

**STANDARD FLOAT SERIES  
DUPLEX PUMP CONTROL PANEL  
SPECIFICATION  
for**

**CITY OF**

***NOTE: : THIS SPECIFICATION IS DESIGNED TO BE USED AS A TYPICAL SPECIFICATION FOR THE FOLLOWING TYPES OF FLOAT PANELS: STANDARD 120 V DUPLEX FLOAT PANEL , STANDARD 24V FLOAT DUPLEX PANEL OR QUALITY FLOAT DUPLEX PANEL OR AN INTRINSICALLY SAFE DUPLEX FLOAT PANEL. BEFORE USING THIS SPECIFICATION, THE USER MUST CHOOSE THE APPROPRIATE SECTIONS DEPENDING UPON THE TYPE OF FLOAT PANEL DESIRED.***

**DATE: 9/17/07**

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## **1. General**

### **1.1 Scope of Work**

The contractor shall furnish and install a pump control system designed to operate sewage pumps in a sewage lift station as described herein. The utility power supply at the lift/pump station shall be \_\_\_ volts, \_\_\_ phase, \_\_\_ wire. The duplex submersible pump motors shall be rated at \_\_\_ HP, \_\_\_ FLA's each and shall be equipped with an internal thermal switch for high temperature protection and probes to detect the presence of moisture inside the motor housing

The control system shall be designed to operate two submersible pumps based on wet well level monitored by float type level sensors. Four normally open float level sensors shall be required for automatic operation of the duplex pump station. The control panel shall be designed for the float level sensors to operate on (select one ) *120 VAC, 24 VAC or intrinsic safe relays* to provide the following functions; stop pumps, start lead pump, start lag pump, and high level alarm. The panel shall require electromechanical and solid state components for interface with wet well level sensors, built-in pump sensors, and to meet control requirements.

This specification describes the Float series of pump control systems as manufactured by EG Controls, Inc.

### **1.2 Codes and Standards**

Electrical equipment, materials and workmanship shall comply with all applicable codes, safety and fire law regulations at the location of the work and shall conform to applicable codes and standards of the organizations listed below.

1. Institute of Electrical and Electronic Engineers. (IEEE)
2. National Electric Code. (NEC)
3. National Electrical Manufacturers Association (NEMA)
4. American National Standards Institute. (ANSI)
5. Underwriters Laboratories. (UL-508 or 913 for intrinsically safe)

All equipment and materials shall be new and shall bear the manufacturers name and trade name. In cases where the standard has been established for the particular material, the material shall be so labeled. The equipment to be furnished shall essentially be the standard product of a manufacturer regularly engaged in the production of the required type of equipment for this type of work and shall be the manufacturers latest approved design. Equipment and material shall be suitably delivered and stored and shall be readily accessible for inspection. All items subject to moisture damage shall be stored in dry spaces. All material and equipment shall be protected against dirt, dust, water and chemical or mechanical injury, vandalism and theft.

## 2. Products

### 2.1 Construction

#### 2.1.1 Enclosure

The described equipment shall be housed in a single NEMA (3R, 12, 4 or 4X) \_\_\_ enclosure fabricated from: (select one)

1. *14 gauge galvanized steel with a baked ANSI gray finish inside and out over zinc phosphatized surface*
2. *Fiberglass with a gray finish outside and a white finish inside*
3. *14 gauge Type 304 stainless steel*
4. *14 gauge steel with a baked ANSI gray finish inside and out over zinc phosphatized surface*

Enclosure shall be padlockable. Fiberglass enclosure shall also be gasketed. Enclosure sizing shall be the responsibility of the system panel manufacturer.

#### 2.1.2 Hinged Inner Door

The hinged inner door shall be provided fabricated from 5052-H32.080 marine alloy aluminum. The hinged inner door shall contain cut-outs for all circuit breaker toggles. Control switches and indicators shall be labeled and mounted to the hinged inner door to keep operators from entering the live electrical compartment. A warning sign stating “DANGER -- Disconnect all sources of power before opening door” shall be installed on the inner door. It shall be completely removable for ease of service and shall be held closed by at least (2) hand operated 1/4 turn fasteners.

