**PART 1 – GENERAL**

* 1. **SUMMARY**

A. Section Includes:

1. Water treatment equipment for steam and water systems.

* 1. **DESIGN REQUIREMENTS**

1. Provide equipment, chemicals, and services to provide a complete water treatment program. A single water treatment company shall provide products and services for the first year from initial start-up. The water treatment company shall be a recognized specialist in the field of chemical water treatment or employs an experienced Certified Water Technologist: CWT consultant certified by Association of Water Technology AWT. The water treatment company shall be available during reasonable times and the course of the Work to consult with Architect and LAUSD about water treatment. Technical service representative shall be trained in industrial water treatment, geographically located within 60 miles of the Project site, and have a minimum of three years direct experience in the treatment of industrial water systems.
2. Water treatment equipment shall feed and control chemicals to protect the following systems:
   1. Condenser Water Systems:
      1. Scale control.
      2. Corrosion control.
      3. Microbiological growth control.
   2. Chilled Water Systems: Corrosion control.
   3. Hot Water Systems: Corrosion control.
   4. Steam Systems:
      1. Corrosion control.
      2. Scale control.
   5. **SUBMITTALS**
3. Submit in accordance with Division 01.
4. Submit Shop Drawings indicating flow diagrams and operation, instruction manuals of systems.
   1. **QUALITY ASSURANCE**
5. Comply with the provisions of Section 23 0500: Common Work Results for HVAC.
6. Water treatment company shall submit proof of a fully documented, accredited, and operational quality assurance program.

**PART 2 – PRODUCTS**

* 1. **CONDENSER WATER SYSTEMS**

1. General:
   1. Provide a completely automatic, proportional water treatment system for condenser water. System shall provide for the feed of a scale inhibitor and bleed off for scale control. Corrosion control shall be provided by the feed of a corrosion inhibitor. The scale and corrosion inhibitor residuals shall be based on fluorescent dye tracer (PTSA) readings in the condenser water, typically 100- 150 PPB (parts per billion). The PTSA (Pyrenetetrasulfonic acid Tetra sodium salt) level shall be measured by an in-line Fluorometer Little Dipper™ 2 or equal. Microbiological control shall be provided by a Brominator on a bypass around the condenser water pumps or return water directly to cooling tower basin to feed biocides.
   2. System shall provide the following sequence:
      1. A water meter in the water make-up to cooling tower and bleed water line shall transmit momentary electrical impulses to a controller. Controller shall energize timers for chemical feed pump based on PTSA readings and set points. Controller and timers shall automatically reset themselves after each cycle. An electrical interlock (flow switch) shall prevent system from operating unless condenser water pump is operating. Complete installation shall include piping and wiring required for proper operation of system.
2. Condenser Water System Components:
   1. Water Meter: Water meter in cooling tower make up and bleed line shall be a Hays model MT, Advantage Control Series AW, Liquid Metronics Inc. (LMI) FC Series, Seametrics or equal, complete with following features:
      1. Cast bronze or forged brass body, corrosion resistant polymer internal components, inlet strainer.
      2. Horizontal 5- or 7-digit totalizer with minimum indication of one gallon and glass facing with metal cover.
      3. NEMA 4 enclosure electric contact register to transmit signal to controller based on rate of flow.
   2. Controller: Controller shall continuously monitor the conductivity of a sample water stream via a remote or attached sensor. As the conductivity rises above a pre-set conductivity level as established by the water treatment company, the controller shall signal an N/C solenoid or motorized bleed valve to open evacuating high TDS recirculating water. The valve shall remain open until the conductivity drops two to five percent below the pre-set level. Controller shall have operating mode indicator lights, connections for chemical pump, N/C bleed-off valve and shall have a conductivity sensor limit timer and alarm to over-ride chemical feed during alarm mode, double biocide timer, built-in flow switch HOA and flange for wall mounting. Provide Lakewood, Pulsafeeder, Walchem WCT Series, Aquatrac, or equal.
      1. Relay indicator lights for power on, bleed, and pump on.
      2. Lockable NEMA 4 enclosure for wall or panel mounting with viewing window, back panel and pump manifold.
      3. Controller shall be a Walchem WCT600PCCAM-B1 controller or equal, conductivity, flat rod ORP sensor, back board, flow switch, and Little Dipper PTSA sensor with Modbus TCP.
   3. Chemical Feed Unit: Scale and corrosion-inhibiting feed unit shall be furnished with proportioning pump, tank, piping, and accessories.
      1. Pump shall be proportional, positive displacement, diaphragm, and chemical-metering type, suitable for feeding a solution of polyphosphates, or phosphonates. Pump shall be a Liquid Metronics Inc. Series AA75 or B71, or Neptune Chemical Pump Co., Pulsafeeder, Inc., Walchem/Iwaki EWN Series or equal, complete with the following features: capacity range from 0.02 to 1.0 gallons per hour at least 80 psi discharge pressure; stroke length adjustment from 0 to 100 percent; stroke frequency adjustments from 10 to 100 strokes per minute; corrosion-proof housing of glass fiber reinforced polypropylene; and integral anti-siphon valve.
      2. Chemical solution tank shall consist of a double wall polyethylene tank, cover, suction and fill connections furnished with the following features: Suction tubing shall be flexible polyethylene complete with Type 1 polyvinyl chloride foot valve, the inhibitor, biocide 1 and biocide 2 tanks shall be 70 gallon and 40 gallon double wall polyethylene tank respectively.
   4. Bleed-Off Unit: Bleed-off unit shall be furnished with a basket strainer and solenoid valve installed in bleed pipe from condenser water return line.

