SECTION 11430

CHEMICAL FEED SYSTEMS

# GENERAL

## SECTION INCLUDES

### Diaphragm metering pumps

#### Caustic Soda Metering Pump No. 1 (P-5443)

#### Caustic Soda Metering Pump No. 2 (P-5444)

### Fabricated skid systems

#### Caustic Soda skid system (two pumps)

## RELATED SECTIONS

### Section 05121, Miscellaneous Metalwork

### Section 11001, General Equipment Provisions

### Section 15290, Polyvinyl Chloride (PVC) Pipe and Fittings

### Section 16050, Basic Electrical Materials and Methods

### Section 16080, Acceptance Testing

## REFERENCES

### Definitions

#### Caustic Soda: 50-percent Sodium Hydroxide solution

### Reference Standards

#### SAE International (SAE)

## SUBMITTALS

### See Section 11001 General Equipment Provisions for additional equipment submittal requirements.

### Product Data:

#### Diaphragm metering pumps

##### Pump, motor, finish, and enclosure data

##### Warranty information

##### Pump performance data

#### Fabricated skid system

##### Materials of construction

##### Piping, valves, and appurtenances

##### Warranty information

### Shop Drawings:

#### Dimensions and materials for all equipment items and appurtenances listed in this specification.

#### Complete dimensioned arrangement drawings showing the assembled equipment, piping, valves, appurtenances, connections, supports, and major components of the pump skid system.

#### Weight of the complete skid system.

### Quality Assurance/Control Submittals

#### Skid fabricator references

##### List of five references meeting requirements of the “Quality Assurance” article in this specification section.

##### Agency name, contact name, contact phone number, and email address.

##### Brief description of skid system and date of installation for each reference.

### Closeout Submittals

#### Detailed assembly, installation, and start-up procedures.

#### Operation and maintenance manuals

#### Manufacturer Field Reports

## QUALITY ASSURANCE

### See Section 11001, General Equipment Provisions

### Skid Fabricator Experience Qualifications

#### Experience in manufacturing skid systems of similar type and size to the systems specified, which can meet the following installation requirements:

##### Minimum number of equipment installed and in operation: Five

###### Location: California

###### Facility type: Municipal Water Treatment

###### Minimum duration of operation: Three years

## SITE CONDITIONS

### Location:

#### Chemical containment area

### Exposure:

#### Corrosive environment due to chemicals

##### Sodium hypochlorite

##### Sodium hydroxide

##### Fluoride

#### NEC-Area Classification: Unclassified

### Temperature range: 32° Fahrenheit to 105° Fahrenheit.

## WARRANTY

### Provide warranty and performance guarantee for all equipment and appurtenances per the requirements of Section 11001 General Equipment Provisions.

#### Pump Warranty Period: five years from the date of Final Acceptance.

#### Skid Warranty Period: two years from the date of Final Acceptance.

# PRODUCTS

## MANUFACTURERS

### Diaphragm Metering Pumps

#### Blue-White Industries MD-3, no equal

### Fabricated Skid System

#### D&H Water Systems, no equal

## DESCRIPTION

### Diaphragm Metering Pumps

#### Pumps Caustic Soda to plant raw untreated water influent injection point

#### Pumps Caustic Soda to plant combined filter treated water effluent

### Fabricated Skid System

#### Fabricated system to house diaphragm metering pumps, chemical piping, valves, and appurtenances in a compact footprint.

