SECTION 43 32 69 – CHEMICAL METERING AND MONITORING SYSTEMS

PART 1. GENERAL

1.1 SCOPE OF WORK

A. Furnish all labor, materials, equipment and incidentals required to install all Chemical Metering and Monitoring Systems shown on the drawings and specified herein.

B. This specification covers the equipment and installation requirements for a duplex wall skid mounted chemical metering systems. The duplex metering pumps shall be skid mounted and factory assembled.

C. Provide chemical metering systems consisting of a pump, piping, valves, instrumentation, and appurtenances that are mounted on a skid for the following chemicals:

1. Sodium Hypochlorite (12.5%)

1.2 RELATED SECTIONS

A. Section 01 01 00 Scope of Work

B. Section 01 33 00 Submittals and Substitutions

C. Section 01 77 00 Project Closeout Procedures

D. Section 01 78 23 Operation and Maintenance (O&M) Data

1.3 REFERENCES

A. The publications listed below form a part of this specification to the extent referenced. The publications are referred to within the text by the basic designation only.

<u>AMERICAN NATIONAL STANDARDS INSTITUTE (ANSI)</u>

ANSI Z400.1 (2004) Hazardous Industrial Chemicals - Material Safety Data Sheets – Preparation

<u>AMERICAN WATER WORKS ASSOCIATION (AWWA)</u>

AWWA B300 (2004) Hypochlorite

<u>ASTM INTERNATIONAL (ASTM)</u>

ASTM D1784: Standard Specification for Rigid Poly(Vinyl Chloride) (PVC) Compounds and Chlorinated Poly(Vinyl Chloride) (CPVC) Compounds

ASTM D1785: Standard Specification for Polyvinylchloride (PVC) and Chlorinated Polyvinylchloride (CPVC) Plastic Pipe, Schedules 40, 80 and 120

ASTM D2105: Standard Test for Longitudinal Tensile Properties of Reinforced Thermosetting Plastic Pipe and Tube

ASTM D2412: Standard Test for External Loading Properties of Plastic Pipe by Parallel-Plate Loading

ASTM D2467: Standard Specification for Poly(Vinyl Chloride) (PVC) Plastic Pipe Fittings, Schedule 80

ASTM D2564: Standard Specification for Solvent Cements for Polyvinylchloride (PVC) and Chlorinated Polyvinylchloride (CPVC) Plastic Pipe and Fittings

ASTM D2855: Standard Practice for Making Solvent Cemented Joints with Polyvinylchloride (PVC) and Chlorinated Polyvinylchloride (CPVC) Pipe and Fittings

ASTM F441: Chlorinated Poly (Vinyl Chloride) (CPVC) Plastic Pipe, Schedules 40 and 80

1.4 SUBMITTALS

The following shall be submitted in accordance with Section 01 33 00 Submittals:

A. Pre-Construction Submittals: The following shall be submitted in accordance with Section 01 33 00 Submittals:

1. Product Data: Submit product data describing equipment features, materials of construction, general dimensions, and operational parameters. Include detail specifications, available test data, and instructions for installation and maintenance.

2. Submit manufacturer's descriptive and technical literature, catalog cuts, performance charts, engineering data sheets, list of materials, and list of equipment. Provide flow and head information on pumps including suction lift that can be achieved by the pumps. Provide materials of construction for all piping/tubing systems and chemical compatibility charts showing that proposed materials are suitable for the chemicals to be used. Provide pressure ratings for all piping and tubing systems. Include cut sheets and catalog data for piping and tubing components and all instruments and relief valves.

3. Submit Shop Drawings for approval. Include:

a. Process flow diagram and process & instrumentation diagram for the skid for each chemical.

b. Skid mounted system general arrangement showing dimensions, pipes, valves, instrumentation, appurtenances, weights elevations, and pipe sizes.

c. Include skid anchorage and mounting details, and clearances for maintenance and operation.

d. List of parts including size and material of construction for all valves, instrumentation, and appurtenances.

e. Instructions for skid installation relative to the chemical storage tank.