a. Solenoid valve shall be ASCO Series 8210 diaphragm type or, Advantage Controls motorized ball valve with spring return Belimo actuator, ABV Series, or equal, with 125 psi working pressure, brass body, normally closed, general purpose enclosure and 120 volt, single phase electrical characteristics. Provide ½ inch up to 200 tons; ¾ inch from 200 to 750 tons; 1 inch over 750 tons.

b. Bleed-off shall discharge into a drain with 8 inches of space between end of bleed line and drain so container may be inserted to measure flow. Provide splash shield between end of bleed line and drain. Bleed off unit shall have a by-pass loop.

* 1. Microbiological Growth Control Feed System: Microbiological growth control feed system shall consist of a Brominator on a bypass around condenser water pump or return directly to the cooling tower basin. Bromine tablet feeder shall be 50 lbs. capacity Brominator, with clear see thru body with a flow rotameter, from Neptune Chemical Pump Co., Vector Industries, or equal for 125 psi working pressure. Install complete with piping, valves, flow indicator and fittings. The clear body brominator shall be a Vector Industries, Biomate-2000-25, 25 lbs. capacity and the flow rotameter shall a Blue and White model F-40750LN-12, ¾ inch, 1-10 gpm, or equal.
  2. **STEAM SYSTEMS**

