SECTION 11440

PERISTALTIC METERING PUMP

# GENERAL

## scope

### The contractor shall furnish and install a pre-assembled, skid-mounted packaged peristaltic metering pump feed system for coagulant (aluminum sulfate), and separate, individual (not a packaged skid mounted system) peristaltic metering pumps for sodium hypochlorite and turbidity samples as indicated on the Drawings. The coagulant skid-mounted systems shall include, but not be limited to, metering pumps, calibration columns, pressure relief valves, and all necessary piping and controls to provide a complete system. The equipment is to be supplied by a single, Owner-approved, equipment supplier for installation by the contractor.

### The Contractor shall furnish all labor, materials, equipment, and incidentals required to supply, modify, install, test, and place into satisfactory operation all peristaltic metering pumps including associated appurtenances shown on the Drawings and specified herein.

### The Contractor is responsible for furnishing complete and operable equipment that functions automatically in accordance with requirements of the Contract Documents. The equipment shall be provided to the jobsite complete with all necessary equipment, piping, local wiring, controls, accessories, anchor bolts, and other appurtenances as specified and as required for a complete operating installation.

### The Contractor is responsible for troubleshooting the system after installation until it functions automatically according to the requirements of the Contract Documents. All combinations of manufactured equipment provided under these Specifications shall be entirely compatible, and the Contractor and the designated manufacturer shall be responsible for the compatible and successful operation of each component of the equipment items.

### The Contractor shall refer to the Contract Documents for any additional equipment items or components required for the complete operation of the equipment of this Section, but not specifically described in this specification.

### The Filtered Water Sample Pumps (50-P-11, and 50-P-22) shall be packaged with the Tertiary Disk Filter System as specified in Specification Section 11905.

## EQUIPMENT LIST

### The major items of equipment covered under this section include but is not necessarily limited to the equipment listed below.

| Pump No. | Description | Comments |
| --- | --- | --- |
|  |  |  |
|  |  |  |
|  |  |  |

[Engineer to populate equipment list]

## QUALITY ASSURANCE

### All equipment shall be new and of current manufacture. The peristaltic metering pump Manufacturer shall be the primary source of information on all equipment and material that they furnish for the job.

## RELATED SECTIONS

### Section 09800 – Painting and Coating

### Section 11000 – Equipment General Provisions

## Reference Standards

### The work in this section shall comply with applicable provisions and recommendations of the following standards, except as otherwise shown or specified:

#### American Gear Manufacturer's Association (AGMA)

#### American National Standards Institute (ANSI)

#### American Society of Civil Engineers (ASCE)

#### American Society of Mechanical Engineers (ASME)

#### American Society for Testing and Materials (ASTM)

#### American Welding Society (AWS)

#### American Water Works Association (AWWA)

#### Anti-Friction Bearing Manufacturer's Association (AFBMA)

#### Hydraulic Institute (HI)

#### Institute of Electrical and Electronic Engineers (IEEE)

#### Insulated Power Cable Engineer's Association (IPCEA)

#### National Association of Corrosion Engineers (NACE)

#### National Electric Code (NEC)

#### National Electrical Manufacturer's Association (NEMA)

#### National Fire Protection Association (NFPA)

#### National Sanitation Foundation (NSF)

#### Standard Specifications for Public Works Construction (SSPWC, "Greenbook"), latest edition

#### Underwriter's Laboratory (UL)

## SUBMITTALS

### **General:** All submittals shall be submitted in accordance with Section 01300.

### **Deviation from Specification:** The Manufacturer shall submit a copy of this specification section with all addenda and all referenced specification sections. Each paragraph shall be check-marked to indicate specification compliance or marked to indicate deviations from the specification requirements. Failure to include the required specification sections and the justification for deviations will indicate non-compliance and shall be rejected without further consideration.

#### Check marks shall indicate complete compliance with the paragraph requirements.

#### Deviations from the specification shall be indicated by underlining the deviation and marking the paragraph or line with a number or letter. The remainder of the paragraph not marked as a deviation shall indicate compliance with the requirements of the paragraph.

