SECTION 13 1504 – WATER FEATURE CHEMICAL FEED SYSTEMS

PART 1 - GENERAL

1.1 SUMMARY

A. This section includes the following:

1. Chemical Test Kits
2. Erosion Feed System
3. Chlorinator Feed System
4. Chemical Metering Pump
5. Liquid Chlorine Feed System
6. Acid Feed System
7. Carbon Dioxide (CO_2) Feed System
8. Chemical Control Unit

B. Related Sections:

1. SECTION 13 1401 – WATER FEATURE PIPE AND FITTINGS
2. SECTION 13 1403 – WATER FEATURE PIPE HANGERS, SUPPORTS, AND ANCHORS
3. SECTION 13 1501 – WATER FEATURE MECHANICAL IDENTIFICATION
4. SECTION 13 1502 – WATER FEATURE PUMPS AND MOTORS
5. SECTION 13 1503 – WATER FEATURE FILTERS
6. SECTION 13 1505 – WATER FEATURE OZONE GENERATION AND INJECTION
7. SECTION 13 1506 – WATER FEATURE UV STERILIZERS
8. SECTION 13 1507 – WATER FEATURE HEATERS
9. SECTION 13 1508 – WATER FEATURE HYDRONIC SYSTEMS
10. SECTION 13 1509 – WATER FEATURE CHILLERS
11. SECTION 13 1510 – WATER FEATURE HEAT EXCHANGERS
12. SECTION 13 1511 – WATER FEATURE VALVES, GAUGES, AND METERS
13. SECTION 13 1602 – WATER FEATURE CONTROLS
14. SECTION 13 1607 – WATER FEATURE PROGRAMMABLE LOGIC CONTROLLERS

1.2 SUBMITTALS FOR REVIEW

A. SECTION 01 3300 – SUBMITTAL PROCEDURES

B. Product Data: Submit manufacturer's literature including printed recommendations, dimensions and sizes, and accessories for each system type.

1. Indicate on the submittal which materials, models, data, and options are being selected.

C. Manufacturer's Certification: Submit documentation from the manufacturer certifying that the chemical systems conform with National Sanitation Foundation (NSF) Standard 50 guidelines.

D. Operation and Maintenance Data: Provide manufacturer's installation instructions, specifications, start-up procedures, assembly drawings, troubleshooting checklists, scheduled maintenance recommendations, replacement part lists and repair data.

E. Warranty: Submit manufacturer's warranty and ensure forms have been completed in the owner's name and registered with the manufacturer.

1.3 QUALITY ASSURANCE

A. Manufacturer: Company specializing in manufacturing products specified in this Section with a minimum five (5) years of documented experience.

B. Installer Qualifications: Company specializing in performing the Work of this Section with a minimum of five (5) years of documented experience.

C. Chemical Control System: Provide with on-site start-up, on-site operator training, and on-site warranty service, all of which shall be performed by a representative trained and authorized by the Manufacturer.

1.4 DELIVERY, STORAGE, AND HANDLING

A. Coordinate delivery with installation time to assure minimum holding time.

B. Accept chemical feed equipment and accessories on-site in original factory packaging. Immediately upon receipt of shipment, inspect, and check for damage.

C. Protect chemical feed equipment and accessories from physical damage including the effects of weather, water, and construction debris.

PART 2 - PRODUCTS

2.1 CHEMICAL TEST KITS

A. Acceptable Manufacturers

1. Liquid Reagent Test Kits

a. Taylor: Professional Complete Chlorine Testing Lab

b. Or approved equal

2. Portable Digital Test Meters

a. Myron L Company: Ultrameter III

b. Or approved equal

B. Liquid Reagent Test Kit:

1. Furnish one (1) test kit containing liquid reagents enough for at least five (5) complete tests for each of the following parameters:

a. Bromine (1-10 ppm) or Chlorine (1-10 ppm). Both free and total measuring capabilities
b. pH, Acid and Base demand (6.8 – 8.4)
c. Total Alkalinity
d. Calcium Hardness
e. Cyanuric Acid

2. Kit shall be provided in a portable molded plastic carrying case containing all reagents, comparators, waterproof instructions, and chemistry guide.

C. Portable Digital Test Meter

1. Furnish one (1) accurate portable digital test meter capable of analyzing the following six (9) parameters with auto ranging and auto temperature compensation:

a. pH
b. Total Dissolved Solids (TDH)
c. ORP in millivolts (mV)
d. Alkalinity
e. Hardness
f. Langelier Saturation Index (LSI)
g. Temperature in ˚F and ˚C
h. Mineral / Salt
i. Conductivity

2. Meter shall be direct reading, not colormetric or requiring reagents.
3. Meter shall be waterproof to 3-feet (1m) and buoyant.

