City of Oak Ridge, Tennessee
* * * * REQUEST FOR QUOTATION * * * *

Page - 1
Date - 2/25/14
Order No. - 137863-000 OQ
Brn/Plt - 22145

Vendor Name:_____
Payment Terms:_____
F.O.B,:_____
Delivery Date:_____
Ship Via:_____
Signature:_____ _____

SHIP TO City of Oak Ridge - Materials Management
100 Woodbury Lane / P.O. Box 1
Oak Ridge, TN 37830
(865) 425-1819 FAX (865) 482-8475
Lyn Majeski lmajeski@oakridgetn.gov

Ordered - 02/25/14 Freight - Default - Handling Code
Requested - 03/20/14 Taken By -
Delivery - Deliveries are accepted 8 a.m. TO 3 p.m.

Description / Supplier Item		UM	Unit Cost		Extension	Req. Dt
DUPLEX ABOVE GROUND VALVE ACCESS STATION WITH PUMPS PER THE SPECIFICATIONS ATTACHED	1	EA		EA		03/20/14

Total Order

CITY OF OAK RIDGE, TENNESSEE
SPECIFICATIONS FOR
DUPLEX ABOVE GROUND VALVE ACCESS STATION WITH PUMPS
RFQ #137863

GENERAL

The duplex, above ground valve access station shall be as described in these specifications and accompanying drawings, and shall consist of (but not limited to), the following:

Equipment Base
Aluminum Access Hatch
Fiberglass Equipment Housing
Discharge Check Valves
Discharge Plug Valves
Discharge Fittings
Automatic Air Release Valve
Pressure Sensor
Station heater
Ventilating Fan
15HP Flygt Pumps

VALVES AND PIPING

- The piping shall be standard Class 125 lbs. ductile iron pipe, size as noted on the drawings. Flanged fittings shall be used throughout.
- Discharge piping shall include two (2) outside lever and spring check valves with replaceable stainless steel seat and two (2) lever operated 2-way plug valves.
- The valves shall be located above the wetwell inside a fiberglass equipment enclosure.
- A pressure sensor with a diaphragm seal shall be installed on the common discharge line.
- The gauge shall be graduated 0-100 feet of water column minimum.
- A ¼ turn ball valve shall be installed between the discharge and the pressure sensor so that the sensor can be isolated.
- The piping shall terminate with plain end piping approximately 6" below the polymer concrete station base, which will span the wetwell.
- Pass through sleeves shall be incorporated into the equipment base and link seals shall be supplied to seal around the discharge pipes where they pass through the station base.

AIR RELEASE VALVE

- An A.R.I. Model D-020 air release valve shall be installed at the top of the discharge manifold.
- The air release valve will allow trapped air to escape the discharge lines.
- The valve body shall be stainless steel with a 1.5" outlet piped back to the wetwell with schedule 80 PVC pipe.
- A ¼ turn ball valve shall be installed between the discharge line and the air release valve.

EQUIPMENT BASE

- The equipment base shall be of the dimensions as shown on the drawings.
- The equipment base shall be polymer concrete consisting of aggregate and fiberglass reinforcing rods bonded together with isophalic resin to form a highly corrosion resistant station base.
- Lifting eyes shall be furnished with the station base to aid handling of the station at the jobsite.
- A .25" 304 stainless steel plate shall be supplied to cover the opening in the station base that allows for the transition of the power and control cords from the wetwell to the station interior.
- 304 stainless steel couplings shall be welded into the transition plate for the installation of cord grips.
- The cord grips shall be sealing type connectors rated for CL. 1, DIV. 1, and Group D.
- Standard aluminum cord grip shall be installed in the bottom of the control panel to coordinate with the cords from the wetwell.

ALUMINUM ACCESS HATCH

- The pump station access hatch shall be installed into the station base.
- The hatch shall be Heavy Duty construction – 300 P. S. F. load rating in accordance with O.S.H.A. standard 1910.23 and the Safe Hatch confined space entry shall be in accordance with O.S.H.A. standard 1910.146.
- The hatch shall be the size shown on the drawings. The access hatch shall allow visual inspections, limited maintenance and level system adjustment while safety grate is left in place.
- The Safe Hatch shall be orange in color to promote a visual awareness of the hazard. The material for the access cover bars, angles and extrusions shall be 6061-T6.
- The diamond deck plate shall be constructed of 5086 aluminum.
- Each unit shall be equipped with a 316 stainless steel hold open arm and shall lock in 90 degree position.
- The aluminum lift handle shall be recessed and the slam lock assembly will be fitted to the deck plate.
- A special key for the slam lock will be provided.

