SECTION 22 31 16 – domestic water softeners

1. GENERAL
	* + 1. RELATED DOCUMENTS
				1. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.
				2. Specifications throughout all Divisions of the Project Manual are directly applicable to this Section, and this Section is directly applicable to them.
			2. SUMMARY
				1. Furnish and install a complete water softening system as scheduled on the Drawings including softener tanks, brining system, valves and any associated piping, controls and appurtenances.
			3. REFERENCE STANDARDS
				1. The latest published edition of a reference shall be applicable to this Project unless identified by a specific edition date.
				2. All reference amendments adopted prior to the effective date of this Contract shall be applicable to this Project.
				3. All materials, installation and workmanship shall comply with the applicable requirements and standards addressed within the following references:

2009 Edition of the International Plumbing Code

NOTE: BJC HEALTHCARE takes various exceptions to the International Plumbing Code and has adopted the more stringent requirements within the Uniform Plumbing Code. These exceptions are included within Project Specifications and/or Project Design Drawings.

ANSI/NSF Standard 61 - Drinking Water System Components - Health Effects

Underwriters Laboratories Listings.

2008 Edition of the National Electric Code

* + - 1. QUALITY ASSURANCE
				1. Manufacturer’s name and contact information shall be permanently marked on equipment.
				2. ASME Compliance for Steel Tanks: Fabricate and label mineral tanks to comply with ASME Boiler and Pressure Vessel Code: Section VIII.
				3. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, Article 100, by a testing agency acceptable to authorities having jurisdiction, and marked for intended use.
				4. Manufacturer Qualifications: Company shall have minimum three years documented experience specializing in manufacturing the products specified in this section.
				5. Installer Qualifications:

Company shall have minimum three years documented experience specializing in performing the Work of this section and be licensed by the AHJ to install water treatment equipment.

Installation of plumbing systems shall be performed by individuals licensed by the AHJ as a Journeyman or Master Plumber. Installation may be performed by Apprentice Plumbers provided they are registered with the AHJ and under direct supervision of a licensed plumber. All installation shall be supervised by a licensed Master Plumber.

* + - 1. SUBMITTALS
				1. Product Data:

Code and Standards compliance, manufacturer's data for pipe, fittings, valves, controls, water testing kits. and all furnished specialties, and accessories.

Include rated pressures, temperatures, capacities and operating characteristics.

Manufacturer’s installation instructions.

* + - * 1. Record Documents:

Shop Drawings: Include plans, elevations, sections, details, and connections to piping systems. Indicate size, profiles, and dimensional service requirements of system based on the specific components being installed.

Wiring Diagrams: Power, signal, and control wiring.

Manufacturer Certificates: Signed by manufacturers certifying that water softeners comply with requirements.

Maintenance service agreement.

Provide full written description of manufacturer’s warranty including special warranty specified in this Section.

Source and Site quality-control test reports.

* + - * 1. Operation and Maintenance Data:

Include manufacturer’s operation instructions, start-up data, trouble-shooting check lists.

Include system components manufacturer’s literature, servicing requirements, Record Documents, installation instructions, exploded assembly views, replacement part numbers and availability.

Include cleaning procedures, preventive maintenance schedule, preventive maintenance recommendations and procedures.

Identify place of purchase, location and contact numbers of service depot and technical support for each product installed.

* + - 1. DELIVERY, STORAGE and HANDLING
				1. All components and materials shall be new, undamaged, and free of rust.
				2. Accept water softeners and components on Site in factory packing. Inspect for damage. Comply with manufacturers rigging and installation instructions.
				3. Provide temporary protective coating and end plugs on valves not packaged within containers. Maintain in place until installation.
				4. Provide temporary end caps and closures on openings, connections, pipe and fittings. Maintain in place until installation.
				5. Protect piping systems from entry of foreign materials by temporary covers, completing sections of the work and isolating parts of completed system.
				6. Protect all components and materials that are to be installed within this project from exposure to rain, freezing temperatures and direct sunlight. EXCEPTION: Materials manufactured for exterior locations.
			2. EXTRA MATERIALS
				1. Furnish extra materials described below that match products installed and that are packaged with protective covering for storage and identified with labels describing contents.

Salt for Brine Tanks: Furnish same form as and at least four times original load, but not less than 200 pounds. Deliver on pallets. Store salt on raised platform where directed by Owner. Do not store in contact with concrete floor.

Water testing kit.

* + - 1. warranty
				1. The manufacturer shall guarantee that under actual operating conditions the effluent shall contain no greater than two GPG hardness as determined by soap test; that the loss of ion exchange resist through attrition during the first three years of operation shall not exceed 3 percent per year; that the resin shall not be washed out of the system during the service run or backwashing period; that the turbidity and color of the effluent, by reason of passing through the softener system, shall not be greater than the incoming water. The manufacturer shall also guarantee that any mechanical equipment which proves defective in workmanship or materials within one year after installation shall be replaced without charge to the Owner.
				2. Special Warranty: Manufacturer's standard form in which manufacturer agrees to repair or replace components of water softener that fail in materials or workmanship within specified warranty period.

