

Section 11261

SODIUM HYPOCHLORITE (BLEACH) CHLORINATION SYSTEM

PART 1 GENERAL

1.01 SUMMARY

This Section includes the furnishing, installation and testing of an operational Sodium Hypochlorite (NaOCl) [Bleach] chlorination system for both surface water and ground water, complete and in place, as shown on the Plans and as specified herein.

1.02 MEASUREMENT AND PAYMENT

No separate measurement or payment for Work performed under this Section. Include cost of same in Contract price bid for Work of which this a component part.

1.03 REFERENCES

This specification references the following publications in their current editions. The publications listed below form a part of this specification to the extent referenced. The publications are referred to in the text by basic designation only.

- A. ASTM E84 Rev B: Standard Test Method for Surface Burning Characteristics of Building Materials
- B. Chlorine Institute -Pamphlet No. 1: Chlorine Basics
- C. Chlorine Institute - Pamphlet No. 6: Piping Systems for Dry Chlorine
- D. Texas Commission on Environmental Quality (TCEQ) Guidelines

1.04 SUBMITTALS

Submit the following in accordance with Sections 01330 – “Submittal Procedures” - Submittals and 01782 - "Operations and Maintenance Data."

- A. Shop Drawings and Product Data:
 - 1. Shop Drawings showing piping and equipment layout if different from that shown on the Plans.
 - 2. Shop Drawings showing piping schematic and pipe sizes if different from that shown on the Plans.
 - 3. Manufacturer’s installation instructions for all components and accessories

4. Catalog bulletins or comparable illustration and data sheets for all components and accessories. Material submitted must describe and illustrate materials of construction, dimensions, ratings, and functions of each item.
5. Chemical metering pumps:

Furnish certified pump head (TDH), capacity, horsepower, and efficiency curves for pump over entire operating ranges.
6. Control diagrams and written description of system operation.
7. All pumps:

Dimensioned drawings and description of construction, including parts lists with materials of construction and metallurgy

B. Operation and Maintenance (O&M) Manuals

- C. Furnish certified report prepared by manufacturer's technical representative certifying satisfactory installation, operation and in-service placement of units.

1.05 RELATED REQUIREMENTS

- A. Plans show general arrangement, location, and basic dimensions. Related Work as called for on the Plans or specified in this or other Specification Sections.
- B. Section 01330 – “Submittal Procedures”
- C. Section 01580 – “Project Identification Signs”
- D. Section 01782 – “Operations and Maintenance Data”
- E. Section 11303 – “Chemical Analyzers”
- F. Section 11700 – “Emergency Eyewash and Shower Equipment”
- G. Section 13202 – “Polyethylene Chemical Storage Tanks”
- H. Section 13446 – “Primary Instrumentation Devices”
- I. Section 15100 - "Chemical Piping"
- J. Section 16473 - "Water Receiving Facilities (WRF) Programmable Logic Controllers (PLC), SCADA Interface Panels and Panel Mounted Equipment"

1.06 QUALITY ASSURANCE

- A. Standardization:

1. Bleach chemical metering pumps and the associated appurtenances such as valves, calibration column, pulsation dampeners, back pressure valves, pressure relief valves and all associated piping to be provided as a package system by one vendor
2. All components of a given type to be by a single manufacturer

B. System Coordination:

Contract Documents describe details of complete equipment installation for purpose specified. Contractor is responsible for all details necessary to properly install, adjust, and place in operation a working system.

C. Requirements of Regulatory Agencies

Chlorination system to comply with regulations of Texas Commission on Environmental Quality (TCEQ)

D. Factory Test

Test each pump at factory in accordance with Hydraulic Institute Standards, using a prototype unless otherwise designated.

1.07 SYSTEM DESCRIPTION

System shall provide disinfection of surface water via chlorination. Chlorination is to be achieved by the use of Sodium Hypochlorite (NaOCl, liquid bleach). Completed disinfection system to include storage tanks (per Section 13202 – “Polyethylene Chemical Storage Tanks”), duty and standby metering pumps, alarms, controls, associated valves and piping, and other miscellaneous appurtenances discusses herein. Detailed system information is provided in “ATTACHMENT.”

