

SECTION 22 3100 – DOMESTIC WATER SOFTENERS

PART 1 - GENERAL

1.1 SUMMARY

- A. Section Includes:
 - 1. Commercial water softeners.
 - 2. Chemicals.
 - 3. Water-testing sets.

1.2 ACTION SUBMITTALS

- A. Product Data: For each type of product indicated.
 - 1. Include construction details, material descriptions, dimensions of individual components and profiles, and finishes for water softeners.
 - 2. Include rated capacities, operating characteristics, electrical characteristics, and furnished specialties and accessories.
 - 3. Wiring Diagrams: For power, signal, and control wiring.

1.3 CLOSEOUT SUBMITTALS

- A. Field quality-control reports.
- B. Warranty.
- C. Operation and maintenance data.

1.4 MAINTENANCE MATERIAL SUBMITTALS

- A. Furnish extra materials that match products installed and that are packaged with protective covering for storage and identified with labels describing contents.
 - 1. Salt for Brine Tanks: Furnish in same form as and at least four times original load.
 - 2. Store salt on raised platform where directed by Owner. Do not store in contact with concrete floor.

1.5 QUALITY ASSURANCE

- A. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended application.
- B. ASME Compliance for Steel Tanks: Fabricate and label mineral tanks to comply with ASME Boiler and Pressure Vessel Code: Section VIII, Division 1, where indicated.

- C. UL Compliance: Fabricate and label water softeners to comply with UL 979, "Water Treatment Appliances."

1.6 WARRANTY

- A. Special Warranty: Manufacturer's standard form in which manufacturer agrees to repair or replace components of water softeners that fail in materials or workmanship within specified warranty period.
 - 1. Commercial Water Softeners, Warranty Period: From date of Substantial Completion.
 - a. Mineral & Brine Tanks: Five years.
 - b. System and Control Valve: One year.
- B. The universal warranty start date is defined in the front end documents.

PART 2 - PRODUCTS

2.1 COMMERCIAL WATER SOFTENERS

- A. Basis-of-Design Product: Subject to compliance with requirements, provide product indicated on Drawings or comparable product by one of the following:
 - 1. Culligan International Company.
 - 2. Ecodyne Water Treatment, Inc.
 - 3. Kinetico Incorporated.
 - 4. Marley
 - 5. WaterSoft; a division of Amtrol, Inc.
- B. Description: Factory-assembled, pressure-type water softener.
 - 1. Furnish and install a water softener to provide a zero soft water effluent as determined by an ASTM standard soap test method, when operated in accordance with operating instructions. Each unit shall be designed to provide X grains per tank maximum capacity of hardness reduction between regenerations at a maximum salt dosage of X lbs. salt. Each unit shall be capable of a continuous flow rate of X GPM with a pressure drop of 15 psi and a peak flow rate of X GPM with a pressure drop of 25 psi.
 - 2. The softener vessel(s) shall be designed for a working pressure of 150 psi and a temperature of 120 degrees F. A minimum freeboard volume of 50% shall be provided to assure adequate bed expansion during backwash. Vessel(s) shall be manufactured of fiberglass reinforced polyester (FRP). The exterior side shall be reinforced by a continuous roving glass filament overwrap of the same color as the vessel(s) shell. The vessel(s) shall be supported by a molded polypropylene structural base.
 - 3. The backwash distributor and soft water collector shall be of the hub-radial design and shall require only assembly of the riser pipe upon installation. The radials shall be designed with a higher density of slots at the outer ends to provide adequate distribution and collection of water away from the center of the tank. Internal piping material shall be constructed of PVC and/or ABS plastic. Systems shall have a single point distributor.
 - 4. The softener shall be provided with X cubic feet of high-capacity, non-phenolic resin per vessel(s) having a minimum exchange of capacity of X grains per cubic foot when regenerated with X lbs. of salt per cubic foot. The media shall be solid, of the proper