4. Meter shall have a four (4) digit LCD display for full 9999 readings.
5. Meter shall log up to 100 readings with a date and time stamp and be capable of downloading .test data, with optional docking port, to a computer for records and reporting.
6. Meter shall be factory calibrated to NIST Standards with certification available upon request.
7. Furnish standard solution, minimum of 2 oz (59ml), for calibration of pH and conductivity, and for ORP and pH sensor storage.
8. Aluminum Frame, Type 6061-T.

2.2 CHEMICAL METERING PUMPS

A. Diaphragm Type Pump

1. Acceptable Manufacturers

   a. LMI Milton Roy
   b. PULSAtron
   c. Graco

2. Housing of chemically resistant glass fiber reinforced thermoplastics

   a. Fittings – PVDF
   b. Seal Rings – Teflon, Viton (dependant on selected model)
   c. Suction Tubing – Polyethylene
   d. Diaphragms and Seals – Teflon

3. Materials that shall NOT be used: PVC, Acrylic, Stainless Steel, Ceramic, Vinyl, and Hypalon.
4. All interior pump components, seats, valves, etc to be compatible with the solution it is pumping
5. Pump drive shall be totally enclosed with no moving parts.
6. Electronics shall be housed in a chemical resistant enclosure.
7. Check Valve: Teflon.
8. Provide a Filter, Regulator, and Lubricator for each pump.
9. Provide a foot valve with integral one-piece strainer and enough polyethylene tubing with factory installed compression connections to run from the chemical storage tank to the pump, for each pump.
10. Provide a wall mounting bracket composed of polypropylene and associated hardware for each pump.
11. Metering pump shall incorporate a variable feed capability to adjust feed rates.

B. Peristaltic Type Pumps

1. Acceptable Manufacturers

   a. Stenner
   b. ProMinent Fluid Controls, Incorporated

2. NSF Standard 50 listing.
3. Housing of polycarbonate plastic rated for indoor or outdoor use.
4. Peristaltic Tube: Material appropriate to be in contact with liquid being pumped.
5. Suction and Discharge Tubing: Material of construction appropriate to be in contact with chemicals being pumped.
6. Electronics shall be housed in a chemical resistant enclosure.
7. Suction Weight: Ceramic.
8. Provide a foot valve with integral one-piece strainer and enough polyethylene tubing with factory installed compression connections to run from the chemical storage tank to the pump, for each pump.
9. Provide a wall mounting bracket composed of polypropylene and associated hardware for each pump.
10. Metering pump shall incorporate a variable feed capability to adjust feed rates.

2.3 LIQUID CHLORINE FEED SYSTEM

A. Chlorine Feed System shall dose stored Liquid Sodium Hypochlorite solution of a concentration of 10-percent by the means of a Chemical Metering Pump, which is activated upon a signal from the Chemical Control Unit.

B. Chlorine Feed System consists of the following:

1. Chemical Metering Pump
2. Chlorine Storage Tank
3. Containment Tank

C. Chlorine Storage Tank

1. Constructed of one-piece heavy-duty polyethylene or Nalgene with UV stabilizer.
2. Translucent with molded calibrations on the tank.
3. Flat bottom design.
4. Tight sealing, rigid high-strength lids.
5. Capacity: as indicated on the Contract Documents and equipment schedules.
6. Tank shall be sufficiently anchored to the floor to resist vertical loads (seismic or wind).

D. Containment Tank

1. Constructed of one-piece heavy-duty polyethylene or Nalgene with UV stabilizer.
2. Translucent with molded calibrations on the tank.
3. Flat bottom design.
4. Overall height shall be at least 2-inches (50mm) lower than the acid storage tank height.
5. Inside diameter shall be at least 4-inches (100mm) larger than the acid storage tank outside diameter.
6. Capacity shall be at least 10-percent larger than the acid storage tank.
7. Containment tanks may not be necessary if double-walled storage tanks are approved by local codes and regulations. Verify approval with the Owner's Representative and Engineer.

2.4 ACID FEED SYSTEM

A. Acid Feed System shall dose stored muriatic acid solution with a concentration of 32-percent by the means of a Chemical Metering Pump, which is activated upon a signal from the Chemical Control Unit.

B. Acid Feed System consists of the following:

1. Chemical Metering Pump
2. Acid Storage Tank
3. Containment Tank

C. Acid Storage Tank

1. Constructed of one-piece heavy-duty polyethylene or Nalgene with UV stabilizer.
2. Translucent with molded calibrations on the tank.
3. Flat bottom design.
4. Tight sealing, rigid high-strength lids.
5. Capacity: as indicated on the Contract Documents and equipment schedules.
6. Tank shall be sufficiently anchored to the floor to resist vertical loads (seismic or wind).