1. General:
   1. Provide a completely automatic, proportional water treatment system for feed water to steam boiler. System shall provide for the feed of both a scale inhibitor and corrosion inhibitor.
   2. System shall provide the following sequence: Interlock chemical feed pump to the feed water pumps in order to proportion the chemical to the flow of feed water.
2. Steam System Components:
   1. Chemical Feed Unit: Scale and corrosion inhibiting feed unit shall consist of a proportioning pump, tank, piping and accessories.
3. Pump shall be proportional chemical metering type suitable for feeding a solution of phosphates, or Tannin, polymer and sulfite.
4. Pump shall be a Liquid Metronics Inc. Series AA75 or B71, as basis of design, or Neptune Chemical Pump Co., Pulsafeeder, Inc., Walchem /Iwaki or equal, complete with the following features: Capacity range from 0.02 to 1.00 gallons per hour; stroke length adjustment from 0 to 100 percent; stroke frequency adjustment from 10 to 100 strokes per minute; corrosion-proof housing of glass fiber reinforced propylene; and integral anti-syphon valve.
   1. The chemical solution tank and pump mounting assembly shall consist of a 70-gallon double wall polyethylene tank, cover, liquid mixer, suction and fill connections furnished with the following features: Suction tubing shall be flexible polyethylene complete with Type 1 polyvinyl chloride foot valve. Liquid mixer shall be a J.L. Wingert Co., Neptune Chemical Pump Co., Liquid Metronics Inc., or equal, complete with 1/20, 120V, single-phase, totally enclosed motor, angle mount, 28-inch stainless steel shaft with 8 feet rubber covered, 3-wire, 18 gage cord and plug set factory wired.
   2. **CHEMICAL FEEDING EQUIPMENT**
   3. Shot feeder shall be constructed of 10 gage steel. Working pressure is 200 psi maximum at 200 degrees F. Capacity shall be 5 gallons minimum for closed loop application. Installation shall be furnished with piping, valves, and fittings. Fill opening shall be 3 ½-inches. Fill cap shall close threaded. Shot feeder shall be furnished with a bottom drain. Shot feeder shall be capable of accepting filter bag kit for side stream filter operation.
   4. Provide a filter pot feeder in bypass piping around chilled and/or hot water pump to control scales and corrosion in chilled/hot water system. Feeder shall be Neptune Chemical Pump Co., or equal. Provide a FTF-2DB for up to 200 gallon capacity; a FTF-5DB for up to 750-gallon capacity and greater. Install a 25-micron filter bag for the initial flushing and change to 1 micron for normal operation.
   5. **WATER TREATMENT**
5. Chemicals:
   1. Provide a one-year supply of water treatment chemicals. Formulations shall be as prescribed for the various systems specified. Formulations shall not contain any ingredients, which may be harmful to system materials of construction and shall not endanger the health or safety of persons coming into contact with the materials. MSDS shall be provided for each chemical furnished. System shall not be operated without benefit of chemical protection unless specified. Once initial passivation is achieved, any additional chemical necessary to recharge the system due to water loss shall be provided as required.
6. Special Water Treatment Programs:
7. For closed hot/chill water systems, scale and corrosion inhibition shall be achieved with a borate/nitrite formulation with a molybdenum additive. Control range shall be a minimum of 300 ppm sodium nitrite and 10 ppm molybdenum.
8. For closed hot loops where Aluminum metal is a component, scale and corrosion inhibitor shall be maintained at a range of 100- 150 PPM as Tannin, measured by a HACH handheld colorimeter (Model 890 or newer).
9. For closed hot/chill water systems in area where the use of molybdenum is prohibited, scale and corrosion inhibition shall be a minimum of 1000 ppm sodium nitrite.
10. For open recirculation system with make-up water containing less than 200 ppm total hardness, as expressed in CaCO3 equivalent. Scale and corrosion inhibition shall be provided with a non-acid formulation based on 6- 12 PPM phosphonate OP (Organo Phosphonate) test or 100-150 PPB of PTSA using a handheld PTSA tester.
11. Biological control shall be provided with a dual alternating biocide program. Both biocidal chemicals shall be liquid. Biocides shall be EPA approved in the state and locality designated for installation. One liquid biocide compound shall be methyl isothiazoline based. The second liquid biocide compound shall be stabilized liquid bromine based or stabilized bromine in tablet form.
12. The rate of bromine tablet or liquid bromine feed shall be controlled by an ORP (Oxidation reduction potential) sensor that is built-in on the cooling tower controller flow manifold piping. Initial set point for the ORP shall be 250 mV. It shall be adjusted to obtain an Active ATP (Adenosine Tri Phosphate) reading of less than 100 RLU (Relative Light Unit). Active ATP= Total ATP minus Free ATP.
13. In the event a complete make-up water analysis is not available, the local service representative of the water treatment service company shall designate type of chemical treatment most desirable. The treatment prescribed shall be based on local make-up water quality and the application of sound water treatment practice.
14. For steam boilers operation at less than 300 psig, scale and corrosion inhibition shall be provided with a liquid phosphonate and polymer compound that also contains a sludge conditioner. Control range shall be 15-30 ppm as expressed in OP (Organo Phosphonate) test. If Tannin chemistry is applied in place of phosphates or phosphonates, Tannin residual if applicable shall be 100-200 PPM. Oxygen pitting shall be controlled with a liquid catalyzed sodium sulfite compound. Control range is 30-60 ppm sulfite.
    1. **TEST EQUIPMENT**
    2. Provide necessary test equipment and reagents including a handheld Fluorometer to maintain chemicals in the control ranges specified. Test kits shall be furnished with carrying cases. The handheld fluorometer shall be a Turner Opticheck or equal.
    3. **WATER TREATMENT SERVICE PROGRAM**
    4. Selected water treatment company shall provide consulting services on a monthly basis for one year from the date of Substantial Completion. Services shall be provided by fully trained representatives of the water treatment company. Services provided shall include:
15. Installation and system start-up recommendations.
16. Initial water analysis and recommendations.
17. Training of operating personnel on proper feeding and control techniques.
18. Periodic field service and consulting meetings.
19. Log sheets and record forms.
20. Any required laboratory and technical assistance.
21. Electronic service reports shall include water meter readings and pictures of the water meter face plate.

**PART 3 – EXECUTION**

* 1. **INSTALLATION**
  2. Installation of water treatment equipment and startup shall be performed under the observation of a representative of the water treatment equipment supplier.
  3. Provide water treatment system as specified in this Section and of the type required for the treatment of water in the system for cooling tower, evaporative cooler, chiller, boiler, etc. Provide bleed-off as required and specified for cooling tower.
  4. On condenser water systems, water meter controller and chemical pump shall be mounted on a polypropylene panel. Mounted (outside or inside) on same panel shall be piping manifold to include chemical injection fitting and all other valves, piping, and fittings required for a complete installation.
  5. **PRE-OPERATIONAL CLEANING**

1. Provide assurance that no untreated water shall be circulated through heating and air conditioning system components for operation. Systems shall be flushed clean before operation. In the event untreated water causes contamination of the system, remove resulting scale or deposits from lines and equipment, and repair damage.
2. Provide chemical cleaning, flushing and charging. Notify the Project Inspector when system is ready for operation and filling with water.
3. Prior to operation, condenser water, chilled water, hot water, and steam systems shall be cleaned to remove oil, grease, and rust oxides by the following:
   1. Flood system with a solution containing cleaning compound.
   2. Circulate system at 150 to 180 degrees F for a period of not less than 12 hours and not in excess of 24 hours. If heat cannot be provided, dosage shall be doubled and circulated for two days.
   3. Cleaning solutions shall be drained and flushed with clean water until stable pH is provided. Refill with treated water to stabilize water in system.
   4. **PROTECTION**
4. Protect the Work of this Section until Substantial Completion.
   1. **CLEANUP**
5. Remove rubbish, debris, and waste materials and legally dispose of off the Project site.

END OF SECTION