B. Informational Submittal

1. Skid delivery schedule.

2. Manufacturer's test reports at manufacturing facility.

3. Recommended spare parts list

C. Contractor shall submit a Test Report describing the findings of the field inspection of the installed equipment and the results of the functional testing, hydrostatic testing, and performance testing – see paragraph 3.5 for details.

D. Operation and Maintenance Manual

1. Submit the operation and maintenance (O&M) manual and required number of copies in accordance with Section 01 78 23.

1.5 SEISMIC LOADS

The structural aspects of the chemical metering system skid shall be sufficient to meet the Pennsylvania 2015 International Building Code requirements for Seismic Design Category = B.

1.6 DELIVERY AND STORAGE

Protect all equipment, delivered and designated for storage, from the weather, humidity and temperature variations, dirt and dust, and other contaminants.

1.7 EQUAL PRODUCTS

The Contract Drawings and Technical Specifications are based on a conceptual arrangement of the chemical metering systems and associated piping as shown on the Drawings and specified herein. Should the Contractor propose to furnish an equivalent system of a different configuration, the Contractor shall be responsible for all revisions necessary to incorporate the proposed system into the design and submit the necessary revised Contract Drawings and Technical Specifications for review and approval.

1.8 QUALIFICATION AND WARRANTY

A. Manufacturer Qualification

1. The chemical metering system shall be supplied by reputable Manufacturers having at least ten (10) years' experience in the design and fabrication of such systems for the treatment of water.

B. Warranty

1. Manufacturer shall provide warranty in accordance with Section 01 77 00 of the specifications.

PART 2. PRODUCTS

2.1 MATERIALS AND EQUIPMENT

A. Provide materials and equipment which are the standard products of a manufacturer regularly engaged in the manufacture of chemical metering skids and components, and that essentially duplicates items that have been in satisfactory use at other locations for a minimum of 10 of years.

B. Chemical metering system shall be skid mounted, assembled, piped, and tested for 100% of the rated pressure and volume in the shop prior to shipment. Field assembly shall be minimized to the maximum extent possible.

2.2 CHEMICAL METERING SYSTEM REQUIREMENTS

Include with each chemical metering skid system: controlled volume pump, pressure gauge, diaphragm seals, back pressure valve, vented ball valve, pressure relief valves, pulsation damper, sight glass (calibration column), stand, and any other items as shown on the P&IDs as being within the limits of the chemical metering system manufacturer's responsibility. Injection assembly shall be provided separately for field installation. Pump stands and platforms shall be adequate to support the metering system. Capacity and design of the chemical metering systems and accessories shall be suitable for 24-hour full load service in ambient, non-freezing conditions.

Chemical Metering System manufacturers: Prominent, Pulsafeeder, or approved equal.

A. Each chemical pumping system shall be capable of delivering chemical solution at any rate from the minimum flow rate to the maximum flow rate and shall be capable of continuous operation at rated capacity. Accuracy shall be plus or minus 2 percent over a 100 to 1 range from the required maximum capacity to the minimum pumping rate.

Chemical	Number of Pumps	Pump Flow Rate and Pump Description
Sodium Hypochlorite (12.5%)	2 (1 duty + 1 spare)	Duplex Wall Mount Auto- Degassing Chemical Feed Skid consisting of the following: 2 - ProMinent gamma/X microprocessor-based solenoid-driven diaphragm programmable pump Model-GMXA0708NPE9N000UD01300EN rated for Capacity: 1.80GPH; 6.8L/H 102PSI; 07BAR or approved equal. Continuous electronic stroke length adjustment from 0 - 100% (recommended 30 - 100%). Stroke rate adjustment in 1 stroke/hour increments from 0 to 12,000 strokes/h. Standard features should include: - Remote on/off and external contact input 1:1 with pulse control. - Backlit dot matrix display with 3-LED indicators - Fiberglass-reinforced, PPE plastic housing rated to IP65. Selected Options: Liquid end materials: Acrylic/PVC (PVDF degassing) Diaphragm/seals: EPDM/PTFE coated Liquid end version: Degassing version with bypass Hydraulic connections: 3/8" x 1/4" Diaphragm rupture indicator: Not included Version: Standard Logo: Standard, with logo Electrical connection: Universal, 100-230 V 50/60 Hz Cable and plug: N.American plug, 115V Relay, pre-set: Not included Accessories: Standard accessories Control variant: Option 0 + analog control Metering monitor: Pulse signal input Bluetooth remote stop: Not included Language: Standard (English) Approvals: MET (USA) Documentation: Standard Documentation

