

## SECTION 15456 - WATER TREATMENT

## PART 1 - GENERAL

## 1.1 DESCRIPTION OF WORK:

- A. Extent of water treatment system work required by this section is indicated on drawings and schedules and by requirements of this section, and includes necessary equipment, chemicals, and service for the following systems:
1. Condenser Water Systems
  2. Closed Hot Water Systems
  3. Closed Chilled Water Systems
  4. Steam Boiler Systems
  5. Water Conditioners
  6. Cleaning of Piping Systems
  7. Sterilization of Domestic Water System
- B. Provide chemicals and service program for a period of one year from start-up date of equipment, including the following:
1. Initial water analysis and recommendations.
  2. Systems start-up assistance.
  3. Training of operating personnel.
  4. Periodic field service and consultation.
  5. Customer report charts and log sheets.
  6. Laboratory technical assistance.

## 1.2 QUALITY ASSURANCE:

- A. Manufacturer's and Representative Qualifications. Firms regularly engaged in manufacture of water treatment equipment, chemical and service shall have been active in the field of industrial water treatment and whose products have been in satisfactory use in similar service for not less than 5 years, and shall have full-time service personnel located within the trading area of job site.
- B. Codes and Standards:
1. ASME Compliance: Construct softener tanks in accordance with ASME Boiler and Pressure Vessel Code, Section VIII, provide stamp and certification.
  2. UL Labels: Provide water conditioners ancillary electrical components, which have been listed and labeled by UL.
  3. NEMA Standards: Provide electrical controls and enclosures conforming to applicable standards of NEMA for environment where water conditioners are indicated.
  4. NSE Compliance: Construct and install water conditioners in accordance with NSF Standard 44 "Cation Exchange Water Softeners Relating to Supplementary Treatment of Potable Water."
  5. Chemical Standards: Provide only chemical products, which are acceptable under state and local public health and pollution control regulations.

### 1.3 SUBMITTALS:

- A. Product Data: Submit manufacturer's technical product including rated capacities of selected equipment clearly indicating water pressure drops, weights, installation and start-up instructions, and furnished specialties and accessories.
- B. Shop Drawings: Submit manufacturer's assembly-type shop drawings indicating dimensions, weight loadings, required clearances, and methods of assembly of components.
- C. Wiring Diagrams: Submit manufacturer's electrical requirements for power supply wiring to water treatment equipment. Submit manufacturer's ladder-type wiring diagrams for interlock and control wiring. Clearly differentiate between portions of wiring that are factory-installed and portions to be field-installed.
- D. Record Drawings: At project closeout, submit record drawings of installed systems products in accordance with requirements of Divisions 1 and 15.
- E. Maintenance Data: Submit maintenance data and parts list for each item of equipment, control, and accessory; including "trouble-shooting" maintenance guide. Include this data, product data, shop drawings, and wiring diagrams in maintenance manual, in accordance with requirements of Division 15.

### 1.4 DELIVERY, STORAGE AND HANDLING:

- A. Handle water treatment materials and components carefully to prevent damage, breaking, denting and scoring to materials and equipment. Deliver packaged units in original crates. Do not install damaged water treatment materials and components; remove from site and replace with new.
- B. Store water treatment materials and components in an environment satisfactory to prevent their damage by the elements.

### 1.5 EXTENDED MAINTENANCE SERVICES:

- A. Agreement to Maintain: Prior to time of final acceptance, submit four copies of "Agreement for continued Service and Maintenance" for water treatment system, for Owner's possible acceptance. Offer terms and conditions for furnishing chemicals and providing continued testing and servicing, and including replacement of materials and equipment, for one-year period with option for renewal of Agreement by Owner.

## PART 2 - PRODUCTS

### 2.1 SUPPLIERS:

- A. Suppliers: Subject to compliance with requirements, provide products by one of the following:
  - 1. Water Treatment System:
    - a. Summitt Labs
    - b. Mogul Div.
    - c. International Chemtex
    - d. Aqua Tech
  - 2. Water Conditioners and Filtering Equipment

- a. Columbia Water Conditioning Co.
  - b. Permutt
  - c. Culligan
  - d. US Filter
3. Filter Feeder:
- a. Neptune
4. Sand Filter
- a. Bruner
  - b. Pep
5. Solid Separator
- a. Griswold
  - b. Lakos

## 2.2 OPEN TYPE SYSTEMS:

- A. Provide an open system chemical feed and control system sized and equipped to chemically treat the raw makeup water available at the project site.
- B. Except as otherwise indicated, provide an open water treatment system of manufacturer's standard materials and components as indicated by published product information, and as recommended by manufacturer for application indicated.
- C. TOWER CONTROLLER:
- 1. Provide a pre-fabricated, pre-wired and pre-piped automatic tower control system to feed inhibitor and bleed solids in direct proportion to the bleed and/or evaporation of the cooling tower water system. The automatic control of biocide used to eliminate bio-fouling shall be a part of this controller.
  - 2. The controller shall be enclosed in a NEMA 1-R, rain-tight enclosure with brackets for mounting and shall have pad-locking hasp. The control door shall be hinged, and contain a large Lexan viewing window. Overriding and operating switches with indicating lamps, for the following functions, shall be mounted on the inside panel: Power, Flow, Inhibitor Pump Operation, Biocide Pump Operation, and Bleed Operation.
  - 3. The TDS control shall be of the solid state design. A fuse and fuse holder, 6inch linear reading TDS meter (0 to 5000 Micro Mho) and its controls shall be mounted on the inside panel of the controller. Inhibitor feed and bleed will be controlled by the TDS, set into the controller, by the operator. The TDS meter will allow the operator to continuously read the system TDS. The control point setting for the TDS will be independent from the monitoring feature of the controller, which will allow the operator to compare the system TDS to the control point setting, without disturbing the TDS control point setting. Both Chemical Feed and bleed are controlled with this equipment at the same time.
  - 4. An automatic biocide control shall be mounted on the inside panel of the controller. This control shall be capable of controlling the feeding of biocide automatically on a 1-7 day schedule. The biocide control shall incorporate a 0-90 minute solid state timer with a dial on the face of the biocide control panel to control the time the biocide pump will

operate. During the Biocide Cycle, the controller will automatically disconnect the TDS control from the system so as to permit the retention of the biocide in the tower water.