- particle size (not more than 4% through 40 mesh U.S. standard screen, wet screening) and shall contain no plates, shells, agglomerates or other shapes which might interfere with the normal function of the water softener.
5. The combination salt storage and brine measuring tank with cover shall be sized to hold X lbs. of salt. The tank shall be of rotationally molded rigid polyethylene. The brine tank shall be equipped with an elevated salt plate for the collection of brine and shall have a chamber to house a brine valve assembly. The brine valve assembly shall include an automatic air eliminator and safety float shut-off valve. It shall open automatically, to educt brine, close to prevent the entrance of air after the brine has been drawn, and permit refill of the tank with the correct amount of water. Brine dosage shall be controlled by the softener control valve through an adjustment on the clock timer. The system shall be designed to allow proper refilling regardless of the salt level in the tank.
 6. Controls: Fully automatic; factory wired and factory mounted on unit.
 - a. Adjustable duration of various regeneration steps.
 - b. Push-button start and complete manual operation.
 - c. Twin Alternating Control – The regeneration shall be controlled by a mechanically operated automatic reset water meter installed in the common soft water effluent line. Softeners shall be regenerated based on total gallons through the meter. An alternator shall be supplied to allow only one unit to be in regeneration or standby at a time while the other unit is in-service. This system shall provide a continuous supply of soft water. Indicating lights shall be provided to show which unit is in-service and which one is regenerating
 - d. Sequence of Operation: Multiport pilot-control valve automatically pressure-actuates main operating valve through steps of regeneration and return to service.
 - e. Pointer on pilot-control valve shall indicate cycle of operation.
 - f. Includes means of manual operation of pilot-control valve if power fails.
 7. Main Operating Valves: Industrial, automatic, multiport, diaphragm type with the following features:
 - a. X inch inlet and outlet connections
 - b. Constructed of lead-free brass.
 - c. Mechanically actuated, four position type to accomplish the regeneration steps of backwash, brine draw / slow rinse, fast rinse and brine tank refill.
 - d. The valve shall contain a fixed orifice eductor nozzle and self-adjusting backwash flow control.
 - e. Slow opening and closing, non-slam operation.
 - f. Diaphragm guiding on full perimeter from fully open to fully closed.
 - g. Self-adjusting, internal, automatic brine injector that draws brine and rinses at constant rate independent of pressure.
 - h. Sampling cocks for soft water.
 - i. Special tools are not required for service.
 8. Flow Control: Automatic, to control backwash and flush rates over wide variations in operating pressure; does not require field adjustments.
 - a. Demand-Initiated Control: Each mineral tank of twin mineral-tank unit is equipped with automatic-reset-head water meter that electrically activates cycle controllers to initiate regeneration at preset total in gallons. Head automatically resets to preset total in gallons for next service run. Electrical lockout prevents simultaneous regeneration of both tanks.

- 9. Factory-Installed Accessories:
 - a. Piping, valves, tubing, and drains.
 - b. Sampling cocks.
 - c. Main-operating-valve position indicators.
 - d. Water meters.

C. Capacities and Characteristics:

- 1. Water Analysis:
 - a. Hardness: X grains/gal.
 - b. Inlet Water Pressure: X psig
 - c. Water Temperature: X deg F
- 2. Continuous Service Flow Rate: X gpm at 15-psig pressure drop.
- 3. Peak Service Flow Rate: X gpm at 25-psig pressure drop.
- 4. Water Meter Size: X"
- 5. Manifold Pipe Size: X"
- 6. Water Consumption: X gal./day
- 7. Number of Mineral Tanks: Two.
- 8. Mineral Quantity, Each Tank: X cu. ft.
- 9. Mineral Exchange Capacity: X grains per cubic foot
- 10. Electrical Characteristics: 24 Volt
- 11. Salt Capacity: X lbs

2.2 CHEMICALS

- A. Mineral: High-capacity, sulfonated-polystyrene, ion-exchange resin that is stable over entire pH range with good resistance to bead fracture from attrition or shock.
 - 1. Exchange Capacity: X grains/cu. ft. of calcium carbonate of resin when regenerated with X lb of salt.
- B. Salt for Brine Tanks: High-purity sodium chloride, free of dirt and foreign material. Rock and granulated forms are unacceptable.