## PERFORMANCE CRITERIA

### Caustic Soda Feed Systems

#### Operating range: Pump shall be able to operate at a minimum flowrate of 0.5 gallons per hour (gph) to a maximum flowrate of 34.6 gph at 140 psig

## DIAPHRAGM METERING PUMPS

### Design

#### Dual-Diaphragm type pump with a brushless variable speed DC motor and no loss motion positive pull-back cam drive mechanism

#### Double ball inlet and outlet cartridge type check valves

#### Integral diaphragm leak detection system

#### The inlet and outlet adapters shall be available for ½” male NPT or ½” ID hose barb connections in elbow or straight configurations

#### Capable of 2,000:1 turndown ratio

#### Dual diaphragm design shall provide near continuous chemical output with less than 3 seconds of interrupted output at 0.05% motor speed

#### Capable of running dry without damage

#### Capable of 23 feet of suction lift (water)

#### Pump shall be rated for continuous duty

#### Quiet, low pulsation/low velocity output

#### Maximum fluid viscosity shall be 10000 centipoises

### Materials

#### Pump Head

##### Natural PVDF Material

##### The diaphragm shall be manufactured from a single layer of natural PVDF material. Laminated diaphragms shall not be used.

##### The inlet and outlet pump head valve housings shall be manufactured from natural PVDF material.

##### The dual pump head inlet valve housings and outlet valve housings shall be connected with a PVDF manifold pipe.

##### The pump inlet (suction) adapter and the outlet (discharge) adapters may be installed in the field on either the left or right side of the pump.

##### There shall be four check valve cartridge assemblies per pump head, two located in the inlet valve assembly and two located in the outlet valve assembly. Each cartridge check valve assembly shall contain a ceramic ball, static seal o-ring and ball seat o-ring. O-ring ball seats shall be manufactured from T/FEP (optional EP) elastomer material. Static adapter fitting seals shall be manufactured from FKM (optional EP) elastomer material. An optional Hastelloy spring-loaded single ceramic ball check valve shall be available.

##### The pump head front shall be covered with a 316 Stainless Steel metal pressure support plate

##### The pump head shall be positively secured to the pump housing with 8 each 10-32 stainless steel socket head screws and washers.

#### Connection Fittings - PVDF

#### Motor

##### Brushless DC gear motor rated for continuous duty.

##### Motor shall include overload protection.

##### The maximum gear motor RPM shall be 190 RPM.

#### Drive System Enclosure

##### Pressure cast aluminum with acidic liquid iron phosphate three-stage clean and coat pretreatment and exterior grade corrosion resistant polyester polyurethane powder coat

##### Shall be factory installed and totally enclosed in a NEMA 4X, (IP66) wash-down enclosure. Capable of operating on any input power from 96VAC to 250VAC, 50/60 Hz single phase supply without user configuration or selection switches. Power consumption shall be less than 180 watts.316 Stainless Steel level mounting brackets and hardware

##### Provided with 316SS floor/shelf level mounting brackets and hardware.

##### A wiring compartment shall be provided for connection of input/output signal wires and alarm output loads to un-pluggable type terminal block connectors. Terminal board shall be positively secured to the rear of the pump housing by two polymeric screws and fully enclosed by the wiring compartment cover. The terminal board shall not be disturbed by the removal of the wiring compartment cover. Ribbon cables shall not be used in the wiring compartment. Conduit hubs, liquid-tight connectors, connector through holes and tapped holes shall be sized in U.S. inches.

##### Provide a clear, polycarbonate thermoplastic drive cam cover that includes an imbedded magnetic safety interlock which will engage the software maintenance mode and limit the motor rotation speed to 6 RPM when removed. The clear cover shall be positively secured to the drive assembly using a four thumb screws. Tools shall not be required to remove the drive cam cover.

##### Provide an LED light for viewing the internal drive mechanism to confirm drive operation.

#### Drive Mechanism

##### The drive cam shall apply force to a drive linkage which in turn moves two diaphragms through the suction and discharge strokes.

##### The drive cam shall provide the force for both the suction and discharge strokes resulting in no loss of motion during the stroke.

##### The diaphragm stroke length shall be 0.190 inches at all times. Stroke length adjustment shall not be provided.

### Controls

#### All control circuitry shall be integral to the pump and capable of adjusting the pump motor speed

#### The pump output shall be capable of being manually controlled via front panel user touchpad controls.

#### Capable of remote control via 4-20mA analog input.

#### The pump output shall be capable of being remotely control via 0-10 VDC input.

#### The pump output shall be capable of being remotely control via TTL/Cmos digital high speed pulse type input and an AC sine wave type pulse input in the range of 0 to 1000 Hz.