5. A pump rack shall be attached to the bottom of the tower controller and contain the following equipment: 1inch inline flow and bleed assembly, consisting of a pressure switch, used for flow control, TDS sensor with a removable probe, check valve, two chemical injection points and a bleed system, consisting of a flow control valve, and an electric bleed valve, sized to meet the requirements of the tower bleed.
6. Pumps shall be capable of adjusting their stroke during operation and be diaphragm operated. Pumps shall be designed for the purpose, head pressure and volume for which they are to operate which shall be the responsibility of the Water Treatment Contractor. All pumps shall have a flame retardant plastic housing and wetted components and shall be chemical resistant to the materials being pumped. The pumping head shall incorporate a pressure relief valve so that the chemical can be diverted back to the supply in the event of an overpressure. Pumps shall operate on 115v/60HZ.

OR

D. TOWER CONTROLLER:

1. Provide a pre-fabricated, pre-wired, and pre-piped automatic tower control system to feed inhibitor and bleed solids in direct proportion to the makeup of the cooling tower water system. The automatic control of biocide used to eliminate bio-fouling shall be a part of this controller.
2. The controller shall be enclosed in a NEMA 1-R, rain-tight enclosure with brackets for mounting and shall have padlocking hasp. The controller door shall be hinged, and contain a large Lexan viewing window. Overriding and operating switches with indicating lamps, for the following functions, shall be mounted on the inside panel: Power, Flow, Inhibitor Pump operation, Biocide Pump operation, and Bleed operation.
3. The TDS and Pulse control shall be of the solid state design. A fuse and fuse holder, 6inch linear reading TDS meter (0 to 5000 Micro Mho) and its controls shall be mounted on the inside panel of the controller. Bleed shall be controlled by the TDS set into the controller by the operator. The TDS meter will allow the operator to continuously read the system TDS. The control point setting for the TDS will be independent from the monitoring feature of the controller, which will allow the operator to compare the system TDS to the control point wetting without disturbing the TDS control point setting. The PULSE CONTROL is a 0 - 90 second solid state timer with a dial on the face of the TDS controller. When the pulse timer receives a pulse from the tower makeup water meter, it will operate the inhibitor pump for the time set into it by the operator.
4. The water meter shall be a contact-output type water meter, designed to deliver an electronic signal when a specific volume of water passes through the meter, and shall be installed in the water makeup line to the cooling tower. The meter shall be a \_\_\_ inch meter, with a magnetic drive hermetically sealed register, and shall meet the AWWA Standard for water meters. Gallons per pulse shall be the responsibility of the Water Treatment Contractor.
5. An automatic biocide control shall be mounted on the inside panel of the controller. This control shall be capable of controlling the feeding of biocide automatically on a 1 - 7 day schedule. The biocide control shall incorporate a 0 - 90 minute solid state timer with a dial on the face of the biocide control panel to control the time the biocide pump will operate. During the Biocide Cycle, the controller will automatically disconnect the

TDS control from the system so as to permit the retention of the biocide in the tower water.

6. A pump rack shall be attached to the bottom of the tower controller and contain the following equipment: 1inch inline flow and bleed assembly, consisting of a pressure switch, used for flow control, TDS sensor with a removable probe, check valve, two chemical injection points and a bleed system, consisting of a flow control valve, and an electric bleed valve, sized to meet the requirements of the tower bleed.
7. Pumps shall be capable of adjusting their stroke during operation and be diaphragm operated. Pumps shall be designed for the purpose, head pressure and volume for which they are to operate which shall be the responsibility of the Water Treatment Contractor. All pumps shall have a flame retardant plastic housing and wetted components and shall be chemical resistant to the materials being pumped. The pumping head shall incorporate a pressure relief valve so that the chemical can be diverted back to the supply in the event of an overpressure. Pumps shall operate on 115v/60HZ.

OR

E. TOWER CONTROLLER:

1. Provide a pre-fabricated tower control system designed to feed inhibitor and solids in direct proportion to the bleed and/or evaporation of the cooling tower water system for use on outdoor towers. The TDS control shall be of solid state design, enclosed in a NEMA 12-X enclosure complete with hinged Lexan door, pad locking hasp, eight-foot power cord with molded plug and a duplex receptacle for bleed valve.
2. Electrode shall be temperature-compensated, 3/4inch NPT screw type, with eight foot electrode cord and quick electric disconnect connector.
3. A biocide feed attachment shall be supplied by the water treatment contractor and installed by the mechanical contractor for attachment to the side of the cooling tower, so that a liquid biocide can be added on a regular basis to the tower from the outside of the tower.
4. Provide a 1/2inch weatherproof 115v/60 HZ solenoid valve and a 1/2inch flow control valve for the tower bleed.
5. A crystal dry type chemical feeder shall be provided by the water treatment contractor for installation by the mechanical contractor, in the makeup water line to the cooling tower. The feeder shall be designed and sized to supply chemical to the tower as it is called for.
6. Protection of the chemical feeder from freezing shall be provided for by the mechanical contractor if required.

F. EVAPORATIVE SECTION CONTROLLER:

1. Provide a pre-fabricated air washer chemical feed and control system, to bleed solids and feed chemicals in direct proportion to the evaporation and bleed of the evaporative coolers.
2. All of the electronic control equipment shall be mounted in a NEMA raintight enclosure. The controller shall incorporate side brackets for mounting and shall incorporate a Lexan window mounted in the cabinet door and shall have pad locking hasp.

3. The TDS control shall be of the solid-state design with a submersible sensor for measuring TDS. A fuse, fuse holder, an 6inch linear reading meter (2 scale, 0 - 5000 Micro Mho) and its controls shall be mounted in the controller and will allow the operator to continuously read the system TDS. The control point setting for the TDS will be independent from the monitoring feature of the controller, which will allow the operator to compare the system TDS to the control point TDS setting without disturbing the control point setting.
4. Provide a 1/2inch weatherproof solenoid valve and 1/2inch flow control valve for field installation.
5. A crystal dry type chemical feeder shall be provided by the water treatment contractor for installation by the mechanical contractor, the water makeup water line to the air washer. The feeder shall be designed and sized to supply chemical to the tower as it is called for.
6. Electrical requirements for the control system shall be 115v/60 HZ/3 amp.

G. CORPORATION STOP:

1. Provide a 3/4inch NPT CPVC Corporation stop for injection of chemicals into the main stream condenser water piping.

H. SOLIDS SEPARATOR:

1. Provide and install, as shown on the drawings, a [ ] inch diameter automatic solids separator to remove suspended matter from the recirculating tower water by centrifugal action.
2. The separator shall be capable of removing 98percent of the suspended particles larger than 45 microns with a specific gravity no greater than 2.6 from [ ] gpm of the water passing through it. Pressure drop through the separator shall be no higher than 9 psig.
3. A 3/4inch motorized weatherproof ball valve 120/60HZ/1 amp., with a programmable solid state timing control, shall be provided to automatically purge collected solids from the bottom of the separator. The timer control cycle shall be adjustable between 1 - 24 hours and the length of time that the valve shall be open will be adjustable between 5 - 90 seconds.