The following items shall be mounted on the inner door:

1. Lead pump selector switch to manually select or automatically alternate the lead pump.
2. Hand-Off-Automatic rocker/toggle switch to select the operating mode for each pump.

#### 2.1.3 Backpanel

The control system enclosure shall include a removable backpanel. The backpanel shall be fabricated from: (select one)

1. *12 gauge steel with a white finish.*
2. *.125 thick type 5052-H32 marine alloy aluminum with a natural finish*
3. *.080 thick type 5052-H32 marine alloy aluminum*

Components shall be fastened to the backpanel using stainless steel pinhead machine screws. All devices shall be clearly labeled in accordance with the schematic ladder diagram. The hinged inner door shall contain cutouts for all circuit breaker toggles. Control switches and indicators shall be labeled and mounted to the hinged inner door to keep operators from entering the live electrical compartment. A warning sign stating “**DANGER -disconnect all sources of power before opening door**” shall be installed on the inner door. The hinged inner door shall be held closed by hand operated quarter turn fasteners.

## **2.2 Control Circuit Wiring**

Control circuit wiring inside the panel shall be (16) gauge minimum, type MTW or THW, rated for 300 volts. All power wiring shall be rated for 600 volts. Conductors shall be color coded in the same colors throughout the entire panel.

All conduit entries shall be sealed to prevent moisture and gas vapors from entering the control system enclosure.

## **2.3 Float Control Circuitry**

*Select the appropriate section based on the type of float control*

### *2.3.5A For 24VAC Float Control*

The panel shall have 24 volt control circuitry for the float sensor in the wet well from the duplex logic control system. The duplex logic control system shall consist of a logic chassis mounted on the back panel and a logic panel mounted on the inner door connected by a multiconductor cable. The duplex logic control chassis shall be a prewired assembly constructed of corrosion resistant anodized aluminum, permanently marked with numbers, letters and graphic symbols to indicate the functions of each device or connection point. The duplex logic chassis shall contain; a 120 VAC control power off-on switch, circuit breakers for 120 and 24 VAC, 120/24 VAC class II control transformer, lead pump selector switch, simplex and duplex 120 VAC receptacles, five control relays with separate mounted LED indicators, duplex alternator, three terminal strips, two pump monitor and one power monitor LED indicators. The duplex logic panel shall consist of a prewired assembly constructed of corrosion resistant anodized aluminum permanently marked to indicate the function of each device. The standard logic panel shall contain; two H-O-A switches, two run LED indicators, one 24 VAC power on LED indicator, one start lag pump LED indicator, one level alarm LED indicator, and one silence push button.

### *2.3.5B For Intrinsic Safe Float Control*

The panel shall have intrinsic safe control circuitry for all float level sensors located in the wet well. Float sensors located in a wet well classified as a hazardous location shall be isolated from associated control contacts which are used to control pump and alarm conditions. Intrinsic safe control devices shall be UL913 approved, and shall provide a safe and reliable means of controlling loads from hazardous locations without releasing sufficient energy, under normal or abnormal conditions, to cause ignition of a flammable or combustible atmospheric mixture while in its most easily ignited concentration

### **3. Components and Features (standard and optional)**

#### **3.1 Incoming Power Supply**

*Select the appropriate section based on the incoming power connection.*

##### **3.1A Main Line Lugs**

Mainline lugs of the appropriate sizes shall be furnished for connecting the incoming supply power. The lugs shall be suitable for use with aluminum or copper conductors.

