shall have a flowmeter (sensor) installed in a meter run of straight pipe, with a minimum of ten (10) pipe diameters upstream, and five (5) pipe diameters downstream of the flowmeter (sensor) for properly indicating the flow rate and total flow. The flow sensor shall be an insertion type with a non-magnetic, spinning impeller (paddle wheel) as the only moving part. The sensor sleeve will be brass (or 316 stainless steel) with the sensor housing being PPS. The impeller shall be glass filled nylon. The shaft material shall be tungsten carbide. The sensor shall be supplied with a 2" NPT adapter for installation into any commercially available weld-on fitting or pipe saddle. The adapter shall have two ethylene-propylene O-Rings. The sensor will have all electronics epoxy-sealed with a 2-conductor, shielded cable extending out through a ½" conduit connection on the top of the sensor. Insertion of the sensor into any pipe size shall be 1 ½" from the inside wall to the end of the sensor housing. The sensor shall operate in line pressures up to 400 psi and liquid temperatures up to 220 degrees Fahrenheit, and operate in flows from 1-30 feet per second in pipe diameters from 3" to 40" with linearity of +/- 1% and repeatability of +/- 1%. If necessary, the meter may be installed in a vault outside the pump house. The meter shall be acceptable to the Colorado Division of Water Resources.

Controls.

All control logic shall be handled by an industrial grade programmable logic controller (PLC) with a 4x20 character touch-screen providing data entry and display. PLC shall provide demand controlled variable frequency drive transfer pump start, shutdown and safety features through its pressure sensing, flow sensing and voltage sensing devices. The PLC shall have touch-screen indicators for input, output, and diagnostic read-outs showing PC Run, CPU Fault, and two communications ports. A visual status indicator shalL be provided for each I/O to indicate on/off

status. The PLC shall be provided with a built-in EEPROM, and capacitor for memory backup. A separate set point controller is not acceptable. The PLC shall have a built-in clock calendar

Control software shall be parameter driven, fully documented, and allow user to easily change all operator parameters.

Standard control features, and equipment that need to be included as a minimum are as follows:

A. Alarms and shutdowns:

- Low discharge pressure
- High flow demand
- High discharge pressure
- Low wet well level
- Phase Loss (attempts restart)*
- Low voltage (attempts restart)*
- Phase reversal (attempts restart)*
- Individual motor overload/phase loss (indicates which individual motor was shut down)
- VFD fault (shutdown VFD pump only and attempts restart)*

*Three unsuccessful restarts in a 15 minute period will give hard shutdown as configured from the factory. Number of restarts during a period and the length of period can be re-configured in the field.

All alarms will be indicated by a red general alarm light. Specific alarm conditions will be displayed in English on the operator interface display (OID).

B. Panel face switches and lights:

- Individual pump run lights
- Individual pump on/off switches
- System Hand/Off/Automatic switch
- Mode Select switch – allows manual bypass mode of operation which can be used if VFD should fail (inside panel on back pan)
- On/Off controls in OID to automatically alternate VFD (hours/sequential/off)
- Reset – Acknowledges pumping station alarms/ Silence Horn/ Lamp Test
- Speed potentiometer – in system manual mode allows user to adjust VFD pump speed
- Low discharge pressure override disables low discharge pressure alarm (through OID)

C. System HOA works with PLC bypass switch and allows user to manually operate pump should PLC fail.

D. Software will be included to automatically, and gradually increase the speed of the pump motor to maintain the desired operating pressure for the Irrigation water system (i.e., 1.5% every 4 seconds). This feature operates whenever pressure drops below linefill set point pressure. The linefill set point is fully adjustable by the operator. This control feature is based on an increase in pressure over a pre-defined time period. The acceleration control on the VFD is NOT an acceptable means of adjusting pressure ramp up speed.

E. Software will be included for optionally maintaining a lower Irrigation water system pressure when not irrigating. Controls will cycle the pressure maintenance pump at these reduced pressures during non-operation times, and pressure will gradually increase to design pressure when the operation periods begin.

F. Neither flow meter nor VFD output frequency shall be used for shutting down last VFD driven pump. Controls and software shall incorporate a method to eliminate excessive cycling of VFD pump at very low flow conditions, yet not run the pump excessively at no-flow conditions.

G. User shall be able to field select either of two modes of VFD operation. The auto switch VFD option allows VFD to start the main pump. The manual mode of operation starts the main pump on the VFD.

H. An integral real time clock calendar shall allow the PLC to internally provide all date, and time functions.

I. Two separately adjustable proportional integral & derivative PID control loops shall provide for both low flow and high flow pressure stability.

J. A shutoff algorithm, for fixed speed pumps, shall minimize pump cycling while also remaining responsive to sudden flow reductions. Minimum run timers alone for minimizing fixed speed pump cycling are not acceptable. Discharging pressure through the relief valve during pump transitions is not an acceptable method of maintaining constant pressure.

K. Manual operation of the VFD driven pump shall be done with a door mounted speed potentiometer to manually adjust the speed of the pump motor.