I. SAND FILTER:

1. Provide an automatic sand filter for removing contaminates from the cooling tower water. The filter shall consist of a 304 stainless steel filter tank complete with pressure gauge and automatic air vent. Backwash shall be automatic, utilizing source water for backwash and will be initiated by pressure differential. The control valve shall be a multiport directional control valve with backwash timer and pressure differential switch.
2. Media shall remove 90percent by volume of the suspended solids, 10 microns and larger.
3. The Control Box shall be NEMA 3R with thermal overload protection. A stepdown transformer will be supplied to convert power to 110 volt [ ] for controls, and motor starter. The complete unit shall be skid mounted on a steel channel skid.

### 2.3 CLOSED SYSTEMS:

- A. Provide a closed system chemical feed and control system sized and equipped to treat the raw makeup water available at the project site.
- B. Except as otherwise indicated, provide closed water treatment system of manufacturer's standard materials and components as indicated by published product information, and as recommended by manufacturer for application indicated.
- C. FILTER FEEDER:
  - 1. Provide, as shown on the drawings, a Filter Feeder and install it in a by-pass loop around the circulating pump of each closed system for the purpose of introducing special chemicals and cleaning the system water. The Filter Feeder shall consist of a steel tank designed for operation 250 degree water at 100 psi. A 3-1/2inch quick opening cap with "0" ring seat shall be provided on the top of the filter to add chemical and filter media. 1-1/2inch cubic feet of filter media, consisting of crushed rock, pea gravel, sand and anthracite shall be installed in the filter as directed by the manufacturer. The back wash flow rate for the filter shall be no more than 4 gpm. All interconnecting face piping shall be 3/4inch, pre-piped and supplied with the filter feeder.
- D. CLOTH BAG FILTER:
  - 1. Provide a 5 Gallon Chemical Pot Feeder with a special Bag Filter Adapter and five replacement bag filters. The pot feeder shall be installed in a by-pass loop around the circulating pump of each closed system, as shown on the drawings, for the purpose of introducing special chemicals and cleaning of the system water. A 3-1/2inch quick opening cap with "0" ring seat shall be provided on the top of the pot feeder to add chemical and for changing the filter bag.
- E. BY-PASS FEEDER:
  - 1. Provide a By-Pass Feeder for adding chemical to the closed water system. The Feeder shall have two 3/4inch NPT female pipe connections, and a 3-1/2inch quick top opening cap, with "0" ring seat. Capacity of the Feeder shall be [ ] gallons, capable of operating at 250 psig and at a temperature up to 212 degrees F. The by-Pass feeder shall be mounted no higher from the floor than 48 inches.
- F. GLYCOL FEEDER:
  - 1. Provide Glycol Feed System consisting of a 50 gallon polyethylene tank with a removable polyethylene tank cover. A 1/2inch suction and underdrain system, with hose bib, for draining the tank, and a pump shut off valve. The tank shall be supported by four steel legs with foot pads and the pump mounted under, for positive suction, as an integral part of the tank.
  - 2. The control cabinet shall be a NEMA 1 enclosure with Lexan viewing window mounted in the cabinet door. The following components shall be mounted on the inside panel: Low liquid level alarm light, low liquid level alarm silencer switch, pump test switch and, pump operating, indicating light. A 0 - 60 psi system pressure gauge. An adjustable drum low level sensor shall prevent the positive displacement pump from operating when the tank liquid level is low and shall also audibly sound an alarm when tank level is low. In addition, two extra normally open dry contacts shall be provided for remote

low tank level warning alarm. A 3 - 35 psi adjustable pressure switch shall control the system pressure.

3. The pump shall be an Oberdorfer or approved equivalent, all bronze, rotary gear pump with a 1/2 HP 1725 rpm motor mounted integrally with the pump. The pump shall be designed to produce 1.8 gpm at 40 psig. Electrical characteristic: 120 v/60 HZ/1phase/1/3 HP.
4. The glycol Feeder discharge shall consist of a 3/4inch check valve, 3/4inch threaded female "T", for connecting the Glycol Feeder to the system piping, and a Watts pressure relief valve set at 50 psig, which will dump any closed system over pressure, back into the Glycol Mixing Tank.

G. GLYCOL TRANSFER PUMP:

1. Provide a Hand-Operated Rotary Transfer Pump with 8 feet of 1 inch hose and a non-sparking 3/4inch nozzle for the transferring of glycol from the glycol container to the glycol feed tank. The pump shall have a 1 inch telescoping suction pipe, and bung adapter with 2 inch thread.

2.4 STEAM BOILERS:

- A. Provide system sized and equipped to treat raw water available at project site and to maintain the following characteristics of water in the steam boiler (tested values for boiler operation):

1. Hardness:0.0
2. Iron:0.0
3. Silica: 60 ppm or less.
4. Total Dissolved solids (TDS): 1500-1700 ppm
5. pH: 10.5 or above.

- B. Except as otherwise indicated, provide steam boiler water treatment system of manufacturer's standard materials and components as indicated by published product information, and as recommended by manufacturer for application indicated.

C. WATER SOFTENER:

1. Provide water softener for the steam boiler feedwater system, based on feedwater makeup requirements of the steam boiler.

D. SHOT FEEDER/POT FEEDER:

1. Shot Feeder: Provide one, 2 Gal. One Shot Pot Feeder for each system, boiler. The one shot feeder shall be installed on the by-pass line of the steam boiler feed water line, no higher than 48inches above the floor, for the purpose of introducing special chemicals to the steam boiler as they are needed. The one shot feeder shall be 2-gal. capacity, constructed of 11 gauge steel with 3/4inch diam. with a quick opening cap and "O" ring seals rated for 200 psi and temperatures of 212 degrees F.

E. STEAM BOILER CHEMICAL FEED CONTROL SYSTEM:

1. Provide the following type of Steam Boiler Chemical Feedwater control system:
  - a. Deaerator Chemical Feed: Provide one Simplex pump package consisting of a diaphragm type pump with internal relief valve. The pump shall be mounted on a 55 [ ] gallon polyethylene tank with steel legs. An agitator with a stainless steel

shaft shall be mounted on the tank. The pump shall be capable of pumping against 75 psi at a flow rate of 6 gallons per day. Both the pump and agitator will operate with 115 volts, 60 cycles.