VENTILATING FAN

- A thermostatically controlled 146 CFM exhaust fan shall be installed inside the equipment enclosure.
- The fan shall automatically operate at approximately 70 degrees F.
- The exhaust opening shall be screened and covered with a screened fiberglass hood to prevent foreign materials from entering the pump station.
- The vent fan shall be connected to the control panel by use of a plug in cord.

EQUIPMENT HOUSING

- A fiberglass reinforced plastic (FRP) equipment house designed for rapid and easy installation in areas of high humidity and corrosive chemicals shall be supplied.
- The FRP building shall be molded by a combination chopped spray technique hand lamination process and shall contain resin rich fiberglass containing 30% +/- 5% chopped roving fiberglass with 1" – 1.5" long glass fibers and 70% +/- resin.
- The exterior, coated with a beige exterior laminate is .180" thick consisting of 3 plies of 1 ½ ounce per foot chopped strand mat.
- The interior laminate is .125" thick consisting of 2 plies of 1 ½ ounce per foot chopped strand mat.
- The building shall be insulated with 1" thick modified polyisocyanurate rigid foam throughout.
- Insulation has a K-factor of .14 BTU in/hr/ft/F degrees, R-7.2 per inch. The insulation shall be completely encapsulated with fiberglass.
- The building shall be attached to the station base plate through a 2 ½" flange on all wall sections.
- All gel-coats and surface coatings are a chemical resistant neopentyl glycol based polyester resin.
- Pigments are selected for their long term weatherability in normal corrosive applications.
- The exterior gel-coat either white or off-white color shall be ARMORCOTE® 991 series gel coat with advanced technology polyesters developed for lower emissions, improved flexibility, and superior weathering resistance to surface yellowing and chalking.
- The gel coats have been formulated to be MACT compliant for the fiberglass industry. ARMORCOTE® 991 gel coats are designed to meet the critical requirements of the marine industry.
- Both accelerated and 45° South Florida exposure testing reveal less yellowing than standard gel coats, and considerably less loss of gloss.
- ARMORCOTE® 991 gel coats are formulated to meet the EPA National Emission Standards for Hazardous Air Pollutants (NESHAP) for Boat Manufacturers.
- Gel coats in the ARMORCOTE® 991 series offer blister resistance comparable to ISO/NPG gel coat.
- The laminating resin is a DCPD polyester, suitable for use in normal corrosive atmospheric conditions.
- Two sides of the enclosure shall be provide with full size hinged double access doors shall be supplied with a latch to engage the enclosure in three places, a stainless steel continuous hinge and protected by a keyed lock.
- Stainless steel lifting eyes shall be provided for handling the enclosure during installation period and for removal without disassembly if required.
- The FRP equipment house is designed to withstand 125 mph winds and 30 lb/ft sq. snow loading.
- The enclosure shall be warranted for 20 years to resist UV damage, corrosion from moisture or corrosive solids, or physical damage in normal service, without the need for special protective coatings, when installed per the manufacturer's recommendations.

STATION HEATER

- A portable 1500 watt heater to provide climate control during winter months shall be supplied.
- The heater shall be protected by a circuit breaker and plug into a GFI receptacle installed on the control panel.

PAINTING

All factory fabricated steel items (other than the equipment base), piping and valves shall be thoroughly cleaned of all rust, mill scale and weld flux. Immediately following clearing, the station shall be painted as follows:

PRIMER COAT – 1-1/2 to 2 mils. Dry film thickness, of rust-inhibitive rapid dry epoxy primer.

FINISH COAT – 8 to 10 mils, dry film thickness, of Tnemec Series 66 Hi-Build epoxy. Finish shall be extremely colorfast and shall have excellent ability to withstand condensation and moisture.

PUMPS

- The package price shall include either a Flygt or KSB Submersible pumps.
- Two pumps shall be required each capable of 57 TDH at 130 GPM .
- Motors shall be 4 pole and wired for 230vAC three phase service.
- Pumps shall be capable of passing a 4" sphere.
- Two (2) base ells shall also be included with package.
- The base ells shall be designed for use with the specified pump.
- The base ells shall be manufactured to accept two (2) each 2" guide rails for pump installation.