2 Nos. of Universal control cables, 5-pin round plugs; 5-wire 15 ft. (5m)

1 Nos. SS2_GMXA_PVC/VITON_NAOCL_WALL- 1/2" PVC/Viton® Primary Backup System (Auto degassing) Primary/Backup arrangement PP/PE skid for solenoid driven pumps or approved equal., (44"W x 20"D x 46"H) 1/2" PVC/Viton socket weld pipe and fittings 1000ml PVC calibration column Two 164ml CPVC/Viton pulsation dampener Two pressure relief valves Pressure gauge with isolator Back pressure valve Plumbing and components rated at 150 PSI regardless of pump pressure.

1 Nos. TERMINAL BOX KIT, 2 PUMP, NON-GFI RECEPT

B. Chemical Metering System Skid Appurtenances: The duplex pump wall skid shall be from TuffSkid of approved equal. The following are the metering pump skid appurtenances for each system:

SODIUM HYPOCHLORITE FEED SYSTEM

- 1/2" CPVC/ Teflon® Dosing System
- HDPE duplex pump wall mount skid (44"W x 20"D x 46"H)
- 1/2" CPVC/ Teflon® socket weld pipe and fittings w/ vented ball valves
- Wye strainer
- 500ml CPVC calibration column
- CPVC/ Teflon® pulsation dampeners
- Pressure relief valves
- Pressure gauge with isolator
- Back pressure valve
- Vented Ball valve with hole drilled in valve and installed so the vent is directed upstream when valve is closed.
- Plumbing and components rated at 150 psi regardless of pump pressure
- Chemical injector with check valve and corporation stop
- Skid anchors
- ID plate

C. CHLORINE ANALYZER

The sodium hypochlorite feed system shall include a chlorine analyzer with all required appurtenances manufactured by ProMinent Fluid Controls Model Number 1055408 or approved equal.

Chlorine analyzer package shall include:
DACB dual channel (standard) transmitter with data logger,
0-2 PPM free CL2 sensor,
DGMA flow through sensor holder,
pH sensor,
pressure regulator with gauge,
control package with back-panel,
wiring & pre-piped ready for field mounting

The multi-parameter controller shall have the following design features:

Measuring range:	
mV connection type	pH: 0.00 - 14.00 ORP voltage: -1,500 - +1,500 mV
Connection type mA (amperometric measured variables, measuring ranges corresponding to sensors)	Chlorine, transducer V2 Order No. 1047979
Connection type mA (potentiometer measured variables, measuring ranges corresponding to the transmitter)	pH, ORP voltage, Fluoride
Conductivity (measuring ranges corresponding to the transmitters)	via Transmitter 0/4 - 20 mA
Temperature	via Pt 100/Pt 1000, measuring range 0 - 302 °F
Resolution	
	pH: 0.01
	ORP voltage: 1 mV
	Temperature: 32 °F
	Amperometric analysis (chlorine etc.): 0.001/0.01 ppm, 0.01 vol. %, 0.1 vol. %
Accuracy	0.3 % based on the full-scale reading
Measurement input **Temperature compensation**	pH/ORP (input resistance > 0.5 x 1012 Ω) Pt 100/Pt 1000 for pH, conductivity, and fluoride sensors
Correction range	0 - 212 °F
pH compensation range for chlorine	Sensor CLE 3 and CLE 3.1; 6.5 - 8.5, sensor CBR 6-5 - 9.5
Disturbance signals/feed forward	Flow via 0/4-20 mA or contact water meter 1 - 500 Hz, the interference variable acts on both channels
Control characteristic	P/PID control
Control	2 x bidirectional control
Analog outputs	3 x 0/4-20 mA electrically isolated, max. load 450 Ω, range and assignment (measured, correction, control variable) can be set
Control outputs	4 x 2 pulse frequency outputs for metering pump control, 2 relays (limit value, 3-point step or pulse length control)
Alarm relay	250 V ~3 A, 700 VA contact type changeover contact
Digital control inputs	(7) as a remote-control input for the functions pause control / sample water fault, parameter set switch-over, level monitoring of chemical tanks
Electrical connection	90-253 V, 50/60 Hz, 25 VA or 24 V DC
Field bus connection	PROFIBUS - DP, Modbus RTU
Ambient temperature	0 - 122° F (for indoor installation or with a protective enclosure)
Enclosure rating	Wall mounted: IP 67 (NEMA 4X)
	Installation in the control cabinet: IP 54 for control cabinet door