D. Containment Tank

1. Constructed of one-piece heavy-duty polyethylene or nalgene with UV stabilizer.
2. Translucent with molded calibrations on the tank.
3. Flat bottom design.
4. Overall height shall be at least 2-inches (50mm) lower than the acid storage tank height.

5. Inside diameter shall be at least 4-inches (100mm) larger than the acid storage tank outside diameter.
6. Capacity shall be at least 10-percent larger than the acid storage tank
7. Containment tanks may not be necessary if double-walled storage tanks are approved by local codes and regulations. Verify approval with the Owner's Representative and Engineer.

2.5 Chemical Control Unit

A. Acceptable Manufacturers

1. BECS Technology
2. ProMinent Fluid Controls, Incorporated
3. ControlOMatic
4. Blu-Sentinel by Evoqua
5. Hayward

B. Chemical Control Unit shall be modular design and shall be supplied as one integrated package from a single source. Control Unit consists of the following:

1. Chemical Control Unit model as indicated on the Contract Documents equipment schedules.
2. Flow Cell and Sensor Assembly with Industrial Grade Probes.
3. Automatic Probe Rinse.

C. Chemical Control Unit

1. Integrated microprocessor-based electronic water treatment control system to continuously monitor water chemistry and for automatic control of the chemical feed systems.
2. Housing shall be a NEMA Type 3 lockable fiberglass cabinet with a visible LCD graphic display and accessible touch pad for direct access to all menus, sub-menus, and for entering numerical data.
3. The following parameters shall be continuously monitored and displayed in the LCD graphic display:

    a. Display Range and Accuracy

        i. pH Level: 1.0 to 9.95 with a resolution of 0.01 units
        ii. ORP Level: 0 to 1000 mV with a resolution of 1 mV
        iii. Sanitizer Residual: 0 to 20 ppm with a resolution of 0.1 ppm
        iv. Total Dissolved Solids (TDS): 1 to 1000 ppm with a resolution of 1 ppm
        v. Temperature: 32 to 120 ˚F (0 to 50 ˚C) with a resolution of 0.01 ˚F

4. Modes of operation shall include: OFF, Manual, Automatic, and Timer Cycle
5. In Manual Mode the Controller shall:

    a. Allow the Operator access to all outputs to chemical feeders, heaters, cleaners, and controller accessories.
    b. Allow operator access to all alarms and controls.

6. In Automatic and Timer Cycle Mode the Controller shall:

    a. Automatically activate the appropriate chemical feeders in order to maintain pH, ORP, and sanitizer set point values within the following tolerances:

        i. pH within +/- 0.1 pH unit
        ii. ORP within +/- 10 mV
        iii. Sanitizer Residual within +/- 0.1 ppm
        iv. Heater within +/- 2.0 ˚F

    b. Be able to operate in either standard on / off feed control or proportional feed control with adjustable dead band and progressive control zones.
    c. Monitor all alarm conditions.

d. Automatically clean and rinse probes on an adjustable seven (7) day program.
e. Capable of being programmed for four (4) separate timed events, each having independent daily on and off settings.

7. Visible indicator lights shall activate when pH and ORP and/or Sanitizer chemicals are being fed and the heater is operating.
8. All set point and calibration levels shall be operator adjustable with the numeric keypad on the unit.
9. Controller alarms shall include:

a. Visible high- and low-level alarms for pH, ORP and/or Sanitizer, and temperature with optional feed lockouts and alarm buzzer options.
b. Continuous monitoring for failure of pH and ORP and/or Sanitizer probes using dynamic probe testing and alert if failure occurs before water chemistry gets out of range.
c. A low flow warning message to alert the Operator when a low or no flow condition exists. Should a low or no flow condition exist, the system shall disable all chemical feed functions.

10. Controller shall have a broad memory capable of logging up to 68 days with frequency of logged input points shall be adjustable from every minute for every four (4) hours and shall record data on the following:

a. pH and ORP and/or Sanitizer readings.
b. Any alarm conditions.
c. Any set point adjustments and feed event history.