Failures include, but are not limited to, the following:

Structural failures of mineral and brine tanks.

Faulty operation of controls.

Deterioration of metals, metal finishes, and other materials beyond normal use.

Attrition loss of resin exceeding 3 percent per year.

Mineral washed out of system during service run or backwashing period.

Effluent turbidity greater and color darker than incoming water.

Fouling of underdrain system, gravel, and resin, with turbidity or by dirt, rust, or scale from softener equipment or soft water, while operating according to manufacturer's written operating instructions.

Warranty Period: From date of Substantial Completion.

Mineral Tanks: Ten years.

Brine Tanks: Five years.

Controls: Five years.

Underdrain Systems: Ten years.

* + - 1. MAINTENANCE SERVICE
				1. Submit four copies of manufacturer's "Agreement for Continued Service and Maintenance," before Substantial Completion, for Owner's acceptance. Offer terms and conditions for furnishing chemicals and providing continued testing and servicing to include replacing materials and equipment. Include one-year term of agreement with option for one-year renewal.
1. PRODUCTS
	* + 1. GENERAL
				1. All materials shall meet or exceed all applicable referenced standards, federal, state and local requirements, and conform to codes and ordinances of authorities having jurisdiction.
			2. ACCEPTABLE MANUFACTURERS
				1. Unity (Bruner)
				2. Mueller
				3. Culligan
			3. WATER SOFTENER (WS)
				1. Furnish, install and place in operation an automatic water softening system with quantity of tanks, flow rates, cubic feet of NSF approved resinous zeolite, sizes and capacities as scheduled on Contract Drawings.
				2. Each unit shall operate at flow rates as scheduled on Contract Drawings with pressure loss not exceeding 15 psi during peak flow.
			4. SOFTENER TANKS
				1. Shall have 50 percent or more freeboard, 150 psi working pressure and 225 psi test pressure, with structural steel legs welded to the tanks. Tanks shall be ASME 100 psig code construction with stamp. Tanks shall be sandblasted to bare metal and internally lined with an NSF approved epoxy (PlaSite 7133 or accepted substitution). Exterior shall be coated with a rust preventative prime coat and a high drade solids, polyurethane enamel 1.25-1.5 mils DFT. Tanks shall have a manhole in the top head. The lower distribution system shall be 4-inch epoxy-coated header with galvanized laterals located to equally distribute flow and require only one layer of gravel. The upper distributor shall be baffle type.
			5. EXCHANGE RESIN
				1. Shall be NSF approved virgin high-capacity sulfonated polystyrene type stable over the entire pH range with good resistance to bead fracture from attrition or osmotic shock. Each cubic foot of resin shall be capable of removing 30,000 grains of hardness as calcium carbonate when regenerated with 15 pounds of sodium chloride and 20,000 grains of hardness as calcium carbonate when regenerated with 6 pounds of sodium chloride.
			6. BRINE SYSTEM
				1. Provide an automatic brine measuring tank system for volume control of brine withdrawal and brine refill from an external source. The system shall consist of a brine measuring tank with full cover and brine float assembly with brine transfer valve. Valves are pressure controlled through the action of a float-actuated pilot control valve. The tank shall be made form heavy-gauge fiberglass. The brine float assembly shall be diaphragm type fitted with a float-actuated pilot control valve (Clayton Model No. 122). The brine transfer valve shall be double-acting diaphragm type pressured open and closed. Brine shall be transferred by gravity or pressure pump system. Pump automatic controls to activate brine refill pump. Tank shall be have dimensions and capacity as scheduled on Contract Drawings.
			7. MAIN OPERATING VALVE
				1. Each softener shall have automatic diaphragm type valve nest, slow opening and closing and free of water hammer. The pressure-actuated valves shall move from one position to another without friction. There shall be no contact between dissimilar metals within the valves. Parts subject to wear shall be replaceable using common tools. The valve nest shall be assembled by manufactured of the softening equipment. The brine valve shall be equipped with an automatic self-adjusting brine injector to draw brine and rinse at a constant rate regardless of water pressure in the 30 to 100 psi range. Each valve nest shall have water sampling cocks and pressure gauges on the inlet and outlet. The operating valve system shall include header, service/regeneration valve and auxiliary service valves as sized on Contract Drawings.
			8. PIPING
				1. The main operating valve and manifold piping shall be factory assembled and shipped attached to the tanks. Piping shall be Type “L” copper. Solder shall contain no lead. Manifold piping shall be arranged with sufficient quantity of unions and flanges to allow removal of valves and servicing of the softener system equipment without the need to cut piping or disassemble more than three joints.
				2. Provide dielectric isolation device where copper lines connect to ferrous lines or equipment.
				3. Dielectric waterway fittings shall have zinc electroplated steel pipe body with LTHS high temperature stabilized polyolefin polymer liner, manufactured by Victaulic, Style 47, Precision Plumbing Products or approved equal.
				4. Brine piping shall be non-metallic (PVC, CPVC, or Polypropylene).
			9. LINE SHUT-OFF VALVES
				1. Potable water line shut-off valves shall be as specified within Section 22 10 00.
				2. Valves within brine piping shall corrosion resistant and recommended for this use by the manufacturer.
			10. controls
				1. The controls shall have adjustable duration of the various steps in regeneration, allow for pushbutton start and provide for complete manual operation.
				2. Regeneration shall be initiated by an insertion-type pulse generator and an installation fitting (tee/saddle) compatible with the specified piping to house the sensor, providing ease of removal for inspection without disruption of the piping system. A 25-foot cable shall be provided for direct connection to the electronic control device. A low voltage signal output from the flow sensor shall transmit flow rate and volume totalization data directly to the electronic water treatment controller. Accuracy shall be ± 1 percent over the full range and repeatable to ± 0.5 percent of all range. One flow sensor shall be on the soft water outlet of each tank. Lockouts shall be provided to keep more than one tank at a time from going into regeneration.
				3. fully-integrated, factory-mounted, programmable microprocessor-driven electronic water treatment controller with integral multiported pilot control valve shall be provided to initiate a backwash/regeneration sequence based on an external signal/batching device. The controller shall be manufactured by the same manufacturer as the water treatment equipment. The multiported pilot control valve shall be factory pretubed to the main operating valve and include a dial for both visual indication of the system status and manu operation in the event of a power failure. The same controller shall sequence all steps of regeneration and return to a service or standby mode. The initiating time and/or volume setpoints shall reset upon regeneration of the system. The user selected program shall operate with manufacturer defaults or with user, customized parameter, all of which will be retained in a nonvolatile memory requiring no external power source or battery backup. All programming shall be accomplished via a color-coded moisture-resistant keypad with actual words and phrases displayed in a prompting manner for all operating procedures. The controller shall be programmable to operate as parallel progressive or alternating. Operator shall be able to reset all data currently in memory back to preset values at any time. Provide two sets of dry from “C” contacts for remote indication of WATER SOFTENER TROUBLE
				4. Electric wiring for the system shall be provided by the supplier of the water softener equipment.
				5. Flow controls for backwash and flush shall be fully automatic requiring no field adjustment.
			11. REGENERATION SEQUENCE
				1. The regeneration shall be in this order: backwash, brine, slow rinse, fast downflow flush, service standby.
2. EXECUTION
	* + 1. INSTALLATION
				1. Installation shall meet or exceed all applicable federal, state and local requirements, referenced standards and conform to codes and ordinances of authorities having jurisdiction.
				2. All installation shall be in accordance with manufacturer’s published recommendations.
				3. Install system components according to manufacturer’s published recommendations and pipe as indicated on Drawings.
				4. Care shall be exercised in fabricating plumbing lines to avoid all cross connections eliminate the possibility of water contamination.

