



**EG  
Controls**

**SECTION 16695 – PUMP CONTROL SYSTEMS:  
Duplex Electrogage Constant Speed Control System**

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**ELECTROGAGE™ SERIES  
DUPLEX PUMP CONTROL PANEL  
SPECIFICATION  
for**

**CITY OF**



**SECTION 16695 – PUMP CONTROL SYSTEMS:  
Duplex Electrogage Constant Speed Control System**

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**DATE: 9/17/07**

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## **1. General**

### **1.1 Scope of Work**

The contractor shall furnish, install and place into operation a pump control system designed to operate sewage pumps in a sewage lift station as described herein. The control system shall be designed utilizing proven technology in control design for sewage lift stations. The control system shall be operator and maintenance friendly to ensure ease of system set up and to limit system down time.

The pump control system shall be capable of operating 2 pumps at \_\_\_HP, \_\_\_ Voltage, \_\_\_ full load amps (FLA), \_\_\_ phase in a constant speed mode in order to convey sewage to the next pump station without causing a sewage over-flow wherever possible regardless of system demands.

The control system shall be of the bubbler type incorporating a liquid level indicator/controller as the level sensing and signal control device.

The factory assembled system shall include:

- Bubbler compressor(s)
- Liquid Level Indicator/Controller
- Enclosure
- Alarms and sensors as specified herein

These specifications describe model EGDP as manufactured by EG Controls, Inc., Jacksonville, Florida, or approved equal.

## **2. Products:**

### **2.1 General**

#### **2.1.1 Codes**

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)

#### **2.1.2 Component Standards**

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.

## **2.2 Construction**

#### **2.2.1 Enclosure**

The described equipment shall be housed in a single NEMA \_\_ enclosure fabricated from \_\_\_\_\_ steel. The enclosure size shall be approximately \_\_ high, \_\_ wide, \_\_ deep. Pilot and indicator devices shall be mounted on the hinged inner door.

#### **2.2.2 Hinged Inner Door**

The hinged inner door shall be provided fabricated from 5052-H32.080 marine alloy brushed aluminum. It shall be completely removable for ease of service and shall be held closed by at least (2) hand operated ¼ turn fasteners.

### 2.2.3 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.

Components having numerical or alphabetical references shall have all wiring similarly coded using a standard decal which shall be placed on the insulation materials within the confines of the enclosure. The decals shall be placed at all wiring terminations for ease of wire identification.

### **3. Components**

#### **3.1 Liquid Level Indicator/Controller**

The wet well level shall be monitored and maintained by a well-type manometer with mercury media that makes and breaks a series of electrical contacts as the mercury rises and falls in direct proportion to the change of the liquid level in the wet well. Level indication shall be vertical in movement.

The liquid level indicator/controller shall have a viewing window which shall display the mercury column, and shall be calibrated in both feet and inches of water, indicating the liquid level in the wet well. The unit shall be mounted on the inner door.

Accuracy: Accuracy shall be + or - 1/2% of full scale with 100% repeat accuracy and zero dead band when making and breaking electrical contacts.

Range: Indicated full scale range shall be zero to ten feet with front scale graduated in feet (0 to 10 feet) and inches (0 to 120 inches).

Control Points: The vertical, linear mercury column shall have a total of 40 control points providing an electrical output for every three (3) inches of water level, and shall be individually labeled as to the level at which they are activated. Liquid level set-points may be changed, with the tool provided, at the control panel without shutting off power to the panel. The liquid level indicator/controller shall be manufactured from corrosion resistant material, i.e. stainless steel, acrylic, nylon, etc.

The liquid level indicator/controller shall be manufactured by EG Controls, Inc., Jacksonville, Florida, Model 10FW3I, or approved equal.

#### **3.2 Systems Test**

The liquid level indicator/controller shall be equipped with manual testing capability located on the inner door. Testing the system must be possible without disconnecting any tubing or wiring. The testing system shall consist of a TEST push button, a solenoid valve, and a test port. Pressing the TEST push-button shall energize a solenoid valve to seal off and prevent liquid from rising in the submersed bubbler tube. Simultaneously, the valve shall divert the bubbler air output to the test port and relieve any air pressure on the indicator/controller. The operator can then simulate rising and falling liquid level by placing a finger over the test port.