1.08 DELIVERY, STORAGE, AND HANDLING

- A. Deliver all materials and equipment to jobsite with sufficient protection to ensure arrival in undamaged condition.
- B. All mechanical equipment to be stored on sleepers above grade and to be completely protected from damage and exposure to the elements until installation
- C. Handle all components in accordance with manufacturer's instructions to prevent damage.

1.09 - 1.12 (NOT USED)

1.13 WARRANTY

Provide Owner with manufacturer's warranty guaranteeing the pumps and associated equipment to be free from defects in workmanship and materials, under normal use and service, for two (2) years from date of Substantial Completion.

PART 2 PRODUCTS

2.01 MANUFACTURERS

Subject to compliance with the requirements of this Section, provide equipment from the following manufacturers.

- A. Chemical Metering Pump
 - 1. LMI Milton Roy
 - 2. Prominent
 - 3. Pulsafeeder
 - 4. Wallace & Tiernan (Evoqua)
 - 5. Or Approved Equal
- B. Fiberglass Reinforced Plastic (FRP) Building
 - 1. Associated Fiberglass
 - 2. Warminster
 - 3. Jacobs Manufacturing
 - 4. Or Approved Equal

2.02 MATERIALS AND/OR EQUIPMENT

- A. General:
 - 1. All equipment is for use as a permanent system to provide uninterrupted disinfection of surface water and groundwater.
 - 2. Chemical metering pumps, controls, and all associated appurtenances are to be supplied in a pre-engineered skid system, unless shown otherwise on the Plans.
 - a. Systems can be a dual pump or triple pump system

- b. Pre-engineered systems shall be fully assembled, tested and guaranteed to be fully functional upon delivery.
- c. System shall include all safety valves, back pressure valves, pulsation dampeners, calibration columns, electronic controllers, control panel and appurtenances as necessary to allow for a quick and easy "Plug & Play" installation.
- d. System shall be designed for handling off-gassing chemicals
- e. System shall provide easy access to pump discharge and suction piping to simplify installation, repairs and retrofitting.
- f. System shall be supplied with a UL listed and labeled control panels as required.

B. Chemical Metering Pumps

- 1. The chemical metering pump(s) shall be microprocessor-controlled, motor-driven, reciprocating, mechanically-actuated diaphragm type. Hydraulically actuated metering pumps shall not be acceptable. The pump shall include integral motor, oil-lubricated or permanently greased bearings, gear reducer and cam-and-spring drive mounted in aluminum housing. Such housing is to be sealed into an outer plastic housing for corrosion protection.
- 2. All pumping functions shall be set by membrane-switch keypad and status shall be displayed on an illuminated LCD. The keypad shall allow for simple scrolling and display of programmed parameters.
- 3. The pump shall have a universal power supply that allows it to operate at a supply voltage in the range of 100-230 VAC +/-10%, 50-60Hz, single phase.
- 4. The diaphragm shall be constructed of a solid core, vulcanized into nylon-reinforced EPDM, with PTFE-faced fluid contact surface. The diaphragm shall be of a convex design fitting into a concave liquid end to minimize dead volume and promote flow of solids in suspension. The pump shall also have a diaphragm failure detector with a visible indicator of diaphragm rupture. There shall also be an option for a fault indication or pump shut down in case of diaphragm rupture.
- 5. The liquid end shall be physically separated from the drive unit by a back plate with weep hole creating an air gap. An elastomer shaft wiper seal shall prevent contamination of the drive if the primary diaphragm fails.
- 6. The liquid end shall be either virgin PVDF. The suction and discharge valves shall be PVDF with Teflon formed composite seals and Alumina Oxide Ceramic valve balls on PVDF liquid ends. The PVDF liquid end shall be NSF 61 Certified for use with standard water treatment chemicals.

