SECTION 22 67 21
WATER DEALKALIZING SYSTEM

SPEC WRITER NOTES:
1. Delete between //----// if not applicable to project. Also delete any other item or paragraph not applicable in the section and renumber the paragraphs.
2. Consider utilizing a reverse osmosis system (RO) instead of a softener and dealkalyzer. A major advantage of RO is reducing the dissolved solids and thus the boiler blowdown. Refer to Section 22 67 19.16 REVERSE-OSMOSIS WATER EQUIPMENT.

PART 1 - GENERAL

1.1 DESCRIPTION

Provide a chloride anion, pressure type, water dealkalizing system, complete, ready for operation, including electrical connections, services, controls, and all required accessories and equipment.

1.2 RELATED WORK

A. Section 13 05 41, SEISMSIC RESTRAINT FOR NON-STRUCTURAL COMPONENTS.
B. Section 22 05 11, COMMON WORK RESULTS FOR PLUMBING.
C. Pipe Insulation: Section 23 07 11, HVAC, PLUMBING, AND BOILER PLANT INSULATION.
D. Division 26, REQUIREMENTS FOR ELECTRICAL INSTALLATION
E. SECTION 22 08 00, COMMISSIONING OF PLUMBING SYSTEMS. Requirements for commissioning, systems readiness checklist, and training.

1.3 QUALITY ASSURANCE

A. Water Analysis: Water to be treated is reported to have an alkalinity as CaCO3 of ___ mg/L (___ ppm) and a pH of ___. // This analysis is for assistance only. Obtain and verify the analysis //.
B. Performance Requirements: Provide written certification that the following performance requirements will be met by equipment under actual operating conditions:
   1. Exchanger material shall not wash out of the apparatus during any dealkalizing run regardless of rate of flow.
   2. Turbidity and color of treated water shall not be increased above same of sodium cycle treated water by reason of passing through the exchanger equipment.
   3. Strainer system, gravel bed, and exchange material shall not become fouled by dirt, rust, or scale from pipe lines to the extent to render backwash ineffective.
C. System Requirements:
   1. Unit shall be capable of delivering water having a maximum alkalinity of 20 mg/L (20 ppm), as CaCO3, up to maximum demand of ___ L/min (___ gpm).
   2. Total loss of head through unit, and assembly, between the gages, including dealkalizer, valves, piping, etc., shall not exceed 100 kPa (15 psi).
   3. Regeneration shall be accomplished within a period of 75 minutes. Regeneration period shall be that part of cycle of operation from the time unit has delivered its dealkalizing capacity until it is ready to deliver dealkalized water again, including all backwashing, brining and brine washout, etc., complete. Amount of salt necessary to completely recondition unit after a capacity run, shall not exceed 64 kg per cubic meter (4 pounds per cubic foot) of exchange material. Quantity of caustic soda shall be approximately one tenth of salt employed.

D. Required Technical Services: Provide services of a qualified manufacturer's representative to check complete installation for conformance to manufacturer's recommendation, put system into service, make adjustments required for full conformance to design and specified requirements, and test per Part 3 of this section of the specifications.

1.4 SUBMITTALS
A. Submit in accordance with Section 01 33 23, SHOP DRAWINGS, PRODUCT DATA, AND SAMPLES.
B. Manufacturer's Literature and Data:
   1. Piping
   2. Valves
   3. Dealkalizing System
   4. Controls
   5. Pressure Gages
   6. Backflow Preventer
   7. Water meter
   8. Caustic pump
   9. Water Testing Equipment
C. Completely detailed layout, setting, arrangement, and installation drawings including electrical/hydraulic controls. Drawings shall also show all parts of the apparatus including relative positions, dimensions, sizes, required clearances for unobstructed operation and general arrangement of connecting piping.
D. Certification of performance requirements.
E. ASME U-form tank construction form.
F. Field performance test results.
G. Completed System Readiness Checklist provided by the Commissioning Agent
   and completed by the contractor, signed by a qualified technician and
dated on the date of completion, in accordance with the requirements of
Section 22 08 00 COMMISSIONING OF PLUMBING SYSTEMS.

1.5 APPLICABLE PUBLICATIONS
A. The publications listed below form a part of this specification to the
   extent referenced. The publications are referenced in the text by the
   basic designation only.
B. American Society of Mechanical Engineers (ASME):
   B16.1-98................Cast Iron Pipe Flanges and Flanged Fittings
   B16.3-98................Malleable-Iron Threaded Fittings
   B40.100-98..............Pressure Gauges and Gauge Attachments
C. ASTM International Standards (ASTM):
   A53/A53M-04b............Pipe, Steel, Black and Hot-Dipped, Zinc-Coated
   Welded and Seamless
   E1229-93(2002)..........Calcium Hypochlorite
   E1120-97(2002)..........Liquid Chlorine
D. American Water Works Association (AWWA):
   C-651 - 05 ...............Disinfecting Water Mains

SPEC WRITER NOTE: Make material
requirements agree with applicable
requirements specified in the referenced
Applicable Publications. Update and
specify only that which applies to the
project.

PART 2 - PRODUCTS

2.1 EXTERNAL DEALKALIZER PIPING
B. Fittings: Malleable iron, ASME B16.3 or coated iron, ASME B16.1, Class
   125.
C.Threaded Joints: Shall be made with ends reamed out. Apply bituminous
   base lubricant or fluorocarbon resin tape to threads only.

2.2 VALVES
A. Manual Valves: Ball, bronze body, stainless steel trim, reinforced
   Teflon seat and seal, full port.
B. Multiport or Valve Nest: water-pressure-operated assembly of non-
   sticking, non-leaking, hard-anodized polymer-coated aluminum alloy or
   cast iron multi-port diaphragm valves. Guided-perimeter diaphragms. All
   valve parts accessible for service. Design shall permit slow opening and
closing automatic operation of various steps of operating service, opening and closing ports in correct sequence. Provide sample cocks. Provide inlet and outlet pressure gages at all valve ports.