- b. Water Meter: Provide a [ ] cast bronze electric contacting water meter. Water meter shall be installed in the cold water make-up line to the Deaerator feed water tank. The water meter shall send electric impulses to the automatic pump controller. Meter shall be totalizing-type, 5 digit times a constant, with a sweep pointer.
- c. Pump Controller: The pump controller shall store counts from the electric contacting water meter. When the prescribed number of gallons of feed water has been used, the controller will operate the chemical feed pump, feeding the chemical to the deaerator for a preset prescribed time. The pump timer shall have a 0 to 9 minute timer.

2. Provide the following type of Steam Boiler Chemical Feed System:

- a. Pump Package: The chemical feed tank shall be a 55 gallon polyethylene tank, with hinged lid, steel tank support frame with legs and agitator bracket. The pump shall be mounted under the tank for positive suction.

The pump shall be a duplex diaphragm positive displacement type with micrometer dial, adjustable while the pump is running through 100percent of its range. It shall have a cast iron body and the pump shall be capable of pumping 3 gph at 400 psi and operating at [115v/60hz] [ ]. The motor housing shall be TENV with thermal overload.

Chemical for each boiler shall be fed directly into the boiler steam drum.

- b. Boiler Chemical Controller: Provide prefabricated boiler chemical feed system to add boiler chemicals to one or more steam boilers, based on the boiler feed water requirements of each boiler.

The controller shall be self-contained in a NEMA rain-tight, wall mounted, enclosure, incorporate side brackets for mounting and shall have a padlocking hasp. The controller door shall be hinged, and contain a large Lexan viewing window. Overriding and operating switches with indicating lamps, for the following functions, shall be mounted on the inside control panel: On and Off power switch with light. Indicating lights and switches for manual operating of chemical feed pump for Boiler No. 1 and Boiler No. 2 chemical feed. Automatic and manual operation switch for agitator. Control for the above controller shall be a dry auxiliary contact on each of the boiler water level controllers. Power will be 116v/60Hz/10 amp.

- c. Agitator: The agitator shall be clamp mounted with a stainless steel shaft and prop. Power will be 115v/60 Hz.
- d. Valves: Two 1/4inch NPT high temperature Asco solenoid valves shall be supplied as shown on the drawing. Power 115v/60 Hz.

F. BOILER CHEMICAL FEED SYSTEM PUMP PACKAGE:

1. Provide the following type of Steam Boiler Chemical Feed System:

- a. **CHEMICAL FEED PUMP PACKAGE:** The chemical feed tank shall be a 55 gallon polyethylene tank, with hinged lid. A steel frame tank support, with legs and agitator bracket, shall be supplied. A slide mount pump rack for each boiler chemical feed pump shall be supplied. A side mount pump rack for each boiler chemical feed pump shall be mounted adjacent to the tank stand with the pumps mounted on the rack. The tank shall incorporate a drain valve with a suction valve for each pump.
- b. **AGITATOR:** A 1/4 HP, 115 VAC agitator with a stainless steel shaft and propeller shall be mounted on the chemical tank agitator support bracket and shall be controlled by the chemical feed controller.
- c. **PUMP:** Provide two [ ] simplex positive displacement metering pumps. (115 VAC with 230 feet of head pressure at 1 gph. Pump motor housings shall be TENV with thermal overload protection. The pump drives shall be totally enclosed with no exposed moving parts and shall have a micrometer dial for adjusting the pumping capacity throughout it's full pumping range with an internal pressure relief valve built into each pump. Materials of construction for wetted ends shall be stainless steel with stainless steel check balls. The pump discharges shall be 1/4inch NPT to allow for easy assembly to the boiler. The pumps shall be controlled by the Boiler Chemical Controller. A suction valve and strainer shall be provided with each pump.
- d. **CONTROLLER:** The controller shall be self-contained in a NEMA 4, wall mounted, enclosure. Overriding and operating switches with indicating lamps, for the following functions, shall be mounted on the face of the controller.
- 1) Power switch, and indicating light.
  - 2) Agitator switch: HAND-OFF-AUTOMATIC with indicating light.
  - 3) Boiler operating switches (Boiler 1,2,&3): HAND-OFF-AUTOMATIC with indicating lights.
  - 4) Three pump timer controls (0 to 6 minutes)
- The controller shall provide a 6 foot power cord and receptacle on the bottom of the controller for the agitator and boiler chemical feed pump. Power for the controller, shall be 115 VAC/60 HZ 10 AMP.
- Control for the chemical controller shall be an auxiliary dry contact switch mounted on the boiler feedwater pumps, so that when a coiler calls for feed water, it will also start the boiler chemical feed pumps and open the valve for that boiler's chemical feed pump high temp solenoid valve.
- e. **Deaerator Chemical Feed Package:** One 55 gallon polyethylene tank with hinged lid, agitator and pump mounted on lid with polyethylene floating cover, on inside.
- 1) One 55 gallon polyethylene tank, with hinged lid and polyethylene floating cover.
  - 2) One agitator, with mounting bracket. 115 VAC.
  - 3) One positive displacement electronic metering pump (115 v. 60 Hz) with 230 feet head pressure @ 15 gpd. Pump to include suction and discharge valves, with foot valve and injection valve. Materials of construction for wetted end shall be PVC, with ceramic balls. Output volume of the pump shall be adjustable while pump is in operation from zero to maximum

capacity. Pump shall be designed for the purpose, head pressure and volume for which is to operate, and be the responsibility of the water treatment contractor.

Volume adjustment shall be readily accessible dial knobs. One for changing stroke length and the other for changing stroke frequency. The pump drive shall be totally enclosed with no exposed moving parts. A solid state electronic pulser shall be fully encapsulated with no exposed printed circuits. Electronics shall be housed in a chemical resistant enclosure. Pump shall automatically stop pulsating when the discharge pressure exceeds pump pressure rating by not more than 35percent.

Chemical pump valves, shall be ball type, with ceramic balls seating on a combination valve seat and seal ring. Pump head, fittings and connections at the pump head shall be PVC. A foot valve with integral one piece strainer shall be provided for the suction line, and an injection check/back pressure valve with 1/2inch NPT male connection for the injection point shall be provided.

- f. Pulse Timer: One pulse timer, designed to accept a signal from a water meter, and operate the deaerator chemical feed pump for a period of 0 to 10 minutes. The pumps feeder shall be housed in a 9" x 5-1/5" NEMA-1 high impact resistant gray, glass-filled polycarbonate cabinet, for wall mounting behind the deaerator chemical package. The package shall have a light on the face of the controller, which will indicate when power is applied to the deaerator chemical package. The package shall have a light on the face of the controller, which will indicate when power is applied to the deaerator chemical feed pump. To check operation, a momentary push button switch shall be mounted on the face of the controller, to substitute for the switch closure of the water meter, or auxiliary contact. The controller shall include a six foot power cord with a molded plug, for inserting into a 120 VAC wall socket. the controller shall be capable of switching 156 amp. at 125 VAC (resistive load). Power consumption is 7VA at 120VAC.