The control panel shall be equipped with necessary fittings and/or adapters for the purpose of applying high pressure air to clear any obstruction to the bubbler tube, should it become clogged. Protection shall be provided to prevent high pressure air (100 PSIG maximum) from damaging the



level indicator/controller during blowdown. The control system shall include a 1/4" NPT female bulkhead fitting for connection to the bubbler tube.

### **3.3 Air Compressor**

The standard air supply for the bubbler system shall be from a continuous running, oilless, diaphragm type air compressor. The air compressor shall be mounted on a subpanel suspended with vibration damping shock mounts.

The air compressor shall deliver a minimum of .6 SCFH and produce a maximum air pressure of 5.5 PSIG (152 inches of water column). A fixed orifice shall be installed in line with the air compressor output to maintain a ripple-free air flow.

The air compressor shall be EG Controls, Inc. , Jacksonville, Florida, Model

### **3.4 Standard Features**

The following devices shall be included as standard features with each control system:

- 10' Electrogage Indicator/Controller
- Industrial grade air compressor (2)
- Set of components for system Test and Blowdown
- Hand-Off-Auto selector switches
- Run pilot lights
- 24V Power On pilot light
- Alarm Silence push-button
- Duplex alternator
- Lead Pump selector switch (1,2-Alt-2,1)
- Provision for normally closed motor over-temperature contact connections
- LED status indication pilot lights for each relay function
- Space heater to prevent condensation within the enclosure
- Serialized UL-508 Label

### **3.5 Circuit Breakers**

All electrical circuits shall be protected by molded case circuit breakers. 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 switching mechanism that is mechanically trip free from the handle. 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. Breakers shall be completely enclosed in a molded case and shall bear the UL label.

Short circuit interrupting duty rating (10 KAIC @240 volts; 14 KAIC minimum @480 volts) for all motor circuit protection circuit breakers shall be acceptable for operating conditions.

Substitution of fuses to replace circuit breakers is not acceptable.

Circuit breakers shall be operable through the inner door to prevent exposing the operator to live power.

### **3.6 Motor Starters**

All starters shall be full voltage non-reversing, NEMA or IEC rated and bear a UL label. The coil operating voltage shall be 120 volts AC 60 Hz.

All starters shall be complete with ambient compensated overload relays of the bi-metallic type. The overload relays shall be equipped with an electrical isolated normally open contact to annunciate a motor overload condition.

### **3.7 Relays**

#### **3.7.1 Relay Type**

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.

#### **3.7.2 Relay Contacts**

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.

### **3.8 Pilot Light Indicators**

The controller indicator lights shall be of the long life, solid state type with a built in ballast resistor and blocking diode for use with 24 VAC voltages. Pilot lights shall be equipped with quick connect terminals for ease of field replacement. Soldered terminals shall not be acceptable. Other panel lights shall be neon rated for 125 VAC and shall be high brightness lamps with appropriate built-in resistors to assure long life and desired brightness. The lamps shall be self-insulated and capable of operating for a minimum of 25,000 life hours.

### **3.9 Phase Monitor Relay**

The three phase monitor relay shall be connected to the power input terminals. The unit shall have an LED indicator which illuminates when the power conditions are normal. During periods of phase imbalance, loss of phase, or low voltage the phase monitor shall deactivate and shut down the pump motors. The circuit shall automatically reset upon restoration of normal power conditions.

### **3.10 Running Time Meter**

A running time meter measuring hours and tenths of an hour of operation up to 99999.9 shall be provided for each pump. The time meter shall operate from the control voltage of the Logic Chassis.

The meter shall incorporate quartz crystal electronics to ensure accurate time recording. The hours shall be displayed with a reliable electro-mechanical wheel indicator to ensure a permanent record of total running time.

### **3.11 Lighting Arrestor/ Surge Arrestor**

A lighting/surge arrestor shall be provided at the service entrance to the control panel. The unit shall be of the solid state type and be able to clamp in five (5) nanoseconds and absorb up to 25KA peak surge current during an occurrence. The unit shall have a surge life expectancy of 10,000 occurrences at 200 amps.

### **3.12 Transformer**

Transformers shall be rated as required, 350 VA minimum size. Transformers shall be multi-tap, 208/240/480 Volt AC primary, 120 Volt AC secondary, open frame dry type control power transformers and shall be designed and tested in accordance with the latest applicable standards of ANSI, IEEE and NEMA, and shall be UL listed.

