

**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.

PART 1 - GENERAL

1.1 DESCRIPTION

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 22 05 11, COMMON WORK RESULTS FOR PLUMBING .
- B. Pipe Insulation: Section 23 07 11, HVAC, PLUMBING, AND BOILER PLANT INSULATION.
- C. Division 26, ELECTRICAL.

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: Certify 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.

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, and sizes and general arrangement of connecting piping.
- D. Certification of performance requirements.
- E. ASME U-form tank construction form.
- F. Field performance test results.

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-651-99 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

- A. Pipe: ASTM A53, galvanized, schedule 40. Flanges, ASME B16.1, Class 125.
- 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: Water-pressure-operated assembly of non-sticking, non-leaking, hard-anodized polymer-coated aluminum alloy 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 Par. 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 500 mm diameter (20 inches) and greater shall have 300 mm x 400 mm (12 inch x 16 inch) manway in top head. Reinforced pipe nozzles. Epoxy interior lining, 0.10 - 0.15 mm (4 - 6 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 (10,000 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.
- H. System Controls: Electronic field-programmable microprocessor control, all solid state components, digital display showing system status at any time and continuous display of flow rate and flow totalization,

moisture-resistant keypad. Volume-based automatic regeneration. Motor-driven pilot valve initiates regeneration. Manual override. Automatic start feature. Mount controls in NEMA 4X panel adjacent to the unit.

- 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.
- J. Manufacturer: Cleaver-Brooks, Culligan, or equal.

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. Supplier: Hach or equal.

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.
 - 2. Hypochlorite: ASTM E1229.

3.2 TEST

- 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.

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