2.3 WATER-TESTING SETS

- A. Description: Manufacturer's standard water-hardness testing apparatus and chemicals with testing procedure instructions. Include metal container suitable for wall mounting.

PART 3 - EXECUTION

3.1 WATER SOFTENER INSTALLATION

- A. Equipment Mounting:
 - 1. Install commercial water softeners on cast-in-place concrete equipment base(s). Comply with requirements for equipment bases and foundations specified in Section 033000 "Cast-in-Place Concrete."

- B. Install brine lines and fittings furnished by equipment manufacturer but not specified to be factory installed.
- C. Prepare mineral-tank distribution system and underbed for minerals and place specified mineral into mineral tanks.
- D. Install water-testing sets mounted on wall, unless otherwise indicated, and near water softeners.
- E. Identify system components. Comply with requirements for identification specified in Section 220553 "Identification for Plumbing Piping and Equipment."

3.2 CONNECTIONS

- A. Comply with requirements for piping specified in Section 221116 "Domestic Water Piping." Drawings indicate general arrangement of piping, fittings, and specialties.
- B. Where piping is installed adjacent to equipment, allow space for service and maintenance of equipment.
- C. Install shutoff valves on raw-water inlet and soft-water outlet piping of each mineral tank.
 - 1. Metal general-duty valves are specified in Section 220523 "General-Duty Valves for Plumbing Piping."
 - 2. Exception: Water softeners with factory-installed shutoff valves at locations indicated.
- D. Install pressure gages on raw-water inlet and soft-water outlet piping of each mineral tank. Pressure gages are specified in Section 220519 "Meters and Gages for Plumbing Piping."
 - 1. Exception: Water softeners with factory-installed pressure gages at locations indicated.
- E. Install valved bypass in water piping around water softeners.
 - 1. Metal general-duty valves are specified in Section 220523 "General-Duty Valves for Plumbing Piping."
 - 2. Water piping is specified in Section 221116 "Domestic Water Piping."
- F. Install drains as indirect wastes to spill into open drains or over floor drains.

3.3 FIELD QUALITY CONTROL

- A. Tests and Inspections:
 - 1. Leak Test: After installation, charge system and test for leaks. Repair leaks and retest until no leaks exist.
 - 2. Operational Test: After electrical circuitry has been energized, start units to confirm proper unit operation.
 - 3. Test and adjust controls and safeties. Replace damaged and malfunctioning controls and equipment.
- B. Prepare test and inspection reports.

3.4 STARTUP SERVICE

- A. Engage a factory-authorized service representative to perform startup service.
 - 1. Complete installation and startup checks according to manufacturer's written instructions.
- B. Add water to brine tanks and fill with the following form of salt:
 - 1. Commercial Water Softeners: The media shall be solid, of the proper particle size (not more than 4% through 40 mesh U.S. standard screen, wet screening) and shall contain no plates, shells, agglomerates or other shapes which might interfere with the normal function of the water softener.
- C. Sample water softener effluent after startup and at three consecutive seven-day intervals (total of four samples), and prepare certified test reports for required water performance characteristics. Comply with the following:
 - 1. ASTM D 859, "Test Method for Silica in Water."
 - 2. ASTM D 1067, "Test Methods for Acidity or Alkalinity of Water."
 - 3. ASTM D 1068, "Test Methods for Iron in Water."
 - 4. ASTM D 1126, "Test Method for Hardness in Water."
 - 5. ASTM D 1129, "Terminology Relating to Water."
 - 6. ASTM D 3370, "Practices for Sampling Water from Closed Conduits."

3.5 DEMONSTRATION

- A. Train Owner's maintenance personnel to adjust, operate, and maintain water softeners.

END OF SECTION 22 3100