##### **3.1B Main Breaker - Type 1-E frame**

The main breaker shall be a properly sized E frame molded case circuit breaker. Each pole of the breaker shall provide inverse time delay overload protection and instantaneous short circuit protection by means of a thermal magnetic element. The breaker 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 short circuits and abnormal currents. Tripping due to overload or short circuit shall be clearly indicated by the handle automatically assuming a position midway between the manual “ON” and “OFF” position. The minimum interrupting rating of the breaker shall be 18,000 amps at 240 VAC and 14,000 amps at 460 VAC. The main circuit breaker toggle shall be operable through a cutout in the inner door.

##### **3.1C Main Breaker - Type 2-Q frame**

The main breaker shall be a properly sized Q frame molded case circuit breaker. Each pole of the breaker shall provide inverse time delay overload protection and instantaneous short circuit protection by means of a thermal magnetic element. The breaker 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 short circuits and abnormal currents. Tripping due to overload or short circuit shall be clearly indicated by the handle automatically assuming a position midway between the manual “ON” and “OFF” position. The minimum interrupting rating of the breaker shall be 10,000 amps at 240 VAC. The main circuit breaker toggle shall be operable through a cutout in the inner door.

#### **3.2 Manual Transfer Assembly**

*Select the appropriate section based on the incoming power connection.*

##### **3.2A Manual Transfer Assembly Type 1-E frame**

Provide a manual transfer assembly consisting of two mechanically interlocked E frame molded case circuit breakers to select utility or emergency power. The normal main circuit breaker shall be rated \_\_\_\_ amps, and the emergency main circuit breaker shall be rated \_\_\_\_ amps. The manual transfer assembly shall be flush mounted through a cutout in the inner door. The minimum interrupting rating shall be 18,000 amps at 240 VAC and 14,000 amps at 460 VAC.

**3.2B**      *Manual Transfer Assembly*      *Type 2-Q frame (Manual Transfer)*

Provide a manual transfer assembly consisting of two mechanically interlocked Q frame molded case circuit breakers to select utility or emergency power. The normal main circuit breaker shall be rated \_\_\_\_ amps, and the emergency main circuit breaker shall be rated \_\_\_\_ amps. The manual transfer assembly shall be flush mounted through a cutout in the inner door. The minimum interrupting rating shall be 10,000 amps at 240 VAC.

**3.3**      ***Relays***

Relays shall be of the square base plug in type with integral LED indicator lights. All relays shall have a transparent polycarbonate dust cover to protect the contact surfaces from airborne dust and other contaminants. All relays shall have DPDT or 4PDT contacts, as required. Relays shall be rated for continuous duty operation.

Relay contacts shall be rated for 10 amps at 300VAC. Relay sockets shall have screw terminals with self-lifting clamps and terminal identification numbers located at each connection on the relay socket.

**3.4**      ***Generator Receptacle***

Provide a 600 volt, \_\_\_\_ amp, \_\_\_\_ pole, \_\_\_\_ wire, reverse service generator receptacle mounted to the side of the control system enclosure.

The generator receptacle shall be compatible with the owners existing generating equipment. Contractors are advised to contact the owner for more specific information regarding this option.

**3.5**      ***Lighting Arrester***

Provide a solid state lightning arrester connected to the incoming supply power at the main line lugs or power distribution block. The lightning arrester shall be designed to protect control equipment from damage due to lightning strikes on the incoming power supply line.

**3.6**      ***Surge Arrester***

Provide a solid state surge suppresser connected to the incoming supply power at the main line lugs or power distribution block. The surge suppresser shall be designed to protect control equipment from damage due to transient surges on the incoming power supply line.

### **3.7 Undervoltage (1 phase) /Phase Monitor (3 phase) Relay**

#### *3.7A Undervoltage Relay (select for 1 phase)*

A under voltage relay shall be installed to monitor the incoming single phase power supply. The internal relay shall be energized and a LED indicator shall glow to indicate that the incoming power supply conditions are acceptable. The under voltage relay shall be used to disconnect all motor starter coil power when the input voltage drops below the setpoint voltage (brown out condition). The under voltage relay shall automatically reset when the fault condition has been corrected. The under voltage relay shall be protected with a input fuse on each incoming power supply phase.

