PERISTALTIC PUMPS – SKID MOUNTED

1. GENERAL

1.1 Scope of Work

.1 Supply, installation, testing, and Performance Verification of skid-mounted, pre-piped, pre-wired and pressure tested chemical feeding equipment shown and specified, complete with metering pumps, control panels, piping, valves, strainers, calibration columns, frames and accessories to feed chemicals, complete and operable, in accordance with the requirements of the Specifications.

1.2 References

.1 The following is a list of standards which may be referenced in this Section:

.1 ABMA

.2 NEMA: MG 1, Motors and Generators.

1.2 Definitions

.1 Terminology pertaining to pumping unit performance and construction shall conform to the ratings and nomenclature of the Hydraulic Institute Standards.

1.3 Contractor Submittals

.1 Shop Drawings:

.1 Make, model, weight, horsepower, and cross sectional details and colour brochures of each equipment assembly.

.2 Complete catalog information, descriptive literature, Specifications, and identification of materials of construction.

.3 Performance data curves showing head, capacity, horsepower demand, and pump efficiency over the entire operating range of the pump, from shutoff to maximum capacity. Indicate separately the head, capacity, horsepower demand, overall efficiency, and minimum submergence required at the guarantee point.

.4 Detailed Drawings showing the equipment dimensions, size, and locations of connections and weights of associated equipment.

.5 Power and control wiring diagrams.

.6 Complete motor nameplate data, as defined by NEMA, motor Manufacturer, and including any motor modifications.

.7 Factory finish system.

.8 Size, length and spacing of anchor bolts or attachment to the foundations or supports.

.9 External utility requirements air, water, power, etc for each component.

.10 Control Panel external face layout and inter layout drawings and electrical wiring diagrams.

.2 Quality Control Submittals:

.1 Factory Functional and Performance Test Reports.

.2 Manufacturer's certification of compliance that the factory finish system is identical to the requirements specified herein.

.3 Special shipping, storage and protection, and handling instructions.

.4 Manufacturer's printed installation instructions.

.5 Suggested spare parts list to maintain the equipment in service for a period of five (5) years. Include a list of special tools required for checking, testing, parts replacement, and maintenance with current price information.

.6 List special tools, materials, and supplies furnished with equipment for use prior to and during startup and for future maintenance.

.7 O&M manual.

1.3 Shipment, Protection, and Storage

.1 Ship pre-assembled to the degree possible.

.2 Provide storage instructions indicating specific requirements to ensure there is no uneven wear, distortion or weathering of components.

.3 Identify all other special storage requirements.

1.4 Responsibility of the Pump Manufacturer

.1 The pump Manufacturer is responsible for the selection, co-ordination and performance of the metering pumps, motors, and control stations which will be capable of meeting the head, pressure, accuracy and flow requirements specified herein. The pump Manufacturer is responsible for the selection, co-ordination and performance of the appurtenances.

.2 All major components (pumps and accessories) shall be supplied as a Vendor Package unless specified otherwise.

2. PRODUCTS

2.1 General

.1 Supplements at the end of this Section list Acceptable Manufacturers, and where specified models. This acceptance does not in any way relieve the Contractor or Manufacturer from providing models that meet all requirements of these specifications, and that fit within the piping and equipment layout shown in the Drawings.

.2 The supply of peristaltic pumps under this Section shall come from a single Manufacturer.

2.2 Pumping Requirements

.1 Take into account the specific gravity, viscosity, corrosivity and temperature of the fluid being pumped.

.2 Minimum turn-down ratio: 1:100

.3 Supply a minimum pumping accuracy of +2% of the full range for each pump package

2.3 Pump Skids

.1 General

.1 The pumps shall come with factory fabricated pump skids as shown in the P&IDs and described herein. The pumping skids includes metering pumps, strainers, controls, calibration column, backpressure valves, pressure relief valves, ball valves, pressure gauges, low flow switches, check valves, and all associated piping and fittings, in accordance with the Drawings.

.2 The aqua ammonia pump skid shall contain two (2) pumps. The pump skid shall be sized appropriately to fit in the designated location in their respective chemical feed rooms, as shown on the Drawings.

.3 Construct the pump parts in contact with the commodity being pumped from materials suitable for the application.

.4 The aqua ammonia pumps shall be the positive displacement, peristaltic type, self-priming unit. The pump shall consist of a single pump head and flexible hose.