#### G. BOILER SKIMMER BLOWDOWN SYSTEM:

- 1. Each steam boiler shall be supplied with a skimmer blowdown control, consisting of:
  - a. One - Steam Boiler Automatic Timed Sample Method Skimmer Blowdown Controller, mounted in a NEMA Type 1 enclosure with Lexan viewing window and padlocking hasp.
  - b. One – 1inch NPT high temperature in-line type electrode assembly.
  - c. One - 1/2inch NPT 250 psig., motorized blowdown ball valve with carbon steel body, 316 stainless steel ball and stem, and a Worcester actuator. 115v/60Hz.

#### H. BOILER SAMPLE WATER COOLER:

- 1. Each Steam Boiler shall be supplied with a Sample Water Cooler to cool water samples down for safe and effective after sample collection. One water Sample Cooler for each steam boiler shall be supplied, rating of 200 psig and steam coil rated at 1,500 psig. The water sampler shall be capable of delivering .3 gpm of 600 degrees F cooled sample water with an exit temperature of 100 degrees F. Proper valves on sample inlet and cooling water inlet plus coil sample outlet and shell outlet will be supplied by mechanical contractor.

## I. BOILER WATER TEST KIT:

1. Provide boiler test kits, including spare reagents, or as recommended by the boiler water treatment contractor for determining water conditions of the boiler makeup water, boiler water and condensate water systems.

## J. BOILER CHEMICALS:

1. Provide one year supply of Steam Boiler and Condensate chemicals, as recommended by the boiler water treatment contractor.

## 2.5 WATER CONDITIONERS:

## A. COMMERCIAL WATER SOFTENER (STEEL TANKS):

1. Provide a single vertical tank as specified below with a [ ] inch side shell and [ ] inch barrel. The tank shall be of the vertical down flow pressure type with automatic controls to operate on the sodium cycle. The influent water has a hardness of [ ] grains per gallon. The system shall be capable of delivering soft water at [ ] gpm continuously with a pressure drop not to exceed 15 psig. The influent and effluent face piping and valves shall be [ ] inches in size. The mineral tanks shall be constructed of low quality carbon steel, having an operating pressure of 125 psig and hydrostatic tested at a pressure of 50 percent in excess of the operating pressure.
  - a. ASME Compliance: Construct softener tanks in accordance with ASME Boiler and Pressure Vessel Code, Section VIII. Provide stamp and certification.
  - b. NSF Compliance: Construct and install water conditioners in accordance with NSF Standard 44 "Cation Exchange Water Softeners Relating to Supplementary Treatment of Potable Water."
  - c. Mineral Standard: Provide mineral products acceptable under state and local public health control regulations.
  - d. Tanks Less Than 20inch Diameter: Provide two 4inch diameter (or 4inch x 6inch elliptical) hand-holes, one in top head and one in lower side shell.

OR

Tanks 24inch Diameter and Larger: Provide an 11inch x 15inch manhole, in the top head. The tank side shall be double butt welded with no un-welded or open seams on the interior of the tank. The tank shall also be provided with two lifting lugs to facilitate the handling and positioning of the equipment.

- e. Support Legs: Construct legs of structural steel angle with foot pads. The legs shall be designed to properly support the softener tank under dynamic loading. Stirrup legs will be unacceptable.
- f. Finish: The tank shall be internally sand blasted and lined with a phenolic epoxy, applied eight to ten mils thick. The tank shall be externally painted with a rust inhibiting primer 2-3 mils dry film thickness with an enamel overcoat.
- g. Freeboard: Provide minimum freeboard of 50 percent of the mineral bed depth to allow for adequate resin expansion during backwash.

2. Upper Distribution: The tank shall be equipped with a "Schedule 80 PVC upper distributor sized to match the face piping of the softener. The distributor design shall be a 4-point splash dome system, capable of distributing the water evenly over the resin bed.
3. Lower Distribution: The tank shall be equipped with a "Schedule 80 PVC header/lateral lower distributor sized to match the face piping of the softener. The equally spaced laterals shall have slot openings of 0.01inch. The distribution system shall be imbedded in a 9inch layer of washed 1/4inch x 1/8inch gravel to support the resin bed, with a 3inch layer of coarse silica sand on top. The mechanical Contractor shall be responsible for installing the support gravel and sand under the supervision of the Water Softener Manufacturer.
4. Controls: The system controls shall have adjustable duration of the various steps in regeneration and shall allow for push button start, as well as complete manual override operations. Softener regeneration shall be initiated by:
  - a. One of two electronic register head water meters, that will produce an electrical signal to indicate need for regeneration upon reaching hand set gallonage. Design so signal will continue until automatically reset. Meter shall be capable of indicating rate of flow and total flow.

OR

One single water meter in a common outlet header, that will automatically regenerate each softener at a pre-set gallonage and will diver water flow to the other unit. Meter shall be capable of indicating rate of flow and total flow.

- b. Provide electrical lockouts on multiple units to prevent more than one softener from regenerating at any one time.

OR

An electric time clock, which will initiate regeneration at any hour of day and any day of the week.

5. Main operating Valve: Provide industrial automatic multi-port diaphragm type, slow opening and closing control valve free of water hammer. The valve shall be diaphragm powered and hydraulically operated with a position indicator to indicate position of main operating valve. Dissimilar metals shall be isolated within the valve. Provide a valve that requires no special tools for service. Equip valve with internal automatic self adjusting brine injector to draw brine and rinse at constant rate independent of pressure. Provide single units with internal automatic by-pass of untreated water during regeneration.
6. Five independent Aqua-Matic Series 420 diaphragm valves for regeneration, shall be provided. Diaphragm valves are to be constructed of cast iron with a 125 psig rating. The valves shall be hydraulically powered, having an upper and lower chamber for power opening and closing, and shall not utilize springs in their operation.
7. Mineral Standards: Provide mineral products acceptable under state and local public health control regulations.
  - a. The softener shall be provide with [ ] cubic feet of Purolite C-100 cation exchange resin, having a minimum exchange capacity of 30,000 grains when regenerated with 15 lbs. of salt per cubic foot. The media shall be of proper

particle size (not more than 4percent through 40 mesh U.S. standard screens, wet screening), and will contain no agglomerates, shells, plates, or other shapes which might interfere with the normal function of the water softeners. The media shall be installed in the field by the mechanical contractor, under the supervision of the softener manufacturer.