#### *3.7B Phase Monitor Relay (select for 3 phase)*

A phase monitor relay shall be installed to monitor the incoming three phase power supply. The voltage level shall be adjustable and a LED indicator shall glow to indicate that the incoming power supply conditions are acceptable. The phase monitor relay shall be used to disconnect all motor starter coil power when the following conditions exist; Low voltage, Voltage unbalance, Phase loss, and Incorrect phase sequence. The phase monitor relay shall automatically reset when the fault condition has been corrected. The phase monitor relay shall be protected with a input fuse on each incoming power supply phase.

### **3.8 Circuit Breakers**

#### *3.8A Type 1-E frame Pump Circuit Breakers*

Each pump motor circuit shall be protected by a properly sized E frame molded case circuit breaker. Each pole of these breakers shall provide inverse time delay overload protection and instantaneous short circuit protection by means of a thermal magnetic element. The breaker 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 short circuits and abnormal currents. Tripping due to overload or short circuit shall be clearly indicated by the handle automatically assuming a position midway between the manual “ON” and “OFF” position. The minimum interrupting rating of the breaker shall be 18,000 amps at 240 VAC and 14,000 amps at 460 VAC. Pump motor circuit breaker toggle shall be operable through a cutout in the inner door.

#### *3.8B Type 2-Q frame Pump Circuit Breakers*

Each pump motor circuit shall be protected by a properly sized Q frame molded case circuit breaker. Each pole of these breakers shall provide inverse time delay overload protection and instantaneous short circuit protection by means of a thermal magnetic element. The breaker 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 short circuits and abnormal currents. Tripping due to overload or short circuit shall be clearly indicated by the handle automatically assuming a position midway between the manual “ON” and “OFF” position. The minimum interrupting rating of the breaker shall be 10,000 amps at 240 VAC. Pump motor circuit breaker toggle shall be operable through a cutout in the inner door.

### **3.9 Motor Starters**

#### *3.9A Type 1-NEMA Rated Motor Starters*

Each pump motor shall be provided with a NEMA rated full voltage non-reversing across-the-line magnetic motor starter. Starters shall provide single phase protection and be equipped with Class 10 or 20 bimetallic ambient compensated overload heaters. The adjustable overload heaters shall be sized according to the motor nameplate data. The motor starter coil shall be rated 120 volts. The motor starter shall be inoperable whenever the overload heaters are removed or have tripped. A overload reset push button shall be provided on the inner door for each motor starter.

#### *3.9B Type 2-IEC Rated Motor Starters*

Each pump motor shall be provided with a horsepower rated full voltage non-reversing across-the-line magnetic motor starter. Starters shall provide single phase protection and be equipped with Class 10 bimetallic ambient compensated overload heaters. The adjustable overload heaters shall be sized according to the motor nameplate data. The motor starter coil shall be rated 120 volts. The motor starter shall be inoperable whenever the overload heaters are removed or have tripped.

### **3.10 Single Phase Start Kits**

Single phase motor start and run control components shall be provided for proper operation of each single phase pump. The components shall include a start capacitor, run capacitor and motor start relay for each pump. Generally these components are supplied by the pump manufacturer, but can be provided by the control system manufacturer if component specifications and wiring diagrams are made available.

### **3.11 Transformer**

*Select the appropriate section based on the incoming power supply.*

#### *3.11A For 120 VAC or Intrinsic Safe Panels*

Transformers shall be sufficiently sized to provide 120/24VAC control power. Protection for the transformer shall be provided according to the National Electric Code.

#### *3.11B For 24VAC Panels without Logic Chassis*

A 50VA control circuit transformer shall provide 24VAC power for float type level switches. Secondary protection must be provided for the 24VAC control circuit transformer.