#### The manufacturer shall prepare a detailed justification for each deviation.

### **Product Data:** The following shall be submitted:

#### Type and model numbers of all equipment and/or components

#### Product cutsheets and brochures of all equipment and/or components

### **Design Data:** The following shall be submitted:

#### Design flow rates, chemical being pumped.

#### Sizing calculations.

### **Drawings:** Drawings shall include the minimum following items:

#### Dimensions, elevations, and materials for all equipment and/or components covered in this specification

#### Installation and layout of equipment and appurtenances

#### Field connection locations

#### Total equipment weight

### **Guarantee and Warranty Information:** Submit all guarantee and warranty information described in the Paragraph entitled "Guarantee and Warranty."

### **Equipment Data:** The following shall be submitted:

#### Name of Manufacturer

#### Type and model

### **Spare Parts:** Submit a list of the spare parts to be provided.

## OPERATION AND MAINTENANCE MANUALS

### Operation and maintenance manuals shall be supplied in accordance with Section 01734. As a minimum, operation and maintenance manuals shall include:

#### Principle of operation

#### Installation instructions

#### Description of unit and component parts

#### Operating procedures

#### Maintenance procedures

#### Safety precautions

## GUARANTEE AND WARRANTY

### The Contractor shall obtain from the manufacturer a warranty for all material, equipment, and appurtenances for one year from the date of substantial completion.

### During the warranty period, the Contractor shall provide the services of a trained manufacturer's representative to make all adjustments, repairs and replace all defective material and equipment at no cost to the Owner.

### The Contractor shall include all costs incurred by the manufacturer, including travel and expenses, under the terms of the warranty.

# PRODUCTS

## general

### Install complete peristaltic metering pump as specified in this section and as shown on the contract drawings.

### Provide Peristaltic metering pumps at the following capacities against the corresponding maximum discharge pressure:

| **Pump No.** | **Description** | **Capacity (GPD)** | **Maximum Discharge Pressure (psig)** |
| --- | --- | --- | --- |
|  |  |  |  |
|  |  |  |  |

## PERFORMANCE REQUIREMENTS

### The peristaltic metering pumps shall deliver chemical or sample at the specified capacity and pressure. All wetted materials of construction shall be compatible with the chemical to be pumped.

### The manufacturer shall be ISO 9001 certified in order to provide the highest level of quality assurance. Manufacturers who are not ISO 9001 certified will be required to submit, on each actual unit supplied, factory witness test data certified by a registered Professional Engineer.

### The package units for coagulant shall be pre-piped and pre-wired at the factory with all components assembled and mounted on the skid. Skid material shall be marine-grade polyethylene with 100 percent UV inhibitor. The package units shall be hydraulically and electrically tested at the factory and shall ship assembled to the fullest extent possible.

## Peristaltic METERING PUMPS

### **General:** The metering pumps shall be a positive displacement, peristaltic type tubing pump with a brushless variable speed motor, non-spring loaded roller assembly located in the pump head, integral tube failure detection system, tube life roller revolution counter with user alarm set-point and flexible tubing with attached connection fittings.

#### There shall be no valves, diaphragms, springs, or dynamic seals in the fluid path. Process fluid shall contact the pump tubing assembly and connection fittings only.

#### Pump shall be capable of 24 hour continuous duty, self-priming and operating in either direction of flow at the maximum pressure specified in this specification.

#### Pump shall be capable of running dry without damage.

#### Pump shall be capable of operating in either direction without output variation.

#### Suction lift shall be [XX] feet of water.

#### Accuracy: +/- 0.5 percent of full scale. Repeatability: +/- 0.5 percent.

### **Pump Head:** Pump head shall be a single, unbroken track with a clear removable cover

#### Tube failure detection sensors shall be wholly located in the pump head. Tube failure detection system shall not trigger with water contact. Float type switches shall not be used. Process fluid waste ports or leak drains shall not be provided.