2.3 DEALKALIZING SYSTEM

A. Vertical, down-flow, pressure type with water-meter-actuated automatic controls, operating on the chloride-anion cycle, designed to remove more than 90% of the bicarbonate alkalinity from softened water.

B. Performance Requirements: Refer to Paragraph 1.3.

C. Dealkalizer Tank: ASME Construction, welded carbon steel, designed for 860 kPa (125 psi) working pressure. Sidewall height shall be adequate to allow 50 percent of the mineral bed depth for expansion. Tank shall have easy access to entire interior. Tanks 1000 mm diameter (39.4 inches) and greater shall have 300 mm x 400 mm (11.8 inch x 15.8 inch) manway in top head. Reinforced pipe nozzles. Epoxy interior lining, 0.2 – .25 mm (7.9 – 9.8 mils) dry film thickness; exterior rust-resistant primer coated. Provide steel floor supports welded to lower head suitable for Seismic Zone 4.

D. Distributor Pipes: Upper pipes stainless steel, lower pipes PVC.

E. Exchange Material: High capacity, strongly basic, styrene base, resinous synthetic material. Exchange capacity as CaCO3 shall be considered to be a minimum of 280 grains per cubic meter (8 grains per cubic foot) with salt consumption of 64 kg per cubic meter (4 pounds per cubic foot) and caustic soda consumption of 6.4 kg per cubic meter (0.4 pound per cubic foot). Resin furnished shall be such type which will not require dosing or addition of any chemical, mixture, or solution to the water to be treated, or the water used for backwashing, other than common salt (NaCl) and caustic soda (NaOH) regeneration.

F. Brine Measuring Tank:

1. Construction:
   a. Filament wound fiber glass, minimum 10mm (3/8 inch) thick, reinforced at top with a minimum 1.6mm (1/16 inch) resin coating on the internal wall.
   b. Polyethylene.
   c. Salt capacity sufficient for six regenerations.

2. Controls: Float-operated angle valve with float, float rod and stops:
   a. Angle Valve: Not less than 25 mm (1 inch), double seated sliding stem, snap action closing and manual opening type. Constructed of all bronze containing not less than 85 percent copper. Equip valve with nonmetallic float of sufficient size to operate valve.
b. Float Rod and Stops: Shall be material and design for use in fully saturated salt brine and be provided with necessary lever and supports. Set float stops on rod to close valve at predetermined low level in tank.

G. Caustic System:
1. Provide pumping system to pump from VA-furnished drums or carboys of 50% liquid caustic soda.
2. System shall include: Metering pump, diaphragm-type; movable pump stand, pressure switch, thirty minute automatic reset timer in protective box, blend valve for adjustment of concentration.


I. Automatic reset register water meter which automatically operates the system to provide backwashing, brining, rinsing and service along with opening the soft water bypass valve while the unit is regenerating. Meter turndown at least 70/1 with maximum flow rating approximately 10% above maximum flow rating required for the unit.

2.4 PRESSURE GAGES
ANSI B40.100, one percent accuracy, 110 mm (4 1/2 inches) in diameter, all metal case, bottom connected. Dials either dead black or white lacquered throughout, graduated from 0 to 690 kPa (0 to 100 psi) and identity labeled. Isolating gage cocks on all gages.

2.5 WATER TESTING EQUIPMENT
Furnish methylorange titration-type water testing equipment in a portable cabinet. Equipment shall be such to permit conducting tests as recommended by manufacturer of equipment.

PART 3 - EXECUTION

3.1 FLUSHING AND DISINFECTING
A. Flush and disinfect new water lines and dealkalizer interior in accordance with AWWA C651.
B. Material:
   1. Liquid Chlorine: ASTM E1120.

3.2 STARTUP AND TESTING
A. Operating: Tests shall be performed in the presence of Contracting Officers Technical Representative (COTR) or Resident Engineer (RE). It
will not be permitted, for testing purposes, to add to or subtract from exchange material used in apparatus, neither will any regenerating agent, other than the solution specified, be permitted.

SPEC WRITER NOTE: See Article, Quality Assurance, for test flow rate.

B. Procedure:
1. Operate dealkalizer at a constant flow rate of ___ L/s (___ gpm) for ten minutes after dealkalized water is produced. If necessary, waste treated water to sewer to maintain above flow rate. Dealkalized water production shall begin when a sample of 40 cc does not indicate more than 20 mg/L (20 ppm) of alkalinity.
2. Regenerate system to demonstrate operation of multiport valve and control system.

C. The commissioning Agent will observe startup and contractor testing of selected equipment. Coordinate the startup and contractor testing schedules with the Resident Engineer and Commissioning Agent. Provide a minimum of 7 days prior to notice.

3.3 COMMISSIONING
A. Provide commissioning documentation accordance with the requirements of Section 22 08 00, COMMISSIONING OF PLUMBING SYSTEMS for all inspection, startup, and contractor testing required above and required by the System Readiness Checklist provided by the Commissioning Agent.
B. Components provided under this section of the specification will be tested as part of a larger system. Refer to Section 22 08 00, COMMISSIONING OF PLUMBING SYSTEMS and related sections for contractor responsibilities for system commissioning.

3.4 DEMONSTRATION AND TRAINING
A. Provide services of manufacturer’s technical representative for four hours to instruct VA Personnel in operation and maintenance of units.
B. Submit training plans and instructor qualifications in accordance with the requirements of Section 22 08 00, COMMISSIONING OF PLUMBING SYSTEMS.

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