L. A system manual or automatic mode switch shall be provided. This mode switch, when in the manual mode, will allow all pump motors and the VFD to be operational should the PLC fail. When the system mode switch is in automatic, the controller will start, and stop all pumps automatically.

M. Testing of panel lights shall be possible by pressing the reset button for three (3) seconds.

N. A rate of pressure change algorithm shall rapidly determine if there is an Irrigation water demand and immediately cycle on the VFD pump, instead of waiting for the pressure to drop to a predetermined start pressure.

Operator Interface Device (OID).

The pumping system shall include a NEMA 4, 4 lines by 20 character touch-screen display keypad mounted on the control panel door. This device will allow the operator to view, and selectively modify system setpoints in the PLC. It shall store its messages in a non-volatile memory. The OID shall incorporate password protection for protecting data integrity. The OID will allow for display, and modification of timers, set points, and lockout times. The device shall communicate with the PLC through the programming port, and shall include a serial printer port allowing a printer to be attached for real time station status logging.

In addition to normal data entry keys, the OID shall include a minimum of the following screens:

A. Event Log.

Displays the last 254 sequential pumping system events with the date, and time of occurrence. Events shall include but not be limited to: all alarms, starting of individual pumps, stopping of individual pumps, and changing of selector switches.

B. Alarm Log.

Shows the last nine (9) alarms recorded in memory, and are displayed with related detailed information about the alarm, time of occurrence, date, pumps operating at time of alarm, and how to correct the alarm.

C. Pump Log #1.

Operator can scroll through the historical pumping system flows, and pressures for up to the last seven (7) days. Sampling time periods can be changed by the

operator (from 10 seconds to 60 minutes). Averages are taken over the sample period, and the average recorded with date, and time stamp.

D. Pump Log #2.

Pumping system flow and pressure are shown every second for the previous 60 seconds, and every minute for the previous 30 minutes. If a shutdown occurs, the flow, and pressure tables are locked in so that the operator may view how the pumping system was performing immediately before the shutdown occurred.

E. Status Screen.

Will display the current operating status. When the pumping system is running, the display will show the setpoint pressure, actual system pressure, flow, VFD pump frequency, and current date and time.

F. Daily Log

Will display the following: individual pump run times, total flow, and total flow since last reset.

G. Configuration Menu Used to scroll up, and down through the data and menu options.

The OID shall be an information system only, and not required for pumping system operation. No switches, reset buttons, general alarm lights, run lights, or speed potentiometers are to be included within this unit. The pumping system will be fully functional in the event the OID should fail.

Codes.

The control panel with controls shall be built in accordance to N.E.C. and UL standards. All equipment and wiring shall be mounted within the enclosure, and labeled for proper identification. All user-required adjustments shall be made from the front of the control enclosure. A wiring schematic complete with legend, terminals, components, and wiring identification shall be provided. The main disconnect shall be interlocked with door.

Operation.

During non-operation times, the pressure maintenance pump (PMP) will cycle on and off as required to maintain pressure. The cycling pressures can be user selected, and can

be set substantially below normal system pressure, if desired. If the PMP cannot maintain the desired pressure, than the VFD will start the first main pump, and will gradually ramp the pressure up to the system pressure. The pump speed will be modulated to hold a constant discharge pressure regardless of flow. As the flow rate increases, and the VFD pump can no longer maintain pressure while at maximum speed, the next main pump will be started, and the VFD driven pump will accordingly reduce its speed, and modulate. An algorithm shall be included for accurately reducing the VFD pump speed as the next sequential pump is started so that no pressure surges are generated during the transition (even with across the line starting). If the user prefers to switch the VFD from pump to pump for starting the pumps sequentially, he can select this option with the OID. As the flow begins to decrease, pumps will be turned off sequentially until only a single VFD driven pump is operating. When a no flow condition occurs, the VFD pump shall be turned off. When there is a pressure set point change all other related set point variables change relative to the new pressure set point.

The control of the pumps shall be so configured that the pump station can function as a single pump supplying the back half of the golf course until such time as a second pump is added and the pump station functions as a duplex station supplying the whole golf course. The current installation shall allow for this expansion of the pump station.

Part 4 - Installation

General.

The purchaser shall be responsible for providing all material, equipment, and labor necessary to install all items associated with the pumping system. The manufacturer will assist with the installation by providing supervision of installation, start up, training, and technical support. The purchaser must obtain from the manufacturer an Installation, Start-up and Training Commencement certificate to validate the warranty. The manufacturer will provide Installation, Operation, and Maintenance Manuals.

Installation.

Offloading is the responsibility of the purchaser. Supervision of installation will be provided by the manufacturer of the pumping system. Installation shall be done after the wet well is completed, and the level floor of the pump house has been poured, and properly cured. The pumping system will be installed over the wet well, and leveled as necessary, as per the Site Preparation Drawing. The pumps will be installed and connected to the piping of the pumping system, and the packaged pumping system will be complete, and ready for the electrical hookup, and connecting all piping. The pumping system will be anchored to the floor of the pump house. The purchaser shall notify the manufacturer of the pumping system two (2) weeks prior to the scheduled

installation date so that installation can be coordinated. Supervision of installation will be limited to one (1) eight (8) hour day, unless otherwise specified.