#### The pump output shall be capable of being remotely control via pulse triggered batching.

#### Cycle timer capable of automatically cycling pump on and off.

#### Capable of dispensing upon demand.

#### Capable of automatically calculating pump motor speed proportional to fixed or variable system flow-rate.

#### 11-button front panel user touchpad control for stop/start, configuration menu access and navigation, operating mode selection, auto-priming, display options selection, tube life data, and reverse direction.

#### Multi-color VGA graphic LCD display for menu driven configuration settings, pump output value, service alerts, tube failure detection system alarm status, remote input signal values, and tubing life timer value.

#### Green display color indicating normal operation, blue display color when in stand-by, and red display color in alarm condition.

#### Provide for remote stop/start pump via 6-30 VDC powered loop or non-powered contact closure loop.

#### User selectable 4-20mA and 0-1000 Hz output signal, scalable, and proportional to pump output volume

#### Four contact closure alarm outputs. Three rated at 1A-115VAC, 0.8A-30VDC and one rated at 6A-250VAC, 5A-30VDC. Each alarm output assignable to monitor TFD system, motor run/stop, motor failed to respond to commands, motor running in reverse, general alarm (over current), input signal failure, output signal failure, remote/local control status, revolution counter (tube life) set-point, or monitor which pump operating mode is active.

#### Four-digit password protected configuration menu.

#### Provide a flow verification system with programmable alarm delay time from 1-255 seconds.

#### Provide a stroke counter set-point display with user programmable alarm set-point value from 1 to 999,999,999 strokes which can be assigned to any one of the 4 contact closure alarm outputs.

#### User programmable maximum RPM set-point

#### User adjustable response delay time for remote start/stop input and contact closure alarm outputs.

#### User programmable power interruption pump restart option to automatically restart or require a user restart if AC main power is interrupted.

### Flow Verification Sensor - Shall output high speed digital pulse signal, while pump is running only, to verify chemical injection.

### Safety

#### The pump shall be certified to NSF Standard 61 Drinking Water System Components, UL standard 778 as a motor operated pump and CSA standard C22.2 as process control equipment.

#### Diaphragm Failure Detection (DFD) system sensors shall be wholly located in the pumphead. DFD system will stop the pump within three seconds of leak detection. To prevent false alarms due to rain, wash-down, condensation, etc., tube failure detection system shall not trigger with water contact.

## FABRICATED SKID SYSTEMS

### Design

#### Two side walls, two pump mounting bases, and one rear back plate

#### Chemical containment built into skid

#### Two chemical inlet ports

#### Two chemical outlet ports

#### Flow indicator as shown on drawings to provide a visual indication of fluid movement through the system

#### Piping layout per Drawings

#### Piping shall be ½” diameter schedule 80 CPVC

#### One drain shall be provided on the chemical suction side of the metering pumps.

#### System shall have a five-year manufacturer’s warranty on all chemically welded joints. Any leaks shall be repaired, on site, at the manufactures expense.

### Material

#### Skid

##### Marine grade high density polyethylene with tensile strength greater than 4100 psi.

##### The polyethylene sheet material shall be 100% UV inhibited. Molded skids shall not be accepted

#### Mounting brackets and hardware

##### Two 316 stainless steel pump mounting brackets with four mounting slots shall be provided per pump. Pump mounting brackets shall be secured to the skid structure with 316 stainless steel hardware.

##### All piping shall be securely mounted to the polyethylene skid with secure plastic mounts and 316 stainless-steel fasteners. Ball valves shall be mounted with polyethylene mounting plates and four 316 stainless steel fasteners.

#### Piping, Valves, and Appurtenances

##### Piping shall be ½” diameter schedule 80 CPVC unless otherwise specified. Caustic skid inlet piping shall be 1” schedule 80 CPVC with double containment.