.5 Peristaltic pumping action shall be created by the compression of the flexible hose between the pump head rollers and track, inducing forward fluid displacement within the hose by the rotation of the pump rotor, and subsequent vacuum-creating restitution of the hose. Process fluid shall be contained within pump hose and shall not directly contact any rotary or metallic components. Pumps shall be dry self priming, capable of being run dry without damaging effect to pump or hose.

.6 Pump head shall consist of a fixed track, flanged hose clamp mechanisms, and fixed roller rotor assembly. Pump hose shall be in contact with the inside diameter of the

track through an angle of 120 to 180 degrees and be held in place on the suction and discharge by a molded flange mechanism. At all times, one roller shall be fully engaged with the hose providing complete compression and preventing back flow or siphoning.

.7 Supply and Install 316L SST clamps for each hose connection

.8 All components of the chemical feed pump skids including pump, speed controller, motor, and related appurtenances unit shall be pre-plumbed and pre-wired.

.9 All actuated valves shall have 120/1/60 power supply

.2 Accessories

.1 Supply and Install inline flow meters to measure the chemical flow from each metering pump. Flow meter shall be capable of accurately measuring flows as shown in the Supplement at the end of this Section. Flow meter wetted components to be chemically resistant to service being used. Meters to meet Division 17 Specifications.

.2 Each pump shall be Supplied with pre-piped calibration column and pressure relief valve. The calibration column shall be constructed of material which is compatible with the chemical and shall be complete with a vented top cap and shall be graduated in milliliters.

.3 Supply and Install pumps suitable for connection to VFD.

.4 Motors to be designated IEEE Chemical Industry - Severe Duty TEFC (CISD-TEFC). Motors shall be VFD rated.

.5 A local control panel for each pump skid shall be Supplied and Installed as shown on the Drawings. Each panel shall include a 4 to 20 mA loop powered speed indicator wired direct from the VFD output, start / stop switch and push buttons to raise and lower the speed of the pump. Refer to typical starter schematic for details.

.6 Supply and Install motors suitable for 600 V/3 phase/60 Hz power supply.

.7 Supply and Install a floor-mounted support frame for the skid assembly. Fabricate support frame of chemically resistant FRP or chemically resistant epoxy coated carbon steel. Provide sufficient strength to allow the support frame to carry the full weight of all of the skid components when full of chemical.

.8 Supply lubricants of the type recommended by the equipment Manufacturer in sufficient quantity to fill all lubricant reservoirs and to replace all consumption during testing, start-up and operation prior to Substantial Performance. Lubrication systems and lubrications shall be certified to ANSI/NSF Standard 61, to be compatible with potable water use.

2.4 Piping and Valves

.1 Supply and Install schedule 80 PVC piping and valves for the aqua ammonia pumping skid and in accordance with Section 15200-000 – Process Piping. Supply and Install flanges on the inlet and outlets to the skid.

.2 Supply and Install valves and appurtenances of material suitable for the specified chemicals, in accordance with Sections 15202 – Process Valves and Operators.

.3 Supply and Install instrumentation and flow meters in accordance with Division 17.

2.5 Pump Skid Operation

.1 The Aqua Ammonia feed pumps shall operate as follows:

.1 One duty and one standby pump will deliver aqua ammonia to the line upstream of the Clearwell for chloramine formation.

.2 The amount of aqua ammonia added will vary depending on the target chloramine residual and the chlorine to ammonia ratio selected. A compound control loop based on the totalized water flow from the chlorine contact channel and the chlorine residual level (at the Clearwell inlet) will be used to control the aqua ammonia feed pumps to maintain a user-defined chlorine to ammonia feed ratio.

.2 The pump Manufacturer shall Supply and Install all wiring and conduit within a skid package. Cables between skids shall be Supplied and Installed as described in Division 16.

2.6 Factory Finishing

.1 Prepare, prime, and finish coat in accordance with Section 11901 – Factory Applied Protective Coatings, or request a deviation for approved equal at Shop Drawing submittal for Manufacturer's standard coating.

2.7 Spare Parts and Maintenance Materials

.1 Supply the following spare parts for each pump skid:

.1 One spare rotor assembly

.2 Supply three spare hoses

.3 Three (3) spares rollers per pump

.2 Supply a list of spare parts which would be expected to be required over a period of five years under normal conditions. At the Contract Administrator's request, provide a price for the listed parts.

3. EXECUTION

3.1 Installation by Contractor

.1 Installation will be by the Contractor in accordance with the Manufacturer's printed installation instructions.

3.2 Field Finishing by Contractor

.1 Provide field finishing with touch ups for equipment as specified in Section 09901 – Painting and Finishing – Process Mechanical.