### **3.13 Convenience Receptacle**

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

### **3.14 Bubbler Air Monitor System (BAMS)**

The bubbler air system shall be a totally enclosed sub-assembly including, but not limited to, the following:

The Bubbler Air Monitor System shall include the necessary check valves, logic, flow switches, isolation transformers, secondary MOV protection, dry contacts push-buttons, pilot lights and test functions.

The BAMS shall have an adjustable alternation of compressors (even alternation 4 Hrs/4Hrs or uneven alternation 4Hrs/1Hr). The logic controller, standby compressor and flow switch shall be automatically tested for proper operation after each alternation sequence.

Pilot lights shall indicate the following functions:

- (1) Air Supply #1 Run
- (2) Air Supply #2 Run
- (3) Air Supply #1 Failed
- (4) Air Supply #2 Failed
- (5) Air Flow
- (6) No Air Flow
- (7) Flow Switch Failed

Air Supply Warning shall be indicated and a normally open dry contact supplied for remote indication when one air compressor has failed.

Air Supply Failed shall be indicated and a normally open dry contact supplied for remote indication when both air compressors have failed.

If both air compressors and the flow switch indicate a failure, both air compressors shall be supplied with power for fail safe operation.

The Bubbler Air Monitor System shall be manufactured by EG Controls, Inc., Jacksonville, Florida, Model BAMS-20A, or approved equal.

### **3.15 Alarms**

High Level Alarm indication shall be included and a silence push button shall be provided for an optional horn. On decreasing levels, the alarm condition will automatically reset when the level falls below the high level alarm setpoint.

### **3.16 Manual Transfer Assembly**

A manual transfer assembly shall be provided that includes the following:

- (1) Normal Main and Emergency Main circuit breakers sized per NEC requirements. Main breakers shall be UL service entrance rated, 10 KAIC minimum @240VAC and 14 KAIC minimum at 480 VAC.

(2) A sliding bar interlock shall provide mechanical interlocking between two (2) adjacent circuit breakers. When moving the sliding bar interlock handle from one side to another, the bar shall extend a sufficient distance to alternately block movement of the blocked circuit breaker handle. This will ensure that both circuit breaker handles cannot be turned “ON” at the same time.

(3) Generator receptacle shall be compatible with the municipality’s existing generator. The generator receptacle shall be model \_\_\_\_\_ as manufactured by \_\_\_\_\_. No equal.

### **3.17 Monitors**

#### **3.17.1 Seal Failure Relays**

Seals Failure relays providing adjustable resistance sensing circuitry from 0 to 250,000 ohms for each pump shall be supplied. Upon activation, the seal failure relay shall not shut down the pump but shall illuminate a red pilot light located on the inner door that shall correspond to the appropriate pump. The moisture sensing probes shall be supplied and installed in the pumps by the pump manufacturer.

#### **3.17.2 Over Temperature Sensing Relays**

Pump over temperature (manual reset) sensors located in the pump motor shall be supplied for each pump. A red pilot light and reset push button for each pump motor shall be supplied and located on the inner door. When activated, the appropriate pilot light shall illuminate and the associated pump shall not be allowed to run, even if the motor cools sufficiently, until the appropriate reset push-button has been pressed.

## **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 Electrogage control system as manufactured by EG Controls Inc. of Jacksonville Florida and represented by: \_\_\_\_\_. All bidding contractors shall base their bid on the Electrogage 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. All equipment and materials shall be new and shall be specifically designed for the function herein.

### **5.2 Substitutions**

The Engineer will consider proposals for substitution of materials, equipment, methods and services only when proposals are accompanied by full and 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 of the computer generated class.

#### **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 shop contract 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
- (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 submittal is to include any field modifications made by the authorized start-up personnel during installation, start-up or testing.
- (2) Original copy of the final 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 two years (24) months from the dates the control panel is shipped from the manufacturer. The Electrogage Indicator/Controller unit shall carry an extended five (5) year guarantee against defects in workmanship and material from the date of shipment from the manufacturers facility.

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, disconnect switches, circuit breakers, motor starters, transformers, relays, fuses, phase monitors, surge arrestors 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.

A factory ID label shall be installed inside the outer door including the following information:

- Factory Order Number
- Factory Ship Date
- Supply Voltage, Phase and Frequency
- Control Voltage
- Electrical Wiring Diagram Number
- Wire (number of incoming wires)
- Motor HP and Full Load Current

A warning label stating “DANGER - Disconnect all sources of power before opening door” shall be installed on the inner door.

Control switches, indicators and all backpanel mounted components shall be clearly labeled in accordance with the schematic ladder diagram.

## **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.