

SECTION 23 25 19
WATER TREATMENT FOR STEAM SYSTEM

PART 1 - GENERAL

1.01 REFERENCE STANDARDS

- A. ASTM A351/A351M - Standard Specification for Castings, Austenitic, for Pressure-Containing Parts; 2024, with Editorial Revision (2025).

1.02 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.03 SUMMARY

- A. Section includes the following HVAC water-treatment systems:
 - 1. Automatic chemical-feed equipment.
 - 2. Stainless-steel pipes and fittings.
 - 3. Chemical treatment test equipment.
 - 4. Chemicals.
- B. Related Requirements:
 - 1. Section 235239: "Firetube Boiler."
 - 2. Section 235313: "Boiler Feedwater – Pumps" and associated Surge/Receiver Tank.

1.04 DEFINITIONS

- A. TDS: Total dissolved solids.
- B. TSS: Total suspended solids are solid materials, including organic and inorganic, that are suspended in the water. These solids may include silt, plankton, and industrial wastes.

1.05 ACTION SUBMITTALS

- A. Product Data: Include rated capacities, operating characteristics, and furnished specialties and accessories for the following products:
 - 1. Water meters.
 - 2. Inhibitor injection timers.
 - 3. pH controllers.
 - 4. TDS controllers.
 - 5. Chemical solution tanks.
 - 6. Injection pumps.
 - 7. Chemical test equipment.
 - 8. Chemical material safety data sheets.
- B. Shop Drawings: Chemical treatment equipment showing tanks, maintenance space required, and piping connections to steam systems.
 - 1. Include plans, elevations, sections, and attachment details.
 - 2. Include diagrams for power, signal, and control wiring.

1.06 INFORMATIONAL SUBMITTALS

- A. Seismic Qualification Certificates: For components, from manufacturer.
- B. Basis for Certification: Indicate whether withstand certification is based on actual test of assembled components or on calculation.

- C. Dimensioned Outline Drawings of Equipment Unit: Identify center of gravity and locate and describe mounting and anchorage provisions.
- D. Detailed description of equipment anchorage devices on which the certification is based and their installation requirements.
- E. Water Analysis Provider Qualifications: Verification of experience and capability of HVAC water-treatment service provider.
- F. Field quality-control reports.
- G. Other Informational Submittals:
- H. Water-Treatment Program: Written sequence of operation on an annual basis for the application equipment required to achieve water quality defined in "Performance Requirements" Article.
- I. Water Analysis: Illustrate water quality available at Project site.
- J. Passivation Confirmation Report: Verify passivation of galvanized-steel surfaces, and confirm this observation in a letter to Architect.

1.07 NYCHA SUBMITTAL PROCEDURES

- A. The contractor must provide show drawings in accordance with the contract specifications. The shop drawings must show the exact dimensions and location of the water treatments equipment, devices, controllers, piping, conduits such as chemical tanks, pumps, control panels, etc. The shop drawings must be reviewed and approved by the engineer and NYCHA independent water treatment consultant.
- B. The water treatment vendor shall provide and store all the required chemicals for each system. The proposed chemicals must be reviewed and approved by both the engineer and NYCHA's water treatment consultant.
- C. The water treatment system installation must be performed by the contractor under the supervision of the engineer and the NYCHA water treatment consultant. Any water
 - 1. treatment system installation guidance proposed by the water treatment vendor must be reviewed and approved by the consultants.
- D. As per contract specifications, the service visits, water treatment analysis, equipment inspection, chemical treatment requirements, corrective actions, technical assistance, and field report must be provided by the water treatment vendor. The vendor must also provide all required laboratory and technical services during construction phase.
- E. The water treatment vendor must report, communicate and schedule the work directly with the contractor. The contractor and the water treatment vendor are responsible for the water treatment work as per contract specifications. The NYCHA independent water treatment consultant will be scheduled by NYCHA to visit the site to perform routine inspections and provide supervision. The Contractor/NYCHA must notify NYCHA 5 days in advance to schedule any site visit with the water treatment consultant. NYCHA's independent water treatment consultant must issue a typewritten report in PDF format to the construction management team after each site visit.
- F. All Required coordination with the college shall be scheduled by NYCHA.