3.3 Field Quality Control by Contractor

.1 Functional Tests: Conduct on each pump.

.1 Alignment: Test complete assemblies for correct rotation, proper alignment and connection, and quiet operation.

.2 Flow Output: Measured by WTP instrumentation and storage volumes.

.3 Operating Temperatures: Monitor bearing areas on pump and motor for abnormally high temperatures.

.2 Performance Test: In accordance with Hydraulic Institute Standards and/or more stringent requirements as described herein for operating conditions indicated in supplemental equipment data sheets.

3.4 Manufacturer's Representative Field Services

.1 Verify satisfactory delivery of the equipment by completing Form 100, illustrated in Section 01650 – Equipment Installation.

.2 Instruct Contractor in the methods and precautions to be followed in the installation of the equipment. Certify the Contractor's understanding by completing Form 101, illustrated in Section 01650 – Equipment Installation.

.3 Arrange for a technically qualified Manufacturer's Representative to attend the installation work, certify correct installation, train operating and maintenance staff and undertake the testing of the system for sufficient periods, to ensure the equipment is installed, operated, and maintained in accordance with the Manufacturer's recommended procedures.

.4 The minimum periods of Site attendance as total number of business days for all equipment are identified in the following table along with the form to be completed on each of these trips.

.5 The total number of trips will depend on the Contractor's schedule. The cost of additional trips, to be determined by the Contract Administrator, will be borne by the Contractor. Arrange for a technically qualified Manufacturer's Representative to attend the installation

work, certify correct installation, train operating and maintenance staff and undertake the testing of the system for sufficient periods, to ensure the equipment is installed, operated, and maintained in accordance with the Manufacturer's recommended procedures.

Item	Description	Total number of business days	Form
1	Equipment Delivery	1	100
2	Installation Assistance	1	101
3	Witnessing of Equipment Installation	1	102
4	Assistance in Equipment Performance Testing	1	103
5	Operator and Maintenance Training	1	T1

3.5 Installation Witnessing

.1 The Contractor shall ensure that equipment is installed plumb, square and true within tolerances specified by the Manufacturer's Representative and as indicated in the Contract Documents.

.2 The Manufacturer's Representative shall ensure the equipment is installed as required to provide satisfactory service.

.3 The Manufacturer's Representative and the Contractor are to cooperate to fulfill the requirements for a successful installation as documented by Form 102, illustrated in Section 01650 – Equipment Installation.

3.6 Equipment Performance Testing

.1 The Manufacturer's Representative shall ensure that each pump, including all component parts, operates as intended.

.2 The Manufacturer's Representative shall demonstrate satisfaction of requirements specified herein.

.3 The Manufacturer's Representative and the Contractor are to cooperate to fulfill the requirements for successful testing of the equipment as documented by Form 103, illustrated in Section 01650 – Equipment Installation.

3.7 Training

.1 The Manufacturer's Representative shall provide the services of factory trained instructors for the purpose of training the City's personnel in the proper operation and maintenance of the equipment as documented by Form T1. Conform to the requirements of Section 01650 – Equipment Installation.

3.8 Supplements

.1 The supplements listed below, following "End of Section," are a part of this Specification.

.2 Data Sheets:

.1 Aqua Ammonia Feed Pumps: P-S430A, P-S440A

END OF SECTION

SUPPLEMENT 1 – AQUA AMMONIA FEED PUMPS

PARAMETER	VALUE
Tag No. (s)	P-S430A, P-S440B
No. of Pumps	1 duty, 1 standby
Commodity	Aqua Ammonia
Specific Gravity	0.925
Concentration (%)	19
Solids Concentration Range (%)	N/A
Solids Concentration Operating Range (%)	N/A
Minimum Volumetric Flow Rate (litres/hour) per Pump	11.8
Maximum Volumetric Flow Rate (litres/hour) per Pump	95
Backpressure (kPa) (excludes losses internal to pump)	150
Minimum Pump Flow Turndown Ratio	100:1
Pump Operation Duration (h/d)	24
Flow Operating Range (L/hr)	10 - 100
Fluid Temperature Operating Range (◦C)	0.5 - 25
Driver Voltage (V/phase/frequency)	600/3/60
Speed (max)	N/A
Motor Suitable for Variable Frequency Drive	Yes
Minimum Pump Efficiency at Design Point (%)	80%
Acceptable Manufacturers	Verderflex VF10 Ponndorf

N/A – not applicable.