HANGERS

Pump Supplier shall provide stainless steel hangers to support cabling from above ground valve access station to pumps and probes located inside of wetwell.

EXCLUSIONS

The owner not the supplier will provide the following:

- Required Stainless Steel Guide Rails for pump installation and removal.
- Required piping and fittings connecting base ells with valve piping located in above ground valve access station.
- Required piping connecting discharge pipe of above ground valve access station with force main.

City of Oak Ridge
Pump Station Control Panel
Technical Specifications

1.0 GENERAL INFORMATION

The following specifications are intended to standardize all new and future upgraded pump stations to have the same components and operational structure of a high quality control panel, providing the maintenance personnel familiarity with the operation and maintenance of the control panels. Standardization will also allow for spare parts inventory to be kept at a minimum. The Square-D line of components was selected primarily for reliability and multiple source procurement.

2.0 QUALITY ASSURANCE

A. Manufacturers Qualifications:

- The manufacturer shall have at least ten (10) years of experience in the construction of control equipment in the municipal water and wastewater industry.
- Control system manufacturer shall be a UL508A certified facility and the industrial control panels shall be listed and serialized. The use of only UL listed components in a panel will not be considered equal to an acceptable listed facility.
- The control system manufacturer shall be a high level member of Schneider Electric Solutions Partner Program to attest to their experience, quality and position in the market.

B. Submittals:

- Complete electronic submittals shall be provided for each control panel for review and approval prior to fabrication.
- The submittal package shall include complete wiring diagrams, scaled layout drawings of the subpanel and inner doors (when applicable), complete bill of materials and component data sheets.
- The wiring diagrams shall include terminal strip layouts to assist the installer with field devices connections including torque requirements per manufacturer's recommendations.
- Contact usage of control devices such as controller and relays shall be identified by the components coil and identified as either normally open or normally closed.
- The schematics must contain all markings required by the UL508A standard and functional descriptions of the devices.
- All ladder rungs shall be numbered in the left margin of 11" x 8.5" pages.
- As-built schematics must be laminated and permanently fastened to the inside of the panel door.

2.0 QUALITY ASSURANCE, continued:

C. Manufacturer's Testing Procedures:

- The manufacturer must apply a systematic and documented testing procedure to each and every panel manufactured in their facilities.
- Evidence of such testing shall be available to the customer upon request and it shall include all test steps and identification of testing and inspecting personnel.

D. Warranty:

- The control system warranty shall be for a period of three (3) years from commissioning date of the equipment.
- The warranty may exclude incidental or consequential damages and surge/transient damages.
- The warranty shall be effective against all defects in workmanship and/or defective components.
- The warranty may be limited to the replacement or repair of the defective equipment.

3.0 ENCLOSURE:

A. NEMA 4X – 316 Stainless Steel with White Polyester Powder Coating:

- The enclosure shall be a NEMA 4X rated manufactured from 316 stainless steel with white polyester powder coating applied by the enclosure manufacture.
- The enclosure shall be a minimum depth of 8" sized adequately to house all of the components.
- The door gasket shall be formed in place rubber composition and shall assure a positive weatherproof seal.
- The door shall open a minimum of 180 degrees.
- Vent Hoods mounted on the external surface of the enclosure shall maintain the NEMA rating on the enclosure and shall be white polyester powder coated by the manufacture.
- Manufacture shall be Hoffman or approved equal.
- A polished inner aluminum dead front door shall be mounted on a continuous aluminum aircraft type hinge and shall contain cutouts for the protrusion of the control breakers and provide protection of personnel from internal live voltages.
- All control switches, pilot indicator lights, elapsed time meters, duplex receptacle and other operational devices shall be mounted on the external surface of the dead front.

3.0 ENCLOSURE, continued

- The dead front door shall open a minimum of 150 degrees to allow for access to the equipment for maintenance.
- A 3/4" break shall be formed around the perimeter of the dead front to provide rigidity. Painted steel or other materials are not acceptable.
- The back plate shall be manufactured of 12 gauge sheet steel and be finished with a primer coat and two (2) coats of baked on white enamel.
- All hardware mounted to the sub panel shall be accomplished with machine thread tapped holes. Sheet metal screws are not acceptable.
- All devices shall be permanently identified with engraved legends.