### **3.12 Auxiliary Power Circuits**

Auxiliary power circuits shall be protected by Q frame molded case circuit breakers. Each pole of these breakers shall provide inverse time delay overload protection and instantaneous short circuit protection by means of a thermal magnetic element. The breaker 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 short circuits and abnormal currents. Tripping due to overload or short circuit shall be clearly indicated by the handle automatically assuming a position midway between the manual “ON” and “OFF” position. The minimum interrupting rating of the breaker shall be 10,000 amps at

120/240 VAC. The circuit breaker toggle shall be operable through a cutout in the inner door. Provide breakers for the following auxiliary circuits; control power and GFI duplex receptacle.

### **3.13 Convenience Receptacle**

A GFI receptacle shall be provided to protect against ground fault leakage and shock. The unit shall have a retractable ground pin and polarized blades for two (2) or three (3) wire receptacles. The unit shall require a reset after any ground fault interruption.

### **3.14 Heating System**

A heating system shall be provided to maintain the internal temperature 2 - 3 degrees F above ambient temperature to prevent condensation inside the duplex control panel. A thermostat shall not be required.

### **3.15 Duplex Alternator**

A solid state duplex alternator shall be provided to alternate pump starting sequence at the end of each cycle. The duplex alternator shall be rated 120VAC.

### **3.16 Lead Pump Selector Switch**

The panel shall have a lead pump selector switch mounted on the inner door to manually select or automatically alternate the lead pump.

### **3.17 Operating Mode Switch**

The panel shall have a Hand-Off-Automatic rocker/toggle switch mounted on the inner door to select the operating mode for each pump.

### **3.18 Elapse Time Meters**

A non-resettable elapse time meter shall be mounted on the inner/outer door to record the accumulated running time for each pump. The elapse time meter shall be rated (select one) *24 or 120 VAC*.

### **3.19 Resettable Cycle Counter**

A recyclable cycle counter shall be mounted on the inner or outer door to record the number of times each pump motor is called to run. The cycle counter shall be rated 120 VAC.

### **3.20 Lag Pump Time Delay**

A lag pump time delay (1 - 60 second) relay shall be included to prevent simultaneous starting of both pumps after a power failure.

**3.21 Pilot Light Indicators**

The panel shall have lights mounted on the inner door to indicate the ON or RUN operation of each pump.

The panel shall have indicating lights mounted on the inner door to indicate the operation of each float level sensor.

The panel shall have a indicating light mounted on the inner door to indicate high level alarm. Manual reset is accomplished by pressing the high level or common reset button located on the inner door after the high level condition has been removed.

The panel shall have a indicating light mounted on the inner door to indicate low level alarm. Manual reset is accomplished by pressing the low level or common reset button located on the inner door after the water level has increased above the stop pumps level sensor.

**3.22 Positive Run Verification**

The panel shall have a “true” pump failure indicating light mounted on the inner door for each pump. The pump failure indicating light will be turned on when the motor does not draw full load current when called to run within an adjustable time-delay period. Each pump fail/positive run verification circuit shall include the following components; adjustable current sensor, control relay, time-delay relay, two position man-auto reset selector switch, and a pump fail indicating light.

**3.23 Motor Overtemperature Alarms**

The panel shall have indicating lights mounted on the inner door to indicate motor over-temperature for each pump. Automatic reset is accomplished by allowing the motor to cool and self reset. Manual reset is accomplished by pressing the appropriate motor over-temperature reset button located on the inner door. Control power to the motor starter coil shall be disconnected when a over-temperature condition is detected.

**3.24 Seal Failure Relays**

The panel shall have indicating lights mounted on the inner door connected to moisture detection relays mounted on the back panel to indicate seal failure alarm for each pump. This circuit can only be reset by removing the water from the motor outer housing. Manual reset is accomplished by pressing the appropriate seal failure reset button located on the inner door after removing the water/moisture. The pump shall be allowed to continue operating when seal failure has been detected.