Start Up.

When electrical inspection of the purchaser's service entrance equipment has been completed, and approved, the pumping system manufacturer shall be contacted for start up by the purchaser. Truck access shall be provided to the site of the pumping system by the purchaser. A minimum two (2) week notice shall be given to manufacturer prior to the scheduled start-up date. During start-up, the pumping system shall be given a running test of normal start, and stop, and full demand. During this test, each pump shall demonstrate its ability to operate without undue vibration, or overheating, and shall demonstrate its general fitness for service. Any defects shall be corrected, and adjustments made at the expense of the pumping system manufacturer. Testing shall be repeated until satisfactory results are obtained. Start-up assistance will be provided, but will be limited to one (1) eight (8) hour day, unless otherwise specified.

After the startup has been complete, but before leaving the job site, a training session will be given. The training session will be given to the owner or the owner's representative to familiarize them with the pumping system operation, maintenance and adjustments. This training session will be limited to one (1) eight (8) hour day, unless otherwise specified.

Warranty.

The manufacturer warrants that the water pumping system or components will be free of defects in workmanship for one year from date of authorized start-up but not later than eighteen months from date of manufacturer's invoice.

Provided that all installation and operation responsibilities have been properly performed, manufacturer will provide a replacement part or component during the warranty life. Repairs done at manufacture's expense must be pre-authorized. The start-up certificate must be on file with manufacturer to activate warranty. Upon request, manufacturer will provide advice for trouble shooting of a defect during the warranty period.

Part 5 – Additional Features

Self-Cleaning Inlet Screen.

A self-cleaning inlet screen shall be installed on the bottom of the main pump in the wet well. It shall be supplied pressurized water from the pumping system through a one and one half (1 ½) inch line. A solenoid valve shall be installed on the feed line to allow for cleaning of the screen during pumping operation. A strainer shall be installed in the feed line if the water is not filtered. The self-cleaning inlet screen shall have no. 10 mesh and be made from stainless steel covering a heavy steel epoxy coated or galvanized body. There shall be rotating bars, utilizing a heavy bearing mechanism, with jets for cleaning the screen when the pump system is operating. The inlet screen shall be installed by others, with the bottom of the inlet screen a minimum of 24 inches off the bottom of the reservoir. The intake screen shall be as manufactured by Clemons or approved equal.

Automatic Backwash Screen Filter System.

A self-cleaning automatic filter with a stainless steel weavewire screen; automatic back washing based on differential pressure and/or adjustable time settings through the Operator Interface Device (OID) on the front door of the control panel; and a check valve on the discharge side to protect the filter element from reverse flow. Flush-line piping is by others. The filter shall be an Amiad SAF-4500 (SAF4500), or a Valve and Filter V-Series with a 300-micron screen. Filtration shall include a check valve downstream to prevent back-flushing and damaging the screen

VFD By-Pass Switch.

There shall be an across the line (ATL) bypass wired in parallel to the main VFD that will be used as the primary starting method in lieu of the VFD if the hand switch is switched to “VFD Bypass”. The hand switch shall be located inside the control panel. (BP)

Air Release Valve.

A properly sized air release valve shall be installed where identified on the drawing or at the highest point on the pipe manifold. The air release shall allow for the release of air, generated by the starting of the pump, to atmosphere. The discharge of the air release valve shall be vented back to the wet well through a ½” polypropylene tube into the wet well. The valve shall have a cast iron body, and cover, with stainless steel internal trim, and a viton orifice button to prevent malfunctions due to corrosion. The air release valve shall be a Valmatic 15A. (AIRLS)

2-Point Level Control Switch for the Wet Well.

Two flexible probes shall extend into the wet well for the purpose of sensing if there is water present and safe for the pumps to operate without running dry. One probe shall serve as a reference and the other shall serve to indicate a level of water. If no water is present the pump system will shut down.

Part 7 – Options

Fabricated Steel Pump House.

A building approximately 16’ wide x 18’ long x 8’ tall to the underside of the eaves or whatever dimensions are required to accommodate the pumping machinery. The building is constructed of interlocking, bolt-together, 16-gauge sheet metal panels for the sidewalls and roof. Building sidewalls and roof shall be insulated. Color of the building shall be determined by owner. A ventilation fan, gravity operated louvers, an electric heater with thermostat light fixtures and two electrical outlets shall be included. Entry to the building is through one double door and one 36” man door. The building shall be designed for a snow load capability of 40 PSF and to withstand a wind load corresponding to a 90 MPH 3-second gust. The structure shall conform in all respects to the 2009 edition of the International Building Code as adopted by the City of Alamosa, and the National Electrical.