**SECTION 22 67 19.19**

**DEIONIZED WATER EQUIPMENT**

**PART 1 – GENERAL**

**1.1 DESCRIPTION**

Provide complete industrial-type packaged deionized (DI) water treatment system producing high purity water by removal of dissolved minerals, bacteria, particles and organic impurities. Designed for continuous automatic operation. The system shall contain all devices necessary for a fully operational system. The DI system is being provided for $NO_x$ control. Coordinate with turbine vendor to provide DI water appropriate for the installed unit.

**1.2 RELATED WORK**

A. Systems for service other than boiler plant make-up water, Section 22 05 11, COMMON WORK RESULTS FOR PLUMBING.

B. Section 23 07 11, HVAC, PLUMBING & BOILER PLANT INSULATION

C. Section 26 05 11, REQUIREMENTS FOR ELECTRICAL INSTALLATION

D. SECTION 22 08 00, COMMISSIONING OF PLUMBING SYSTEMS. Requirements for commissioning, systems readiness checklist, and training.

**1.3 QUALITY ASSURANCE**

Manufacturer shall have been engaged in the manufacture of reverse osmosis systems as a primary product for at least ten years. The ten year requirement supersedes any conflicting requirement in other parts of the project specification.

**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. Catalog cuts, complete description and specifications of all equipment and accessories
2. Accessories including filters, product storage tank, pressure gages and test kit.
3. Performance data including normal and maximum flow and pressure drop. Certification that required performance will be achieved.
4. Piping.

C. Complete detailed layout, setting, arrangement, and installation drawings including. Drawings shall also show all parts of the apparatus including relative positions, dimensions, and sizes and general arrangement of connecting piping.

D. 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 PROJECT CONDITIONS**

A. Contractor shall examine current water samples of building's domestic water supply and perform tests necessary for the design parameters below.

B. Influent Water Analysis shall include:

1. Maximum Silt Density Index (SDI) Rating
2. Turbidity, NTU
3. Maximum Free Chlorine and/or Chloramine
4. Color
5. Alkalinity
6. Hardness
7. All other analyses required to deliver parameters as defined by installed equipment vendor.

C. Design Parameters:

1. Normal System Flow: 2 gpm
2. Maximum System Flow: 4 gpm
3. Daily Water Usage: 96 gallons per day
4. Daily Hours of Water Demand: 24
5. Operating Temperature Range: 40-105 degrees F
6. Water properties as required by the installed equipment vendor.

**1.6 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):

B40.100-2005.....Pressure Gages and Gage Attachments

C. ASTM International (ASTM):

A269-07.....Seamless and Welded Austenitic Stainless Steel Tubing for General Service.

D1785-06.....Poly (Vinyl Chloride) (PVC) Plastic Pipe, Schedules 40, 80, and 120.

D. American Water Works Association (AWWA):

B300-04.....Hypochlorites

B301-04.....Liquid Chlorine

C651-05.....Disinfecting Water Mains

E. National Electrical Manufacturers Association (NEMA):

ICS-6-1993(R2001, R2006) Industrial Control and Systems: Enclosures

F. National Fire Protection Association (NFPA):

70- 08 .....National Electrical Code.

G. Department of Health and Human Services, Food and Drug Administration (FDA):

CFR 21, Chapter 1, Part 175.300, 02 Resinous and Polymeric Coatings

PART 2 – PRODUCTS

**2.1 DEIONIZED WATER SYSTEM**

A. Packaged automatic deionized water system mounted on steel frame, designed for project conditions. Equipment arranged on the frame to allow easy access for operating, maintenance and repair. Unit shall include all required piping, wiring and controls for a fully operational system.

B. Water Quality for Water Injection to Reduce $NO_x$: The quality of water injected into the combustor for $NO_x$ control must meet the general requirements defined below:

| | Limit | Test Method |
|---|---|---|
| pH | 5.5 to 8.5 | ASTM D1293 |
| Suspended solids | ≤2.6 mg/l | ASTM D5907; ISO 11923 |
| Maximum particle size | 10 microns | |
| 90% of particles | ≤5 microns | |
| Dissolved silica | ≤0.1 ppmw $SiO_2$ (≤0.1 mg/l) | ASTM D859 |
| Electrical conductivity | 5 µS/cm | ASTM D5391 |

C. Skid and Frame Assembly:

1. DI machine shall be built on a skid and frame constructed of welded structural carbon steel. The entire surface shall be sand-blasted and coated with high solids epoxy coating.

D. Reassembly:

1. Unit shall be shipped to the site completely assembled and tested. If units or sections are to be disassembled at the site to allow for installation in a limited space, the unit shall be reassembled and tested for intended operation.

**2.2 WATER TESTING EQUIPMENT:**

A. Furnish water testing equipment in a portable cabinet specially made for the installed equipment. Include sufficient materials for 6 months of normal testing procedures.

B. Silt Density Index (SDI) apparatus to measure degree of suspended solids feeding the RO membranes. Include pressure regulator, pressure gage, filter holder, 600 mL beaker, sample valve, tubing and 0.45 micron filter papers.

C. Test kit to measure total water hardness, total iron, free chlorine, pH.

**PART 3 – EXECUTION**

**3.1 REQUIRED TECHNICAL SERVICES:**

Provide services of a qualified manufacturer's representative to check complete installation for conformance to manufacturer's recommendations, put system into service, make all adjustments required for full conformance to design and specified requirements, and perform all demonstrations and tests.

**3.2 FLUSHING AND DISINFECTING:**

A. Flush and disinfect new water lines and DI system and tank interiors in accordance with AWWA C651.

B. Material:

1. Liquid chlorine: AWWA B301.
2. Hypochlorite: AWWA B300.

**3.3 STARTUP AND TESTING:**

A. Operating: Tests shall be run in presence of PM/COTR.

B. Procedure:

1. Operate DI system at constant maximum required capacity for one hour after demineralized DI product water is produced. When necessary, waste product water to sewer to maintain above flow rate. Product water production shall begin when a sample shows that demineralization complies with requirements.
2. Demonstrate all features of the control system including diagnostics and flow and cycle indications.

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

**3.4 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.

**3.5 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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