#### Squeeze rollers with encapsulated ball bearings shall be directly coupled to a one piece thermoplastic rotor. Four polymeric rollers shall be provided; two squeeze rollers for tubing compression shall be located 180 degrees apart and two guide rollers that do not compress the tubing shall be located 180 degrees apart. The roller diameters and occlusion gap shall be factory set to provide the optimum tubing compression; field adjustment shall not be required. Spring loaded or hinged rollers shall not be used.

#### Rotor assembly shall be installed on a D-shaped, chrome plated motor shaft and removable without tools.

#### Pump head and tubing compression surface shall be corrosion resistant Valox thermoplastic.

#### The pump head cover shall be clear, annealed acrylic thermoplastic with an integral ball bearing fitted to support the overhung load on the motor shaft. Cover shall include an imbedded magnetic safety interlock which will limit the motor rotation speed to 6 RPM when removed.

#### Cover shall be positively secured to the pump head using a minimum of four thumb screws. Tools shall not be required to remove the pump head cover.

### **Pump Tube Assembly:**

#### To ensure pump performance and accuracy, only tubing provided by the manufacturer is acceptable.

#### Pump tube shall be assembled to connection fittings of PVDF material.

#### Connection fittings shall be permanently clamped to the tubing with 316 stainless steel clamps. To prevent tubing misalignment and ensure accuracy, fittings shall insert into keyed slots located in the pump head and secured in place by the pump head cover.

#### Connection fittings shall be [XX]" M/NPT.

#### Tube material and size codes shall be neoprene

### **Drive System:** Drive system shall be factory installed and totally enclosed in a NEMA 4X, (IP66) wash-down enclosure. Capable of operating on any input power from [110]VAC to [240]VAC, [50/60] Hz single phase supply without user configuration or selection switches.

#### Motor

##### Reversible, brushless DC gear motor rated for continuous duty.

##### Motor shall include overload protection.

##### The maximum gear motor RPM shall be 125 RPM.

##### Wash-down & severe duty

#### Enclosure

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

##### Rated NEMA 4X (IP66).

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

#### Control Circuitry. All control circuitry shall be integral to the pump.

##### All control circuitry shall be integral to the pump and capable of adjusting the pump motor speed from 0.01% to 100.00% in 0.01% increments less than 1% motor speed and in 0.1% increments greater than 1% motor speed (10,000:1 turndown ratio).

##### The pump output shall be capable of being remotely control via 4-20mA analog input. The input resolution shall be 0.01 of input value and capable of adjusting the pump motor speed from 0% to 100.0% motor speed in 0.1% increments. Four values shall be user configurable to define the low and high points on the output slope: a low input value, the required pump percentage of motor speed at the low input value, a high input value, the required pump percentage of motor speed at the high input value.

##### The pump shall be capable of automatically calculating the pump motor speed required to achieve a part per million dosing output that is proportional to a fixed system flow rate.

##### The pump shall be capable of automatically calculating the pump motor speed required to achieve a part per million dosing output that is proportional to a variable system flow rate.

## PIPING

### The packaged system for coagulant peristaltic metering pumps is to be supplied complete with suction and discharge piping and accessories as described herein, and as shown on the Drawings. The suction piping shall be sized to provide adequate NPSH to the pumps. Pressure relief valves shall be provided on the pump discharges to protect the pumps from excessive backpressure or dead-head conditions. A by-pass line shall run from the pressure relief valves back to the suction line. The by-pass line shall include an isolation valve. Isolation valves shall be provided on the suction and discharge of the pumps for ease of maintenance.

### All piping, valves, and appurtenances shall meet the requirements of specification section 15000 – General Piping Systems and Appurtenances

## ACCESSORIES

### The packaged peristaltic metering pump system for coagulant shall include the following accessories:

#### **Calibration Column:** The calibration column shall be piped to the suction line and is to include an isolation valve. Column shall be direct reading in GPH and sized to allow at least a 30-second drawdown at the design capacity of the pump listed in 2.01.B. Column shall be glass and all wetted materials are to be compatible with the chemical to be pumped.