8. Brine System: Provide a single brine measuring and dry salt storage tank with salt platform sufficiently sized for at least 4 regenerations at full salting. Construct tank of 3/16inch thick fiberglass or 3/8inch thick molded polyethylene with cover. Equip brine tank with float-operated plastic fitted brine valve for automatic control of brine withdrawn and fresh water refill.
9. Accessories: Provide the following:
  - a. Pressure gauges for hard water inlet and soft water outlet.
  - b. Sampling cocks for hard water inlet and soft water outlet for each tank.
  - c. Provide complete water testing set for hardness.

**B. COMMERCIAL WATER SOFTENER (FIBERGLASS TANKS):**

1. General: Provide a single vertical tank as specified below, with a [ ] inch by [ ] inch diameter mineral tank. The tank shall be of the vertical down flow pressure type with automatic controls to operate on the sodium cycle. The influent water has a hardness of [ ] grains per gallon. The system shall be capable of delivering soft water at [ ] gpm continuously with a pressure drop not to exceed 15 psig. The influent and effluent piping and valves shall be [ ] inches in size. The mineral tanks shall be of one piece construction throughout, with no seams, no welds, and no joints. The tank shall have an operating pressure of 150 psig at 120 degrees F.
  - a. NSF Compliance: Construct and install water conditioners in accordance with NSF Standard 44 "Cation Exchange Water Softeners Relating to Supplementary Treatment of Potable Water."
  - b. Mineral Standards: Provide mineral products acceptable under state and local public health control regulations.
  - c. Freeboard: Provide minimum freeboard of 50 percent of the mineral bed depth to allow for adequate resin expansion during backwash.
2. Controls: The system controls shall have adjustable duration of the various steps in regeneration and shall allow for push button start, as well as complete manual override operations. Softener regeneration shall be initiated by:
  - a. One of two electronic register head water meters, that will produce an electrical signal to indicate need for regeneration upon reaching hand set gallonage. Design so signal will continue until reset. Meter shall be capable of indicating rate of flow and total flow.
    - 1) Provide electrical lockouts on multiple units to prevent more than one softener from regenerating at any one time.
  - b. One single water meter in a common outlet header, that will automatically regenerate each softener at pre-set gallonage and divert water flow to the other unit. Meter shall be capable of indicating rate of flow and total flow.

- 1) Provide electrical lockouts on multiple units to prevent more than one softener from regenerating at any one time.
3. Main Operating Valve: Provide a 5 cycle diaphragm control valve assembly, with no moving teflon internal "jam resistant" internal part.
4. Mineral Standards: Provide mineral products acceptable under state and local public health control regulations.
  - a. The softener shall be provided with [ ] cubic feet of Purolite C-100 cation exchange resin, having a minimum exchange capacity of 30,000 grains when regenerated with 15 lbs of salt per cubic foot. The tank shall be filled with proper particle size media (not more than 4 percent through 40 mesh U.S. standard screens, wet screening), and will contain no agglomerates, shells, plates, or other shapes which might interfere with the normal function of the water softeners.
5. Brine System: Provide a single brine measuring and dry salt storage tank sized for at least 4 regeneration at full salting. The brine tank shall be constructed from rigid polyethylene with a special built-in salt grid system and polyethylene cover. Equip brine tank with float-operated plastic fitted brine valve for automatic control of brine withdraw and fresh water refill.

## 2.6 FILTERING SYSTEM:

### A. COMMERCIAL FILTER:

1. Provide a single vertical tank with a [ ] inch barrel. The tank shall be of the vertical down flow pressure type with automatic controls to operate on:
  - a. Push button control.
  - b. Pressure differential.
  - c. Time clock.
  - d. Water meter.
2. The system shall be capable of delivering filtered water at [ ] gpm continuously with a pressure drop not to exceed 15 psig. The influent and effluent face piping and valves shall be [ ] inches in size. The filter media tanks shall be constructed of low quality carbon steel, having an operating pressure of 125 psig, and hydrostatically tested at a pressure of 50percent in excess of the operating pressure.
  - a. ASME Compliance: Construct filter tanks in accordance with ASME Boiler and Pressure Vessel Code, Section VIII. Provide stamp and certification.
  - b. NSF Compliance: Construct and install filters in accordance with NSF Standards, relating to supplementary treatment of potable water.
  - c. Mineral and Media Standards: Provide mineral products acceptable under state and local public health control regulations.
  - d. Tanks Less Than 20inch Diameter: Provide two 4inch diameter (or 4inch x 6inch elliptical) hand-holes, one in top head and one in lower side shell.

OR

Tanks 24inch Diameter and Larger: Provide and 11inch x 15inch manhole, in the top head. The tank side shall be double butt welded with no un-welded or open seams on the interior of the tank. The tank shall also be provided with two lifting lugs to facilitate the handling and positioning of the equipment.

- e. Finish: The tank shall be internally sand blasted and lined with a phenolic epoxy, applied eight to ten mils thick. The tank shall be externally painted with a rust inhibiting primer 2 - 3 mils dry film thickness with an enamel overcoat.
  - f. Freeboard: Provide minimum freeboard of 50% of the filter and mineral bed depth to allow for adequate expansion during backwash.
3. Upper Distribution: The tank shall be equipped with a "Schedule 80" PVC upper distributor sized to match the face piping of the softener. The distributor design shall be a 4-point splash dome system, capable of distributing the water evenly over the filter media.
  4. Lower Distribution: The tank shall be equipped with a "Schedule 80" PVC header/lateral lower distributor sized to match the face piping of the softener. The equally space laterals shall have slot openings of 0.01inch. The distribution system shall be imbedded in a 9inch layer of washed 1/4inch x 1/8inch gravel to support the filter media bed. The Mechanical Contractor shall be responsible for installing the support gravel and media under the supervision of the Filter Manufacturer.
  5. The system controls shall have adjustable duration of the various steps in backwashing, and shall allow for push button start, as well as complete manual override operations. The filter backwash shall be initiated by:
    - a. Push button control: Provide contacts on the filter controller for remote push button starting of the backwash cycle of the filter.

OR

Pressure Differential: Provide a differential pressure switch between the influent and the effluent of the filter, to start backwash cycle of the filter. The differential switch shall be rated at [ ] psig and have an adjustable differential of [ ] psig.

OR

Time Clock: Provide an electric time clock, which will initiate the backwash cycle of the filter.