Tests and approvals	CE, MET (corresponding to UL according to IEC 61010)
Housing material	PC with flame proofing equipment

2.3 CONTROLS

A. The chemical metering equipment shall be provided with the appurtenances and accessories, as required, for flow capacity adjustment. Manual range adjustment shall be provided on all systems. Provide a color coordinated, 115 V AC, 1 PH plug and outlet for each feed pump.

B. Manual Control: Provide the capability for starting or stopping the chemical metering equipment and adjustment of the solution feed rate manually by the operator.

2.4 PIPING

A. ALL PIPING AND FITTINGS SHALL BE 1/4" SCH. 80 PVC SOCKET WELD WITH VITON SEALS UNLESS OTHERWISE REQUIRED BY COMPONENTS. 2. INLET AND OUTLET SHALL BE 3/8" OD TUBE FITTING. 30 FEET OF 3/8" OD PE TUBING, P\N 7741514, TO BE SHIPPED LOOSE WITH THE PACKAGE. 3. (1) 50ML, 7PH BUFFER SOLUTION, P\N506253, AND (1) 50ML, 10PH BUFFER SOLUTION, P\N 506255, TO BE SHIPPED LOOSE WITH THE PACKAGE. 4. ALL DIMENSIONS ARE IN INCHES AND ARE SHOWN FOR REFERENCE ONLY.

B. Tube fittings shall be flareless compression type, constructed of Teflon® resin. Fitting system shall meet a 150-psi working pressure.

C. CPVC Solvent Cement: Joints shall be assembled using an approved solvent cement in accordance with the manufacturer's recommendations and ASTM D2564 and ASTM D2855. No cementing shall be done in the rain or when the air temperature is below 40°F or above 90°F.

D. Pipe Supports: Pipe shall be provided with supports spaced not farther than the manufacturer's recommended spacing for 100°F service. For piping 2" or smaller, supports shall be every 5' Provide pipe unions of the same material at all changes in piping direction. Piping shall be pitched to drain as shown on the drawings.

2.5 INJECTORS

A. Injector for sodium hypochlorite solutions shall be provided with a check valve and shall be CPVC. The device shall introduce the solution that it will allow disassembling of the unit without leakage/spillage of the chemical solution. The injector shall be manufactured by SAF T SEAL or approved equal provided with a ½" male inlet connection, spring loaded ball check valve, CPVC compression gland, CPVC Ball valve, CPVC quick release coupling, 1" male main connection, and the tip shall be provided with a Viton® GLT SAF-T-SEAL. The injector shall be connected to the Teflon tubing and the secondary containment dip-tube in such a way that it shall allow for ease of maintenance.

2.6 ACCESSORIES

A. Supporting Skid: The chemical metering system and all appurtenances shall be supported on a skid/ stand made of polyethylene (HDPE).

B. Anchor Bolts: System supplier shall size and provide 316 SS anchor bolts and shall provide installation template for positioning the bolts. Contractor shall confirm anchor bolt material is 316 SS.