#### **Flow Verification Sensor:** Not Required

#### **Pressure Relief Valve:** A pressure relief valve shall be provided at the discharge of each pump. The relief valve setting shall be set at a pressure lower than the pump internal relief valve. Valve wetted materials are to be compatible with the chemical to be pumped.

#### **Back Pressure Valve:** Not Required

#### **Pressure Indicator:** A pressure liquid-filled gauge with stainless steel case shall be provided in the discharge piping common line. The gauge shall be sized at least 25% higher than the pump internal relief valve set pressure. Provide ball valves and diaphragm seal for process isolation. Wetted material shall be CPVC, diaphragm shall be Kalrez 2037. Pressure gauges shall be manufactured by Ashcroft Inc., or approved equal.

#### **Pulsation Dampener:** Not Required

#### **Flow Indicator:** Not Required.

#### **Chemical Containment:** Pump skid shall be contained with a polyethylene chemical containment basin which shall be a minimum one (1) foot depth and shall completely surround the pump skid.

#### CPVC diaphragm check valves shall be included in each pump discharge line. All pump discharge isolation valves must be fully open.

## CONTROLS

### The peristaltic metering pump systems shall be provided with all necessary controls including motor starters and properly sized overload protection. The only required field electrical connection shall be the power supply. An ON-OFF switch and indicating light will be provided for each pump motor. All electrical components will be housed in a NEMA 4X enclosure. All wiring from electrical devices to the control panel will be run through conduit.

## SPARE PARTS

### Supply the following spare parts and accessories:

#### Two (2) spare tubes for each tubing type.

#### One (1) spare roller assembly for each pump type.

## Peristaltic METERING PUMP SYSTEM pre-qualified suppliers

### Pumps shall be manufactured by Blue and White Industries, or Equal

# EXECUTION

## Product Delivery, Storage, and Handling

### ***[For skid mounted equipment***]. The applicable equipment shall be shipped completely assembled and skid mounted. It shall be capable of being set in place and field erected by the contractor with minimum field assembly.

### ***[For stand alone equipment***]. Each equipment unit shall be shipped completely assembled. Each equipment unit shall be capable of being set in place and field erected by the contractor with minimum field assembly.

### Packaging shall be as required to prevent damage during shipment and unloading.

### Deliver materials to the site to insure uninterrupted progress of the work. Deliver anchor bolts and anchorage devices which are to be embedded in cast-in-place concrete in ample time not to delay that work.

### The Contractor shall store and temporarily support equipment prior to installation in strict accordance with the Manufacturer's recommendations and instructions. Protect all exposed surfaces. Protect all equipment from being contaminated by dust, dirt, vibration and moisture. All material and equipment shall be covered or stored in a manner which will prevent entry of deleterious matter. Power cables shall be covered or stored in a manner which will protect them from dirt and abrasion.

### Keep records of the storage parameters and the dates that storage procedures were performed. Temporarily connect equipment with built in space heaters to a power source and keep heaters in operation. Rotate all shafts that have bearings on at least a monthly basis. The contractor shall be responsible for work, equipment, and materials until inspected, tested and finally accepted.

### Handle all equipment and materials very carefully. Damaged equipment and materials will not be acceptable. Protect all bolt threads, etc. from damage and corrosion. Protect all factory applied coatings from damage during shipment, unloading, storage and installation.

### In addition to the normal Installation, Operation, and Maintenance manuals required by the contract, a spare manual shall be shipped with the unit in order to allow for proper operation of the equipment prior to the release of all final Installation, Operation, and Maintenance manuals.

## Installation

### Inspect and verify the structures or surfaces on which the equipment will be installed have no defects which would adversely affect the installation.