7. Stroke length control shall be adjustable manually by means of a stroke length knob, in increments of 1%, from 0% to 100% of stroke length. Stroke length shall be determined by a sensor within the stroke adjustment knob that provides accurate feedback to the electronics of the pump for calibration for LCD display of stroke length. The digital display and optional analog output will calculate, display, and transmit the flow of the pump based on pump speed and stroke length settings.
8. Stroke frequency control shall be done with an integral VFD and stepper motor pump controller. For the integral controller, the first 1/3 of the frequency in strokes per minute will operate with the stepper motor and frequency greater than 1/3 will operate with the internal VFD. When specified in 2.02 B, control shall be switchable between manual or external control via a 4-20 mA signal. In manual mode, stroke frequency control shall be manually adjusted by touch keypads, with the set stroke rate displayed on the pump's LCD. In external mode, the pump shall be capable of receiving a 4-20 mA input via optional external control cable. The metering pump shall be capable of remote "ON-OFF" operation using the "PAUSE" function via a voltage-free contact relay through an optional control cable. Pump shall include TEFC, four-pole AC motor.
9. The pump shall include the provision for programmable metering profiles to optimize an application based on discharge or suction conditions. There shall be options for normal operation, slow suction operation or slow discharge operation depending on the off-gassing and viscosity application requirements.
10. Each pump shall bear a permanently affixed manufacturer's stainless steel nameplate containing the model number and individual serial number for future identification.
11. Performance requirements for pumps:

The pump supplier shall provide a complete operating system including the process controller.
12. Materials of Construction

Wetted parts of all metering pumps shall be selected by the Manufacturer to ensure optimum, corrosion-free, and erosion-free operation for the chemicals involved. The pump except for stainless steel portions shall be painted with the manufacturer's premium epoxy paint system. The pump shall be NSF/ANSI 61 certified.
13. Mounting and Connections

As shown on the Plans and per manufacturer's recommendations.
14. The dosage of each chemical metering pump shall be set at each chemical

metering pump or through the SCADA control panel.

15. Pump to be single headed
16. Pump to have an accuracy of 2 percent over the range of 100:1.
17. Provide single ball-type valves with reversible seat and replaceable ball guide on the pump suction and discharge
18. Valves to be removable without disconnecting piping and capable of disassembly by hand
19. Chemical injector shall be equipped with anti-siphon devices to prevent feeding of sodium hypochlorite (Bleach) solution while the chemical metering pumps are not in operation
20. Accessories:
 - a. Pressure Relief/Off-Gas Valves:
 - b. De-aerator valve to relieve gas build-up back into the day tank.
 - c. An adjustable-pressure, diaphragm-type back pressure/anti-siphon valve shall be provided with each metering pump.
 - d. Provide and install intake and discharge pulsation dampeners.
21. Control:
 - a. Pump to be controlled via 4-20 mA signal from existing surface water or groundwater flow meter.
 - b. Provide pump overpressure shut off control
 - c. Provide a leak detector on the pumps to detect leak in the pump diaphragm.
 - d. Provide pump shutoff control and alarm to indicate leak in the pump.
22. Special Tools and Parts:

Provide to the Owner one set of special tools, calibration devices or instruments required for operation, calibration, and maintenance of equipment.

C. Communication

1. The chemical metering pumps shall be equipped to transmit 4-20 mA signals to/from the pumps to the customer operated control panel or PLC and/or the Owner's Supervisory Control and Data Acquisition (SCADA) system.

2. The control system operating the chemical metering pumps shall send an "ON/OFF," "FLOW RATE" and "PUMP OFF" alarm to the customer operated control panel or PLC and/or the Owner's SCADA system.
3. The chemical metering pumps shall be capable of receiving a flow proportional signal from the customer operated control panel or PLC and/or the Owner's SCADA system to control the flow rate of the pumps.
4. See Section 16473 - "Water Receiving Facilities (WRF) Programmable Logic Controllers (PLC), SCADA Interface Panels and Panel Mounted Equipment" for more information on the interface between the chemical metering pumps and the Owner's SCADA system, if applicable.