The panel shall have indicating lights mounted on the inner door connected to seal minder relays (ABS) mounted on the back panel to indicate seal failure alarm for each pump. This circuit can only be reset by removing the water from the motor outer housing. Manual reset is accomplished by pressing the appropriate seal failure reset button located on the inner door after removing the water/moisture. The pump shall be allowed to continue operating when seal failure has been detected.

The panel shall have indicating lights and reset buttons mounted on the inner door connected to a 24 VAC Control And Status module (Flygt Mini-CAS II) mounted on the back panel to indicate seal failure and over-temperature alarm for each pump. Manual reset is accomplished by pressing the appropriate Mini-CAS reset button located on the inner door. The pump shall not be allowed to continue operating when a seal failure or over-temperature has been detected.

**3.25 12VDC Alarm System**

The panel shall have a 12 VDC alarm system. The 12 VDC battery and associated electro-mechanical and solid state devices will be mounted on the back panel. The red alarm strobe light shall be mounted on top of the panel and the audible alarm shall be mounted on the side. The following condition will cause the 12 VDC alarm system strobe and audible alarm to be energized; high level alarm.

**3.26 Alarms**

The panel shall have a red/amber alarm beacon mounted on top of the panel. The alarm beacon shall be rated 120 VAC, 40/60W, and shall illuminate/flash for the following condition(s); high level alarm. The panel shall have a audible alarm mounted on the side of the panel. A silence push button shall be mounted on the inner door. The audible alarm shall be rated 120 VAC, 90db at 2 feet (min.), and shall sound for the following condition(s); high level alarm.

**3.27 Remote Alarm Enclosure**

A separate enclosure shall be provided for remote mounting the visual and/or audible alarm devices from the duplex pump control panel. The alarm enclosure shall be rated (select one ) *NEMA-3R or NEMA 4X* and shall be fabricated from (select one) *14 gauge galvanized steel with a gray finish inside and out OR 14 gauge Type 304 stainless steel.*

**3.28 Terminal Strip**

The terminal strip shall be mounted on a 45° angle using rail offset brackets to angle up bottom side of terminals from back panel to ease field wiring connections. Rail offset brackets shall be zinc bichromate plated steel. All wiring within the control system enclosure should be installed in wiring duct and terminated at the terminal blocks.

**3.29 Isolated Dry Contacts**

The following dry alarm contacts shall be used to alert maintenance/service personnel of the following pump station conditions:

- Motor overload tripped alarm
- Motor overtemperature alarm
- Seal failure alarm
- High level alarm
- Low level alarm
- Power failure alarm
- Pump failure alarm (for each pump)



The panel shall provide the following dry alarm contacts wired to terminals for remote monitoring (contacts shall be either normally open or normally closed):

- Pump Motor on for each pump
- Pump Motor off for each pump
- Motor overload tripped alarm for each pump
- Motor over-temperature alarm for each pump
- Seal failure alarm for each pump
- High level alarm
- Low level alarm
- Power failure alarm
- Pump failure alarm for each pump

### **3.30 Telephone Dialer**

Provide and install, or Provide a (12”H x 10”W x 6”D) space for field installation of an automatic telephone dialer in the control system enclosure.

## **4. Quality Assurance**

### **4.1 *Manufacturer Experience***

#### 4.1.1. UL Certification

The manufacturer of the control system shall be certified by Underwriters Laboratories (UL) as being a UL 508 listed manufacturing facility and certified to install a serialized label for quality control and insurance liability considerations.

#### 4.1.2 Liability Insurance

The manufacturer of the control system must carry blanket liability insurance of at least ten (10) million dollars.

#### 4.1.3 Experience

The manufacturer of the control system must be able to document ten years of experience in successfully designing and manufacturing similar control systems for wastewater pumping applications.