### The Contractor shall promptly report to the Owner, in writing, defects which may affect the work.

### The Contractor shall furnish and install all on-site wiring and piping. Support piping independent of equipment.

### Installation shall include furnishing and applying an initial supply of grease and oil, recommended by the Manufacturer.

### Installation of equipment shall be in accordance with the Manufacturer's written recommendations.

### Check and align unit components.

### All electrical connections shall be in conformance with requirements of Division 16, Electrical.

### Plug all taps and orifices not required for equipment operation and controls.

## Start-Up and Field Testing

### Contractor shall verify that structures, pipes and equipment are compatible. Contractor shall make adjustments required to achieve optimum operation. Contractor shall demonstrate that the completed installation meets the specified requirements and that all controls and safety shutdowns are operational.

### The equipment shall be field tested after erection in the presence of the Owner and Engineer to confirm and verify the following:

#### Structural and mechanical integrity

#### The equipment operates without jamming, overheating, or vibration

#### Verification of correction equipment and motor rotation.

#### The equipment operates in the manner intended and performs the specified functions satisfactorily

#### Compliance with performance criteria in this specification and with factory performance tests.

### Vibration testing for each equipment unit shall consist of the following:

#### The Contractor shall provide services of a specialist in vibration testing to conduct the tests.

#### Test each installed pump and motor at each operating speed for compliance with specified vibration and critical frequency limits.

#### Perform bump tests on each pump in each of two orthogonal planes one of which shall include the discharge elbow to determine critical frequency.

#### Determine the natural frequency of the pump support structure at each pump by a bump test and an analyzer with a frequency finder.

#### Perform vibration measurements at the upper motor bearing of each pump at each operating speed. Provide measurements in each of two orthogonal horizontal directions one of which shall be in the plane of greatest vibration and in addition provide a measurement in the vertical (pump axial) direction. Modify units and/or dynamic balance, if required to meet specified vibration limits or to correct excessive vibration.

#### The limits of vibration as set forth in the standards of the Hydraulic Institute shall govern.

### Field test using job supplied flow meters and pressure gauges.

## Manufacturer's Field Services

### Retain factory trained Equipment and Motor Manufacturer's service representatives with demonstrated ability and experience in the installation and operation of the specified equipment, motors and accessories to perform the services listed below:

#### Prior to installation, provide for one site visit to ensure that the equipment shipped to the job-site has been handled according to the Manufacturer's recommendations, has arrived in good working order, and that all equipment has been stored and protected according to the Manufacturer's recommendations.

#### Provide technical assistance to Contractor during installation of equipment units.

#### Check alignment and inspect the installation prior to final grouting and start-up.

#### Assist in initial start-up, adjustments and field testing

#### Instruct Owner's personnel in the operation and user maintenance of all components in accordance with the requirements of Section 01720, Instruction of Operations and Maintenance Personnel.

#### Supervise and provide written recommendations for the correction of any defective or faulty Work before and after acceptance by Owner.

#### The Manufacturer’s service representative shall check and approve the installation during construction and prior to initial operation.

### Prior to initial start-up, a written statement shall be provided by the Manufacturers stating the equipment has been installed by the Contractor in accordance with the Drawings, Specifications and Manufacturer's shop drawings and is ready to be placed into operation. After installation supervision service by the Manufacturer, the Manufacturer shall submit to the Owner within 14 days a letter, on the Manufacturer's letterhead, certifying that the equipment was installed per the Manufacturer's recommendations.

### The Manufacturer’s service representative shall re-visit the job-site as often as necessary until all deficiencies are corrected and the installation and operation is satisfactory to the Owner.

### Perform all field tests in the presence of the Owner and the Equipment Manufacturer's representative.

### The Contractor shall notify the Owner seven (7) days prior to the scheduled day for initial start‑up so that the Owner can notify operation and maintenance personnel of the proposed instruction. The Contractor shall include the cost of all the Manufacturer's installation, start‑up, and training services in his bid.

END OF SECTION