D. Fiberglass Reinforced Plastic (FRP) Building

1. A pre-engineered, prefabricated fiberglass reinforced plastic (FRP) building to house the bleach storage tank(s), chemical feed equipment, and appurtenances shall be provided when called for in the Contract Documents and as shown on the Plans.
2. The building shall be FRP construction – one room with composite walls and roof dimensions as indicated below and on the Plans.
3. Building is shall be prewired with panel board and equipment shown on the Plans and listed below. All building materials must be compatible with a bleach solution, and corrosion resistant.
4. Building shall be constructed to meet the following requirements:
 - a. Building dimensions shall be as shown on the Plans.
 - b. Exterior surface shall be gelcoat type with low luster finish. Color to be beige. Finish shall be free from fiber pattern, roughness, or other irregularities. Finish shall also be resistant to ultra-violet degradation, outdoor elements, and ammonia gas.
 - c. Exterior and interior laminates bonded to gelcoat shall be a minimum of 1/8-inch thickness. Laminates to be polyester resin and chopped strand fiberglass with a minimum glass content of 25 percent.
 - d. Center core shall be minimum of 1-inch thick with a minimum insulating value of R-6.06. Core material shall be self-extinguishing polyisocyanurate foam with a density of 1.9 lbs per cubic foot. Class A Flame Spread per ASTM E84 Rev B.
 - e. Roof slope shall be 1-inch vertical rise per 1-foot horizontal, with peak at center

- f. Building shall be equipped with a 4-inch-wide internal installation flange for anchoring building to concrete building foundation. Installation flange to be pre-drilled on 12-inch centers with 7/16-inch holes for anchoring building to concrete foundation.
 - g. Building shall be capable of withstanding winds up to 120 mph.
 - h. Provide vapor tight partition between building inside and outside.
 - i. Install building on concrete foundation using stainless steel 3/8-inch expansion anchors with neoprene rubber gasket installed between concrete foundation and building installation flange.
 - j. Provide one WPGPCI receptacle for emergency eyewash and shower equipment.
 - k. Provide an interior, overhead lamp with wet rated fluorescent light fixtures. Lamp to be fluorescent with dual 48" bulbs with acrylic lens cover.
 - l. Pre-wire using 12 gauge wiring in UL listed non-metallic flexible, liquid tight conduit, 125A, main lug, 8 branch circuit panel in NEMA 3R thermoplastic enclosure, Duplex outlets (115V). All Work to conform to NEC and Specification Sections.
5. Provide FRP composite door
- a. Install doors using a continuous stainless steel hinge.
 - b. Provide stainless steel latch, door stop, panic hardware, and two point padlock style hasp.
 - c. Door gaskets to be neoprene rubber
6. Provide one heater with thermostat and tip over switch. Heater to be mounted by manufacturer and configured to size.
7. Ventilation:
- a. The Building Manufacturer will coordinate with the Tank Manufacturer to determine the location and size of the wall penetration needed to vent the chemical storage tank(s). For more details on the vents needed for the chemical storage tanks, see Section 13202 - "Polyethylene Chemical Storage Tanks."
 - b. Provide a forced air ventilation system which includes:
 - (1) Two (2) screwed and louvered floor level vents;

- (2) An intake fan which is located at and draws air in through the top vent and discharges to the outside atmosphere through the floor level louvered vents. Exhaust fan manufacturer, model, size and location shall be as shown on the Plans.
- (3) Louvers shall be screened and no smaller than 6" x 6".
- (4) Size ventilation system to provide a complete air change in the compartment a minimum of every three minutes
- (5) Fan motor shall include conduit/conductors to panel board
- (6) Fan, motor, housing and louvers should be chemically resistant to chlorine vapors.

c. Ventilation and interior lamp equipment shall be automatically activated by external switch, mounted on building exterior by door, and by door operated micro switch.