Water Meter: Provide two electronic register head water meters, that will produce an electrical signal to indicate need for backwashing of the filter upon reaching a hand set gallonage. Design so signal will continue until automatically reset. Meter shall be capable of indicating rate of flow and total flow.

- 1) Provide electrical lockouts on multiple units to prevent more than one softener from backwashing at any one time.

OR

Water Meter: Provide one single water meter in a common outlet header, that will automatically backwash each softener at a pre-set gallonage and will divert water flow to the other unit. Meter shall be capable of indicating rate of flow and total flow.

- 1) Provide electrical lockouts on multiple units to prevent more than one softener from regenerating at any one time.
6. Main Operating Valve: Provide industrial automatic multi-port diaphragm type, slow opening and closing control valve free of water hammer. The valve shall be diaphragm powered and hydraulically operated with a position indicator to indicate position of main operating valve. Dissimilar metals shall be isolated within the valve. Provide a valve that requires no special tools for service. Provide single units with internal automatic bypass of untreated water during regeneration.
7. Five independent Aqua-Matic Series 420 diaphragm valves for media backwash, shall be provided. Diaphragm valves are to be constructed of cast iron with a 125 psig rating. The valves shall be hydraulically powered having an upper and lower chamber for power opening and closing, and shall not utilize springs in their operation.
8. Media Standards: Provide media products acceptable under state and local public health control regulations.
  - a. The filter shall be provided with [ ] cubic feet of [ ] filter media.
  - b. The filter media shall be installed in the field by the mechanical contractor, under the supervision of the manufacturer.
9. Accessories: Provide the following:
  - a. Pressure gauges for influent and effluent of filter.

### PART 3 - EXECUTION

#### 3.1 CLEANING OF PIPE LINES AND BOILERS:

- A. The water treatment contractor shall be responsible for furnishing the cleaning material and supervising the chemical cleaning of the chilled and/or heating piping.
- B. The system to be cleaned shall be filled with a solution of 10% by weight of a heavy duty alkaline liquid cleaner. The cleaner shall be capable for wetting and penetrating heavy soil deposits of oil or grease, and keeping these products in suspension, for removal through a Filter Feeder.
- C. The cleaning solution shall be circulated for a minimum of 8 hours, with the Filter Feeder being back-washed as required to remove solids which have been cleaned from the system.
- D. At the end of the cleaning period, the alkalinity in the system shall be reduced to the pH of the incoming raw water. The system shall then be chemically treated as specified. In no case shall the system being cleaned be left in an untreated condition for more than 8 hours.
- E. At the conclusion of the cleaning operation, the Water Treatment Contractor shall certify in writing that the system was cleaned as specified.

OR

- F. The Water Treatment Contractor shall be responsible for furnishing the cleaning material and supervising the chemical cleaning of the chilled and/or heating piping.

- G. The system to be cleaned shall be filled with a solution of 10 percent by weight of a heavy duty alkaline liquid cleaner. The cleaner shall be capable of wetting and penetrating heavy soil deposits of oil or grease, and keeping these products in suspension, for removal through flushing the system to drain.
- H. The cleaning solution shall be circulated for a minimum of 8 hours. At the end of the eight hours, the system shall be flushed to drain, and then refilled with fresh water, taking care to remove any entrapped air from the system.
- I. At the end of the cleaning period, the system shall be chemically treated as specified. In no case shall the system being cleaned be left in an untreated condition for more than 8 hours.
- J. At the conclusion of the cleaning operation, the Water Treatment Contractor shall certify in writing that the system was cleaned as specified.

### 3.2 CLEANING OF STEAM BOILERS:

- A. The Water Treatment Contractor shall be responsible for furnishing the cleaning material and supervising the chemical cleaning of the steam boilers.
- B. The boiler manhole/hand holes should first be opened and the boiler drum visually inspected for dirt. Any dirt should be removed by hand.
- C. With the manhole open, the boiler should be operated at a rolling boil with a heavy duty alkaline cleaner, capable of wetting and penetrating heavy soil deposits of oil or grease, and removing them from the system. The solution shall remain in the boiler for a period of 8 hours to assure good circulation and boil out.
- D. At the end of the boil out period, slowly cool the boiler. Completely drain and flush all internal parts of the boiler with a high pressure hose. Inspect all internal parts for cleanliness and freedom from oil and/or grease, and reinstall the manhole cover.
- E. At the end of the boil out, the boiler should be filled with fresh treated water and operated for 8 hours, with the condensate being wasted to drain.
- F. At the conclusion of the cleaning operation, the Water Treatment Contractor shall certify in writing that the boilers were cleaned as specified.

### 3.3 CLEANING OF OLD RUSTY SCALED HYDRONIC SYSTEMS:

- A. The Water Treatment Contractor shall be responsible for furnishing the cleaning material and supervising the chemical cleaning of the chilled and/or heating piping.
- B. A Filter Feeder shall be installed across the suction and pressure side of the circulated water system to be cleaned.
- C. The system to be cleaned shall be filled with a solution of 1000 ppm HEDP (phosphonate), and the pH adjusted between 7 to 8.5 to break up existing corrosion, which will be removed through the Filter Feeder, as outlined in B. above. This material should be continuously circulated throughout the system over a period of two weeks, and the Filter Feeder flushed as required, with the understanding that the chemical will also remove some new metal from the existing pipes.
- D. At the end of two weeks, the chemicals should be removed from the system, and the system flushed out with fresh city water and chemically treated with an inhibitor as specified. IN no case shall the system be left in an untreated condition for more than 8 hours.

- E. At the conclusion of the cleaning operation, the Water Treatment Contractor shall certify in writing that the system was cleaned as specified.

### 3.4 CHLORINATION:

- A. Acceptable products are:

Liquid Chlorine	[Fed. Spec. BB-C120B]
Hypochlorite	[Fed. Spec 0-C-114, Type 11, Grade B]
	[Fed. Spec. 0-S-60D, Grade A or B]

- B. After all pressure tests have been performed and piping has been flushed clean, the chemical treatment contractor shall be responsible for sterilizing the domestic water lines and fire protection lines.

- C. Chlorination procedures shall comply with local code and health department regulations.