4.0 INCOMING POWER:

A. Main/Auxiliary Breaker:

- A properly sized service entrance main breaker shall be supplied in its own section for the bottom feed incoming power supply.
- The main breaker shall be tied to an identical (auxiliary power) breaker with a mechanical interlock to prevent both breakers from being energized at the same time.

1. Both the main breaker and the auxiliary breaker shall be Square D "H or J" Frame 611 Series Heavy Duty Breakers.
2. Where more than one connection is required, on the load side of the breakers, Square D, Class 611 Power Distribution Connectors of the proper size shall be used on the load side lugs.

5.0 AUXILIARY POWER CONNECTION:

A. Power Receptacle:

- The Auxiliary Power Connector shall be a Crouse-Hinds 1P-14 Arktite Heavy Duty Breaking Receptacle 200 Series Assembly utilizing a 45 degree angle adapter and spring load receptacle cover.
- The receptacle shall be a 4 pole configuration rated at a minimum of 200 amps.

6.0 SURGE PROTECTION:

A. Lightning Arrestor 230v and 480V

- Three phase surge protection utilizing a Square D SDSA3650 Surge Protector.
- The surge protector shall be properly mounted onto the back panel.

7.0 ALARM SYSTEM:

A. 120 VAC Alarm:

- An alarm system shall be installed that will provide both audible and visual indication of an alarm condition.

- The audible and visual devices shall only activate on a high or low level wet well level, all other alarms shall be viewable on the control panel display screen as indicated below.
  1. 160,000 Candle power strobe light with red prismatic lens.
  2. 120 VAC Alarm horn, 90 DB @ 10 Ft sound level.
     A. The alarm horn output shall be pulsated at a rate of .5 Hz per second.
     B. The alarm system shall meet the following specifications:
        1. Operating voltage – 120 VAC.
        2. Strobe output – 12 VDC @ 500 ma.
        3. Horn output – 12 VDC @ 125 ma.
        4. Relay output contacts 10 Amps.
        5. A push button shall be externally mounted on enclosure to silence the audible horn when acknowledging an alarm condition while the strobe light continues to flash until alarm condition is no longer present.
        6. A push to test button shall be mounted on the dead front to test both audible and visual alarm devices.

8.0 CONTROL BREAKERS:

A. Control and GFIC Breakers:

- All control breakers shall be Square D QOU Miniature Circuit Breakers, Class 720 sized appropriately.

- All Control breakers shall be accessible with the dead front door in the closed position.

- The breaker for the externally mounted Control and Auxiliary Device Transformer shall be installed by the control panel manufacture.

- In addition to the required control breakers three (3) additional 15amp breakers will be installed for future loads.

- The neutral for all 120V ac circuits shall be provided by an isolated multi-tap buss bar installed by the panel manufacture.

9.0 MOTOR BREAKERS:

A. 10 Hp and Below:

- All pumps and other external loads at or below 10 hp. shall utilize a Square-D U-Line combination Breaker/Starter.
- All U-Line breakers shall contain breaker, starter, HOA, communication modules and the "TESYS T Motor Management System" which will transmit the data to the Control PLC.
- Regardless of motor size the U-Line Breaker shall be rated at 32 Amps.

9.0 MOTOR BREAKERS, continued:

B. 11 Hp and Larger:

- All pumps and other external loads 11 Hp and larger shall utilize a Square-D "H or J" frame 611 Series Breakers sized for the load.

10.0 MOTOR STARTERS:

Motor starters shall be intelligent units capable of integrating motor control, control and changeover functions, with a capacity of up to 32A consisting of:

- One 45 mm power base reversing or non-reversing, circuit-breaker function and built-in interference suppression
- Clip-on control unit that provides protection against overloads and short-circuit and alarm and fault differentiation.
- Real-time control of motor load and local or remote diagnostics and parameter setting.
- Clip-on multi-protocol automation control module.

A. 10 HP and Below:

- All pumps and other external loads at or below 10 hp. shall utilize Square-D U-Line combination Breaker/Starter.
- All U-Line breakers shall contain breaker, starter, HOA, communication modules and the "TESYS Motor Management System" which will transmit the data to the Control PLC.
- Regardless of motor size the U-Line Starter shall be rated at 32 Amps.

B. 10 HP and Above:

- All pumps and other external loads 11 Hp and larger shall utilize the Square-D ATS22 Series Soft-Start/Soft-Stop Starters with built By-Pass Contactor.
- All Square-D ATS22 Series Soft-Start/Soft-Stop Starters shall use properly sized line fuses as required.
- All Square-D ATS22 Series Starters shall provide predictive maintenance information to the control PLC.