Provide and install double check valve assembly backflow prevention on the potable water line serving the water softener downstream of all potable water connections serving any other outlets or equipment.

Backflow preventers shall be duplexed where located within lines serving in-patient areas, critical research areas, and/or any area or equipment where un-interruptible (twenty-four hour) water service is required.

Provide a physical air gap of at least two times the diameter of the softener equipment drain piping discharging into a floor drain/sink receptor.

* + - * 1. Provide 4” thick reinforced concrete housekeeping pad beneath softener and brine tanks. Pad shall extend minimum 4” beyond equipment bases. Thoroughly coat top and sides of pad with three coats of epoxy prior to setting tanks.
				2. Provide all supports required by the equipment and piping included in the system.
				3. Install piping to allow for expansion and Contraction without stressing pipe or equipment connected.
				4. Provide code approved transition adapters when joining dissimilar piping materials.
				5. Provide dielectric isolation device where copper lines connect to ferrous lines or equipment, such as dielectric union, coupling or dielectric flange fitting.
				6. Install valves with stems upright or horizontal, not inverted.
			1. TESTING
				1. Water testing set shall be furnished for hardness test, complete with metal container for all mounting.
			2. Instruction and start-up
				1. A complete set of operating instructions covering the installation, maintenance and operation of the softener system shall be furnished bound in booklet form.
				2. Provide for the service of a competent supervising agent from the water softener manufacturer to inspect the completed installation, start the water softening system in operation and acquaint the operators with the proper operation and maintenance of the equipment.
			3. Performance demonstration
				1. At the time of Substantial Completion of the system, demonstrate the proper installation and operation of the equipment specified herein by cycling the water softeners through a complete regeneration sequence, checking for proper sequence and valve operation, as well as electrical and mechanical controls. Notify Owner 48 hours in advance of the demonstration.

END OF SECTION 22 31 16