C. Accessibility: Parts subject to wear or requiring adjustment, inspection, or repair shall be accessible and capable of convenient removal when required.

D. Equipment Identification Plate: A stainless steel identification plate shall be securely mounted on the skid in a location that is at eye level. The plate shall bear the system supplier's name, address, phone number, equipment model number, and serial number. Contractor shall confirm material and contents on equipment ID plate.

2.7 SPARE PARTS & TOOLS

A. System supplier shall provide one set of recommended spare parts for chemical metering system and related accessories supplied.

B. On metering pump for each chemical system.

C. System supplier shall supply one set of any special tools required for assembly, disassembly, or adjustment of the appurtenances supplied.

PART 3. EXECUTION

3.1 GENERAL

A. The chemical metering system shall be manufactured in accordance with the best trade practices and in accordance with all applicable codes and regulations.

3.2 FABRICATION & SHIPMENT

A. The system supplier shall fabricate the entire skid as a pre-engineered skid in the factory in controlled conditions prior to shipping to the site.

B. The system supplier shall provide all installation documents and O&M Manuals in accordance with the contract documents.

3.3 INSTALLATION

A. Pumps, equipment, and appurtenances shall be installed to provide a complete and integrated system in accordance with the instruction of the system supplier and under the direct supervision of the system supplier's representative.

3.4 LABELLING

A. Contractor shall label all chemical systems in accordance with OSHA's Hazardous Communication Standard requirements set out in 29 CFR 1910.1200 (HCS) updated in 2012.

3.5 TESTING

A. After installation of each system, operating tests shall be carried out to assure that the chemical metering installation operates properly. If any deficiencies are revealed during any tests, such deficiencies shall be corrected, and the tests shall be re-conducted. Reports of all tests shall be submitted to the Owner's Representative prior to final acceptance of the installation.

B. Pumps shall be tested at the site after installation to demonstrate that the pumps are capable of operating without any leakage of chemicals. Testing shall be performed using the actual chemicals at the maximum design flow rate and at half the design flow rate.

C. Time, Volume and Pumping Pressure: Pumps shall be tested by filling the calibration column with chemical and measuring the outage, with all other equipment valved off. The time, volume, and pumping pressures shall be recorded.

D. Test Pressure: Tests shall be carried out at 100 psig. Tests shall be performed by maintaining this pressure for one hours. Back pressure valves shall be manually controlled for this testing and shall be reset as necessary after testing. The time to deliver a given quantity of chemical at a given stroke and speed setting shall be the same at all pressures.

E. Flow: Pumps shall be tested to demonstrate zero gpm flow at a zero stroke or speed setting. Failure to meet this test will be cause for rejection.

F. Chemical Waste: Chemicals wasted during testing procedures shall be neutralized to achieve a pH value between 6.5 and 9.5. All chemicals wasted during testing procedures shall be neutralized, collected and shipped off-site for disposal in accordance will all State, Federal, and Local regulations, and to a disposal facility that is listed on the Owner's List of Approved Disposal facilities.

G. Test Report: Contractor shall provide a test report that shall include as a minimum a description of the test, methodology used, date and time when test was performed and the results of the testing. All testing results shall be reported, including test results that failed to meet the requirements. Should test runs fail to meet the requirements, an explanation shall be provided with the rationale for failure of the test.

3.6 REMEDY

A. If the tests specified above reveals deficiencies, corrective measures shall be taken until the System satisfies all of the specified requirements. Remedies shall be completed at no additional cost to the Owner.

3.7 MANUFACTURER SERVICES

A. The Contractor shall provide the following personnel:

1. One (1) representative of the manufacturer who is experienced in the installation and adjustment of the equipment specified. The representative shall supervise the installation and adjustment of the equipment – for a minimum of 2 days (8 hours a day).

2. A representative of the Manufacturer for 3 days (3 trips) during Testing described in Paragraph 3.4.

B. Conduct a video recorded training course for designated operating, maintenance and support staff members. The training period shall be a total of 6 hours of normal working time. Field training shall cover each item contained in the operating and maintenance manual.

END OF SECTION