11.0 PUMP PROTECTION:

A. Phase Monitor:

- A line voltage rated, adjustable phase monitor shall be installed to sense low voltage, loss of power, reversed phasing and loss of a phase.
- Control circuit shall de-energize upon sensing any of the faults and shall automatically restore service upon return to normal power.
- Phase monitor shall be dual voltage and be an 8-pin and utilize an 8-pin relay base.
- Relay shall have a 20 second delay to normal after a fault reset.
- Manufacture is MPE or approved equal

B. Pump Monitor Relay:

- One plug in solid state Pump Monitor Relay unit shall be supplied for each pump to monitor the pump for over-temp and leakage.
- The unit shall have an 11-pin, round base to mate with a standard 11-pin socket.
- The unit shall also be flanged in order to allow dead front door mounting.
- The unit shall be powered by 24VAC, 24VDC, or 120VAC.
- LED indication shall be provided for power on, over-temp, and leakage conditions with an over-temp reset push-button provided to allow reset of unit.
- The sensor input circuitry is to contain both hardware and software filters to provide noise immunity, as well as sensor input short circuit protection.
- Pump Monitor Relay shall be of type approved by pump manufacture as to not void any pump manufacture warranties.
- Manufacture shall be MPE or approved equal.

12.0 CLIMATE CONTROL:

A. Air Vents

- Air vents and fans shall be supplied for proper ventilation and maintaining ambient temperature for the installed equipment.
- All vent openings shall be louvered and screened to prevent entrance of insects into the enclosure.
- Inlet vent opening shall also have a washable filter to filter out fine dirt and pollen particulates.
- Ventilation fan shall be controlled by a thermostat manufactured by Hoffman part number ATEMNO.

12.0 CLIMATE CONTROL, continued:

A. Air Vents, continued:

- Both inlet and outlet vent openings shall be covered with an external protective shroud to prevent driving rain from entering the enclosure and inhibit vandalism, with the shroud be constructed of 716 stainless steel.

B. Air Conditioning:

- Air conditioning will be required on control enclosures that house VFD's.
- The Owner (The City of Oak Ridge) will provide assistance in selection when required.

C. Heaters and Condensation Control:

- All Control Enclosures shall utilize a Hoffman Unit Heater Model D-AH2001A to control ambient temperature inside of enclosure.

13.0 CONTROL TRANSFORMER:

- The Control and Auxiliary Device Transformer shall be a separate transformer located outside of the Control Panel mounted to the same Unistrut Frame supporting the control panel.
- The control transformer shall be outdoor rated and in compliance with all applicable codes.
- The control transformer shall have its own separate breaker located inside the control panel properly sized for its incoming service.
- A UL approved Surge/Lightening protector shall be installed to protect the incoming service of the control transformer.
- The control transformer shall be properly sized to accommodate the total load of the 120v breakers located inside the main control panel plus a minimum of 20% extra capacity.
- The minimum allowable size of the transformer shall be 5KVA.
- The interconnecting conduit between the control transformer and control panel shall enter the control panel via the bottom of the control panel cabinet and be rigid conduit properly supported to prevent damage to conduit.
- A neutral wire shall be run from the control transformer to inside of the control panel and landed on an isolated multi-connection bus bar installed by the control panel manufacture.

14.0 PUSH BUTTONS, SELECTOR SWITCHES, AND PILOT LIGHTS:

- All required Push Buttons and Selector Switches shall be manufactured by Square-D and shall be in the 9001 series.
- All required Pilot lights shall be LED type manufactured by Square-D and be in the 9001 series.
- All pilot devices shall be installed with securing notches or mechanical components to prevent rotation of the devices per manufacturer's recommendations.

15.0 ELAPSED TIME METERS:

Each pump shall have an elapsed run time meter. These meters shall be manufactured by Redington and be model 710-0016.

16.0 CONTROL RELAYS:

- All control relays shall be 11-pin TPDT relays as manufactured by Square-D and be in the 8501 series type K.
- All control relays shall have pilot lights to indicate state of relay.
- All Control relays shall be of the tubular type and be pluggable into a standard 11-pin socket.

17.0 UN-INTERRUPTIBLE POWER SUPPLY:

- All Control Circuits shall be powered by an UPS properly sized to provide back-up power to controls for a period of 12 hours before falling below required voltage.
- All UPS systems shall be manufactured by APC.