8. Pipe and Equipment Supports:

Building manufacturer to provide integral fiberglass mounting panels and equipment support channels as manufactured by Aickinstrut Systems or equal with stainless steel (Type 316) or non-metallic hardware.

E. Bleach Storage Tanks

Refer to Section 13202 – “Polyethylene Chemical Storage Tanks.”

F. Safety Equipment

1. Provide warning signs on doors and tanks wherever applicable, in accordance with Section 01580 – “Project Identification Signs.”
2. Emergency Shower and Eyewash

Install per Section 11700 – “Emergency Eyewash and Shower Equipment.”

2.03 – 2.04 (NOT USED)

PART 3 EXECUTION

3.01 - 3.02 (NOT USED)

3.03 ERECTION / INSTALLATION AND CONSTRUCTION

- A. Materials and equipment shall be installed in accordance with manufacturer’s written instructions and applicable codes and ordinances

- B. Install all piping, fittings, valves and appurtenances required to install and operate the chemical feed system in accordance with Section 15100 - "Chemical Piping" and the Plans.
- C. Chemical Metering Pumps:
 - 1. Install pre-engineered skid system (including pumps and associated piping and control panels) in the orientation and location shown on the Plans.
 - 2. Pre-engineered skid system (including pumps and associated piping and control panels) shall be installed in accordance with manufacturer's installation manual and approved Shop Drawings.
 - 3. Install pre-engineered skid system flat and level. Securely bolt pump to the support structure using stainless steel nuts, bolts, and washers. Utilize lock nuts with nylon inserts or lock washers to prevent pump vibration from working mounting bolts loose. Do not distort or crack base feet when mounting pump.
 - 4. Flush piping of debris by disconnecting pump and flushing with water. Reconnect pump to piping.
 - 5. Coordinate pump with 4-20 mA flow proportional signal from on-site flow meter. Calibrate pump as necessary per manufacturer's written instruction.
- 3.04 REPAIR / RESTORATION (NOT USED)
- 3.05 FIELD QUALITY CONTROL
 - A. Manufacturer's technical representative to assist Contractor in testing all equipment to ensure that it functions properly
 - B. Chemical Metering Pumps:

Connect pump up to temporary source of water and test pump. Relieve air from piping system using valves provided for that purpose. Set pressure relief valve at 20% higher than normal operating pressure. Set back pressure valve so that pump experiences a minimum of a 5 psi back pressure. Run calibration test on pump at 100% speed and 100% stroke.
 - C. Upon satisfactory completion of testing, Manufacturer's Authorized Technical Representative to assist Contractor in installation and placing system in operation.
 - D. Manufacturer's Authorized Technical Representative to assist Contractor in instructing the Owner's personnel in operation and maintenance of chlorination equipment.

- E. Manufacturer's Authorized Technical Representative shall provide follow-up check and training approximately 3 months from start-up.

3.06 ADJUSTING (NOT USED)

3.07 CLEANING

Upon completion of use of the temporary chlorination system, Contractor to restore site to original condition. All rental equipment is to be cleaned and returned to supplier. All piping and equipment to be removed and either stored or disposed of per the Project Manager's request.

3.08-3.10 (NOT USED)

END OF SECTION

ATTACHMENT

[Design Engineer is to complete blanks per site requirements]

A. Chemical Metering Pumps:

1. Number of pumps: _____
2. Pump Designations: _____
3. Pump Manufacturer: _____
4. Pump Model: _____
5. Motor Horsepower: _____
6. Motor Speed: _____
7. Operating Conditions:
 - a. Fluid: Sodium Hypochlorite (NaOCl) [Bleach]
 - b. Density: 9.7 pounds/gallon (based on concentration)
 - c. Concentration %: _____
 - d. Minimum Flow Rate: _____
 - e. Maximum Flow Rate: _____
 - f. Suction Pressure: Variable due to supply tank level. See Plans for Pump and Tank Levels
 - g. Discharge Pressure: 145 psi
 - h. Control Variable: Flow proportional signal
 - i. Stroke Adjustment: Manually

END OF SECTION