11. Controller shall include a memory storage battery with a minimum reserve power for six (6) months.

D. Flow Cell and Sensor

1. Control System shall include a remote mounted flow cell and sensor assembly enclosed in a non-corrosive, lockable fiberglass enclosure with a window.
2. Incorporate the following features:

a. An integral self-air purging sensing chamber with see-through inspection cover and two sensing electrodes.
b. A paddle wheel-style flow switch with see-through cover and “on stream” light.
c. Flow switch shall indicate flow through sample stream and signal controller to initiate an alarm condition and to shut off feed circuits in the event flow should stop.
d. Flow switch shall operate on low voltage and be made of non-corrosive material.
e. Valves for isolating all assembly components and a water sample test valve shall be provided and be constructed entirely of non-corrosive materials.
f. ORP sensing electrode shall incorporate at least one (1) square centimeter of 99.999-percent pure platinum.
g. Both electrodes shall contain not less than 50 milliliters of electrolyte gel to lengthen electrode life.
h. Gel used in each electrode shall be inorganic to prevent degradation by chlorine or bromine.
i. Each electrode shall use a porous Teflon liquid junction to minimize the chance of liquid junction clogging and prolong electrode life.
j. Electrodes utilizing organic gels or wood, or ceramic liquid conjunctions are considered equal to these specifications.

E. Automatic Probe Rinse

1. An automatic probe rinse system to clean sensing probes shall be provided.

2. System shall consist of one (1) six-gallon (22 liter) vapor-proof tank, one (1) feed pump capable of pumping up to 10 gallons per day (757 liters per day) at 75 psi (517 kPa) and a four (4) function anti-siphon/pressure relief valve.
3. Feed pump shall be controlled by a digital programmable electronic timer in the controller.

PART 3 - EXECUTION

3.1 GENERAL

A. Supply all labor, equipment, and materials to construct, test and put into operation complete system lines, valves, tanks, and injectors in accordance with the Contract Documents and as directed by the Engineer of Record.

B. Install all piping without bending, springing, or forcing, true to line and grade, in a neat and workman like manner and properly supported.

C. Install tubing in adequate lengths so equipment can be moved or adjusted in positions and locations for maintenance purposes without disconnecting tubing.

D. Inspect all equipment and remove any dirt or foreign material before attaching inlet, outlet piping or tubing.

E. Injectors shall tap into filtered water return lines and shall incorporate shutoff valves to allow disconnection of feed lines while filters are operating.

F. Install the entire systems to meet applicable state and local codes, including but not limited to NSF guidelines.

3.2 INSTALLATION

A. Liquid Chemical Feed Systems

1. Locate Liquid Chemical Feed (Liquid Chlorine and/or Acid) Systems in locations indicated on the Contract Documents.
2. Provide a 4-inch (100mm) wide by 6-inch (150mm) tall containment curb surrounding the chemical storage tanks. Curb shall provide spill containment. Do not allow liquid chlorine and acid storage tanks to be placed within the same containment curbed area.
3. Mount chemical metering pump in the locations shown on the Contract Documents, approximately 48-inches (1.2m) above the finished floor elevation and to the side of each tank. Do not mount the pump directly above the chemical tanks.
4. Upon delivery of the chemical storage tanks, inspect for defects or shipping damage. Any discrepancies, or product problems, should be noted on both the driver’s bill of landing and the Contractor’s packing list.
5. When unloading tank(s) from the delivery truck, avoid contact with sharp objects.
6. Do not allow tank(s) to be rolled over on the fittings. Large bulk storage tank(s), whenever possible, should be removed from the delivery truck bed by use of a crane or other suitable lifting device.
7. Keep unloading area free of rocks, sharp objects, and other materials that could damage the tank.
8. If tank(s) are unloaded on their side, carefully brace to prevent rolling.
9. Test by filling the tank(s) with water prior to use, to prevent chemical loss through unsecured fittings, shipping damage, or manufacturing defects. Tanks should be tested for a minimum of five (5) hours.
10. Do not mount heavy equipment on tank sides.
11. Do not allow weight on tank fittings. Fully support pipes and valves connected to tanks.
12. Supply enough liquid chemicals to fill the tank(s) to a level within 3-inches (75mm) from the top of tank(s).

B. Chemical Control Unit

1. Mount the Chemical Control Unit on the wall in the general location as indicated on the Contract Documents and where the controller, probes, and automatic rinse unit may be easily accessible
2. Install isolation valves on the influent and effluent sides of the probe housing.
3. Factory Representative shall be on site to calibrate and perform initial start-up of the chemical controller. Calibration should be performed testing water at the control unit using the sampling valve and comparing this sample with several samples taken from the pool, one from the edge of the pool and one from the center of the pool a minimum of 18-inches (450mm) below water level. No samples should be taken from the surface of the pool.
4. Supply enough cleaning solution to fill probe rinse tank.
5. Provide a phone line or wireless connection near the chemical controller.
6. If a printer has been provided, install the printer on a wall shelf in a location where it will be protected from moisture and water spray and is easily accessible.

END OF SECTION