18.0 ENCLOSURE ACCESSORIES:

- All enclosures shall have a LED Trouble light installed across the top of the cabinet.
- The light will be controlled by a switch located on the dead front panel.
- A 15 AMP GFIC receptacle shall be installed on the dead front panel.

19.0 GENERAL PRACTICES:

- All Switches, Relays and enclosure components shall be labeled with engraved marking plates.
- All wiring shall be labeled at both ends to match as-built drawings.
- A complete set of as-built schematics shall be laminated to inside of outer enclosure door.
- All terminal strips shall be labeled.

20.0 CONTROL REQUIREMENTS:

A. Control Scheme:

The control scheme is to use a primary controller to operate the station as required on a regular basis.

- Controller shall take care of all the functions needed to operate the station in the proper manor.
- Controller shall communicate via either Ethernet or Modbus communication devices all of the current conditions at the pump station as well as any other alarms.
- A secondary controller shall serve as a back-up to the primary control unit in the event the primary fails to operate.
- When the Controller Selector Switch is set in the "Auto" position the back-up controller shall take over control of the station when the liquid level in the wet well reaches a predetermined level.
- The Controller Selector Switch shall have three (3) selections
  - Primary
  - Auto
  - Back-up
- Each controller shall utilize a separate level probe for its monitoring of the wet well.

21.0 PRIMARY CONTROLLER:

The primary controller shall be a Twido Model TWDLMDA20DRT PLC manufactured by the Square-D Company.

- The Twido PLC shall have all the required components to properly operate, control and monitor all station functions.
- The HMI for operator interface at the pump station shall be a Magelis Model XBTGT2230 touch screen manufactured by Square-D Company.
- The Twido shall operate the required pumps as required in a pump down configuration.
- The Twido shall monitor all ten (10) points on the level probe.
- The level probe shall be manufactured by MPE Inc. and be part number LP-97-10-50 or an approved equal.
- Probe Level Inputs shall utilize a Probe Relay manufactured by MPE Inc. and be part number LPR-1.
- The Twido shall communicate vie either Ethernet or Modbus protocols to an external SCADA System.
- All required programing shall be done by the panel shop installing the PLC.

21.0 PRIMARY CONTROLLER, continued

- All station functions shall be monitored, and transmitted to the SCADA system and includes the following functions:
    - Automatic Lead/Lag operation.
    - Automatic alternation of all pumps.
    - Monitor and alarm on all pumps fault.
    - High and Low level alarms.
    - Monitor Modbus communications for pump monitoring devices, such as:
        - Drive or breaker state and faults
        - Motor voltage
        - Running state
        - Amp draw
        - Pump run times
- The Magelis HMI shall offer the operator the ability perform the following functions:
    - Select pump state – Hand, Off, Automatic.
    - View liquid level in wet well.
    - Change set points for Lead On/Off, Lag On/Off, High Alarm, and Low Alarm.
    - View all faults with a running history of all pumps for a period of least 30 days.

22.0 BACK-UP CONTROLLER:

The back-up controller will take over pump station control in the event that the primary controller fails. This shall happen when either the Twido has a major fault or when the level in the wet well reaches a predetermined set point.

- The back-up controller shall be manufactured by MPE Inc. and be part number 010-120-122P.
- The back-up controller shall communicate via a Modbus Protocol connection to the SCADA System.
- The back-up controller shall use a level probe manufactured by MPE Inc. and be part number LP-97-10-50.
- The back-up controller shall have four (4) points monitored for pump operation and high level alarms.
- The controller shall also have separate Hand, Off, Automatic switches for pump operation as well as alternation selector switch and high level alarm and silence button.
- The back-up controller shall also be pluggable into a standard 12-pin rectangular socket.
- Required probe relays shall be manufactured by MPE Inc. and be part number LPR-1.

23.0 VFD CONTROLS:

If in the design criteria a station requires the use of VFDs, the City of Oak Ridge and their designated engineers will provide further information on the requirements for the Control Panel.

24.0 DOCUMENTATION:

A minimum of five (5) complete sets of "As Built" documentation shall be supplied to the City of Oak Ridge. This documentation shall consist of:

- Complete as built drawings in both hard copy and PDF format.
- Copies of PLC and Magelis programs in both hard copy and digital media (disk).
- Catalog sheets on all components used in both hard copy and PDF format.