### **4.2 *Manufacturer Quality Control***

The complete control system shall be functionally tested at the manufacturing facility and certified as a complete system to assure proper operation per specification. All components must be mounted with stainless steel hardware.

### **4.3 *Manufacturer Approval***

Manufacturers listed in this specification do not constitute approval. All controls must have the capabilities and functions as outlined in the specifications.

## **5. Submittal Requirements**

### **5.1 Base Bid**

The base bid control system shall be the float control system as manufactured by EG Controls Inc. of Jacksonville Florida and represented by: \_\_\_\_\_. All bidding contractors shall base their bid on the float control system. Contract shall be awarded on the base bid control system. Alternative deductive systems will be considered only after contract award and must be specified with any applicable deducts at bid time in order to receive consideration. Bidders submitting alternate quotations shall submit appropriate cut sheets, circuit drawings and a detailed bill of materials with their alternate bid packages. Approval of an alternative system shall be at the sole discretion of the engineer.

### **5.2 Substitutions**

The Engineer will consider proposals for substitution of materials, equipment, methods and services only when proposals are accompanied by complete technical data and all other information required by the Engineer for the proposed substitution. Substitution of materials, equipment, methods and/or services is not allowed unless such substitution has been specifically approved by the Engineer.

### **5.3 Shop Drawing Submittals**

#### **5.3.1 Drawing Requirements**

All drawings are to be computer generated.

#### **5.3.2 Engineering Approval**

The Engineer reserves the right to approve or disapprove any and all equipment based upon his evaluation. Approval for fabrication and installation will be made only after submittal and review of all submittal documents. The information required for approval shall include the following items and be provided in (8) sets as a minimum:

- (1) Appropriate cut sheets
- (2) Complete electrical schematics detailing the system
- (3) A complete bill of material
- (4) Detailed drawings of the enclosure (including backpanel and inner door)
- (5) Exploded detail of every control face plate, light, switch or meter mounted on the exterior of the enclosure.

### **5.4 Record Documents And Testing**

#### **5.4.1 Record Documents**

(1) Eight (8) sets of as built drawings as per Section 5.3.2, items 1 through 5 of this specification are to be supplied depicting “as built” conditions. This as built is to include any field modifications made by the authorized start-up personnel during installation, start-up or testing.

(2) Original copy of the factory Quality Control report.

#### **5.4.2 Testing**

The control panel shall be thoroughly tested at the factory prior to shipment.

## **6. Warranties**

All guarantees implied or stated by the control system manufacturer shall be passed in full force to the owner.

All components in the specified control system are warranted for defects in material and workmanship for a minimum of twelve (12) months from the dates the control panel is shipped from the manufacturer.

The manufacturer of the control system shall warrant all components in the system for unit responsibility purposes.

## **7. Equipment Identification**

All electrical equipment shall be identified in accordance with these specifications. All identification labels, both within the enclosure and external, shall be engraved nameplates attached with stainless steel machine screws, photo etched, silk screened, or laser-screened laminated mylar. All control wiring shall be numbered on each termination.

Engraved nameplates attached with stainless steel machine screws, photo etching, silk screened, or laser-screened laminated mylar shall be provided to identify all individually mounted push-buttons, rocker switches, lights, meters, circuit breakers, motor starters, transformers, relays, fuses, phase monitors, surge arrester and any other equipment for which identification is required for eventual service or replacement. This includes the appropriate equipment within the cabinet. Embossed tape is not acceptable.

## **8. Execution**

### **8.1 *Field Wiring***

Field installed interior wiring shall be neatly grouped by circuit and bound by plastic tie wraps. Circuit groups shall be supported such that circuit termination points are not stressed.

### **8.2 *Panel Protection***

The pump control panel shall be maintained in an upright position at all times. Lifting shall be only at the floor sills or the top mounting lifting angles.

The pump control panel shall be protected at all times. Any damage to the paint shall be carefully repaired using touch up paint that can be identified by the pump control manufacturer.