1. The Mechanical Contractor shall inform the General Contractor that the water system is to be chlorinated 48 hours in advance, so that arrangements can be made for other trades not to use the water.
2. Before commencing the chlorination process, the Water Treatment Contractor shall post signs at each water fountain, and on each restroom door, stating that the water is not fit for drinking, and that the water is being chlorinated.
3. Introduce sufficient chlorine into the domestic water system to provide a dosage of not less than 50 parts per million at each faucet and valve. The chlorine solution shall then be allowed to stand for a minimum of 24 hours in the system.
4. At the end of 24 hours test shall be made for residual chlorine at the extreme end of the system from the point where chlorine was introduced. If chlorine residual is less than 10 ppm, the chlorination procedure shall be repeated.
5. Flush the system with a clean supply of water until the chlorine residual in the system is reduced to less than 1 ppm, or to the chlorine residual of the supply water. During the flushing, each faucet and valve in the system shall be opened and closed a minimum of 4 times.
6. After 24 hours, the water treatment representative will have samples taken and tested by an independent laboratory. The system must be free of bacteriological contamination. If the system is contaminated, it shall be re-chlorinated until a satisfactory test is made.
7. The Water Treatment Contractor shall write a letter, informing the Mechanical Contractor that the building has been successfully chlorinated, and that the water is fit for human consumption.

### 3.5 TESTING

- A. Closed Systems:

1. Provide a Nitrite "Drop Test" kit for determining the level of Nitrite or Molybdate in the closed system.

- B. Open Systems:

1. Provide the following test equipment and test kits:
2. One conductivity meter and three ranges covering 0 to 10,000 ppm/TDS and with automatic temperature compensation.
3. One "Drop Test" kit for determining the level of inhibitor being used in the cooling tower water.
4. One "Drop Test" for determining the chloride level of the water in the cooling tower and the makeup water.

C. Steam Boilers:

1. Provide a Testmaster Senior test cabinet, consisting of 4 automatic burettes in a wall-mounted cabinet with internal 115 volt light. Included with the cabinet shall be all components, glass ware, etc. necessary to test for pH, sulfite, P & M Alkalinity, phosphates, chloride, and hardness. One TDS conductivity meter with three ranges covering 0 to 10,000 ppm/TDS temperature compensated.
2. The test cabinet shall include an initial supply of all reagents needed to perform the above tests, with a supply of boiler log sheets on which to record the test results, and a hard back three ring binder with testing instructions.

3.6 COUPON RACKS:

A. Coupon Rack for Closed Systems:

1. Install as shown on the drawings two coupon holders between the low and high pressure of the circulating pump. The coupon holders shall be isolated with shut off valves for removing and inspecting the coupons.

When the system is ready for startup, the Water Treatment Contractor shall install two pre-weighted coupons, one copper, and the other steel in the above coupon holders, noting time and date. At the end of 90 days, the coupons shall be removed, noting the time and date, re-weighed, and inspected, with a report being sent to the mechanical contractor, for distribution to the proper people, showing the condition of the system being treated.

B. Coupon Rack for Open Systems:

1. Install as shown on the drawings a three station coupon rack, built to ASME specifications and as shown on the drawing, made from 3/4inch PVC Schedule 80 pipe. The coupon holders shall consist of nylon screw and nut for holding the coupon, PVC water inlet ball shut off valve, 3/4inch PVC pipe, and the coupon rack shall be pre-mounted on an unpainted plywood backboard.

When the system is ready for startup, the Water Treatment Contractor shall install three pre-weighted copper coupons in the above coupon holders, noting time and date. One coupon each, will be removed at the end of 60, 90, and 120 days, noting time and date, reweighed, and inspected, with a report being sent to the mechanical contractor, for distribution to the proper people showing the condition of the system being treated.

### 3.7 INSTALLATION:

- A. Coordination where installation of Water Treatment equipment in piping systems is required with the other work (plumbing and heating piping) as necessary to interface components of water treatment equipment. Provide installation instructions to those firms providing installation.
- B. Electrical Wiring: Install electrical devices furnished by manufacturer but not specified to be factory mounted. Furnish copy of manufacturer's wiring diagram submittal to Electrical Installer.
  - 1. Verify that electrical wiring installation is in accordance with manufacturer's submittal and installation requirements of Division 16 sections. Do not proceed with equipment start-up until wiring installation is acceptable to equipment installer.
  - 2. Install pressure gauges, valves, and controls furnished by manufacturer, in accordance with manufacturer's instructions.

### 3.8 INSTALLATION OF WATER CONDITIONERS:

- A. General: Install water conditioners where indicated, in accordance with equipment manufacturer's written instructions, and with recognized industry practices, to ensure that water conditioners comply with requirements and service for the intended purposes.
- B. Access: Provide access and service space around and over water conditioners as indicated, but in no case less than that recommended by manufacturer.
- C. Support: Provide 4inch high concrete pad under water conditioners. Plumb and level units.
- D. Electrical Wiring: Install electrical devices furnished by manufacturer but not specified to be factory-mounted. Furnish copy of manufacturer's wiring diagram submittal to Electrical Installer.
  - 1. Verify that electrical wiring installation in accordance with manufacturer's submittal and installation requirements of Division 16 sections. Do not proceed with equipment start-up until wiring installation is acceptable to equipment installer.
- E. Piping Connections: Provide shutoff valves and unions or flanges on water connections. Pipe drain to nearest floor drain of suitable size for the backwash of the softener.

### 3.9 INSPECTION:

- A. Examine areas and conditions under which water treatment systems are to be installed. Do not proceed with work until unsatisfactory conditions have been corrected in manner acceptable to Installer.

### 3.10 FIELD QUALITY CONTROL:

- A. Sample water softener effluent at one-week intervals after start-up for period of 3 weeks and prepare test report on the conditions of the water.

### 3.11 SYSTEM START-UP:

- A. The Water Treatment Supplier shall put the system into operation, and make adjustments necessary for proper operation.

- B. The Water Treatment Supplier shall provide a written report to the Division 15 Contractor indicating that the start-up has been completed and that all Water Treatment Equipment is operating properly.

3.12 TESTING AND CLEANING:

- A. Sample all treated water systems at one-week intervals after start-up for period of 4 weeks and prepare certified test report for each system being treated.
- B. Start-up test, and adjust water conditioners in presence of manufacturer's authorized representative. Operate units including regeneration, back washing, rinsing and flushing. Adjust unit to maintain required steady state effluent water quality.
- C. Cleaning: Clean factory-finished surfaces. Repair any marred or scratched surfaces with manufacturer's touch-up paint.

3.13 EXTRA STOCK:

- A. In addition to startup salt, furnish ten 80-lb bags of salt on a pallet and store where requested by Owner. Obtain a receipt from Owner for this salt.

3.14 CLOSEOUT PROCEDURES:

- A. Provide services of manufacturer's technical representative for one 8 hour day to instruct Owner's personnel in operation and maintenance of water treatment systems.
  - 1. Schedule training with Owner, provide at least 7 day notice to Contractor and Engineer of training date.

END OF SECTION 15456