##### CPVC per Section 15067 CPVC Piping, Valves, and Appurtenances.

##### True union ball valves shall be schedule 80 PVC (or CPVC) with PTFE shaft bearings and seals. Seals and O-rings shall be selected by the skid fabricator to be compatible with the chemical being used. All ball valves shall be Asahi type 21.

##### Seals specified as EPDM.

##### All socket weld joints shall be chemically welded with gray CPVC 724 industrial pipe cement with the use of P-70 industrial primer for chemical applications. All joints shall be squared, beveled and 100% seated. All socket welded joints shall have a full five year field replacement warranty by the manufacture.

##### To prevent leaks, no threaded joints shall be permitted on the skid assembly.

#### Flow indicator

##### A flow indicator shall be located in the discharge side of the piping system to provide a visual indication of fluid movement through the system.

##### Machined from clear cast acrylic with a ceramic ball indicator and polypropylene ball stop.

##### The flow indicator shall be secured to the piping system with PVC socket weld connectors and half unions.

#### Calibration column

##### Clear PVC with PVC solvent weld end caps

##### A calibration column fill line / discharge valve shall be included to assist in filling the calibration column and reliving pressure on the discharge side of the pumps. This line shall be vented back to the storage tank.

##### Valves shall permit the cylinder to be filled by gravity. A by-pass line shall be provided to allow the metering pump to be used to fill the calibration cylinder.

##### Calibration cylinders shall be located in the inlet side of the system to permit metering pump output volume calibration.

#### Pressure gauge

##### Pressure gauge and guard shall be located in the discharge side of the system to indicate system pressure.

##### The liquid filled gauge shall be stainless steel and include a blow-out plug.

##### The gauge shall be bottom mounted to the guard with ¼” NPT stainless steel threads.

##### The temperature compensated oil filled gauge guard shall be PVC with ½” socket weld bottom connection.

##### Pressure gauge shall have 2.5" dial, stainless steel case and 316 stainless steel Internals with 1.6% accuracy.

##### The pressure gauge shall be Ashcroft model 1008S, or approved equal

#### Diaphragm Check Valves

##### Diaphragm check valves shall be located at the discharge side of each peristaltic pump to prevent the back flow of fluid through the pump.

##### The diaphragm check valve shall be PVC with a 1.0 – 1.5 PSI cracking pressure.

##### The maximum inlet working pressure shall be 150 PSI.

##### Seals specified as EPDM.

##### Ball check valves shall not be permitted for this application.

#### Pressure Relief Valves (PRV)

##### A PRV shall be located on the discharge side of each pump to prevent excessive pressure in the system. Fluid shall be returned to the inlet side of the system if the pre-set maximum system pressure is exceeded.

##### The PRV shall be PVC, CPVC with a PTFE diaphragm seal.

##### The PRV shall have infinite adjustment increments from 15 to 150 psi.

##### The PRV shall have a 3 year manufacturer’s warranty.

##### Pressure relieve valve shall be by Griffco.

#### Back Pressure Valves (PRV)

##### A BPV shall be located on the discharge side of the skid system to maintain constant back pressure on the discharge side of the diaphragm metering pumps, unless otherwise indicated on the Contract Drawings.

##### The BPV shall be PVC, CPVC with a PTFE diaphragm seal.

##### The BPV shall have infinite adjustment increments from 15 to 150 psi.

##### The BPV shall have a 3 year manufacturer’s warranty.

##### Pressure relieve valve shall be by Griffco, or approved equal.

#### Inlet Y Strainer - shall be located on the suction side of the piping system. The Y-strainer shall be PVC with removable screen.

## ACCESSORIES

### See requirements of Section 11000 General Equipment Provisions

## SOURCE QUALITY CONTROL

### See Section 11000, General Equipment Provisions

### Factory test all equipment, motors, and controls

# EXECUTION

## INSTALLATION

### See Section 11000 General Equipment Provisions

END OF SECTION