1.08 CLOSEOUT SUBMITTALS

- A. Operation and Maintenance Data: For sensors, injection pumps, and controllers to include in emergency, operation, and maintenance manuals.

1.09 QUALITY ASSURANCE

- A. Steam System Water-Treatment Service Provider Qualifications: An experienced steam systems water-treatment service provider capable of analyzing water qualities, installing water-treatment equipment, and applying water treatment as specified in this Section.
- B. Commissioning of a system or systems specified in this section is part of the construction process. Documentation and testing of these systems, as well as training of the Owner's operation and maintenance personnel, is required in cooperation with NYCHA and the Commissioning Agent (CxA). Project Closeout is dependent on successful completion of all commissioning procedures, documentation, and issue closure. Refer to Section 017700 Closeout Procedures, for closeout details. Refer to Section 019113 Project Commissioning Requirements, for detailed commissioning requirements.

PART 2 - PRODUCTS

2.01 MANUFACTURERS

- A. Manufacturers: Subject to compliance with requirements, provide products by the following:
- B. Neptune Chemical Pump Co.
- C. Cascade Water Services, Inc
- D. Nalco; an Ecolab Company
- E. Approved Equal.

2.02 PERFORMANCE REQUIREMENTS

- A. Water quality for steam systems shall minimize corrosion and scale buildup for optimum efficiency of steam and condensate equipment without creating a hazard to operating personnel or the environment.
- B. Base steam systems feedwater treatment on quality of water available at Project site, steam and condensate system equipment material characteristics and functional performance characteristics, operating personnel capabilities, and requirements and guidelines of authorities having jurisdiction.
- C. Steam Condensate:
- D. pH: Maintain a value within 7.8 to 8.4.
- E. Total Alkalinity: Maintain a value within 5 to 50 ppm.
- F. Chemical Oxygen Demand: Maintain a maximum value of 15 ppm.
- G. Soluble Copper: Maintain a maximum value of 0.20 ppm.
- H. TSS: Maintain a maximum value of 10 ppm.
- I. Ammonia: Maintain a maximum value of 20 ppm.
- J. Total Hardness: Maintain a maximum value of 2 ppm.
- K. Steam boiler operating at 10 psig and less shall have the following water qualities:
- L. "OH" Alkalinity: Maintain a value within 200 to 400 ppm.
- M. TSS: Maintain a value within 600 to 3000 ppm.

2.03 AUTOMATIC CHEMICAL-FEED EQUIPMENT

- A. Feed System
 - 1. Complete Chemical Feed System(s) shall be furnished suitable for handling the required chemicals. The system will consist of two pumps, tank, portable mixer and piping and accessories as defined below. Manufacturer will select all materials in contact with

chemical and guarantee their suitability for the particular application. Pump mounting shall be per the manufacturer preference.

B. Tank

1. The tank shall be constructed of 304SS and furnished with a hinged removable cover. Tank shall include connections for pump suction, drain, level gauge, chemical fill, dilution water, level switch, and relief valve return piping. Drain connection shall be separate from pump suction connection. Drain shall be located in the bottom of the tank for complete emptying of contents. Suction outlet connection should be on the side wall of the tank, a minimum of 2" above the bottom to prevent sediment from being drawn into the suction line.
2. Tank will be furnished with drain valve, level switch, level gauge.

C. Mixer/Agitator

1. A portable clamp mount (above the storage tank) mixer with 304SS coated shaft and propeller shall be furnished. Mixer clamp shall allow angular and radial adjustment of shaft angle. Mixer propeller shall operate at 1750 RPM. The purpose of the mixer shall be to mix liquid/dissolve powder in liquid/create and maintain a suspension.

D. Piping

1. Package is to be furnished complete with pump suction and discharge piping and accessories as described below. A stainless-steel valve and strainer shall be provided at the tank outlet and a valve shall be provided at each pump inlet. Pump suction piping shall be sized to satisfy pump NPSH requirements. Piping shall be 304SS pipe.
2. Pump discharges shall be piped to a common outlet using 304SS pipe. A stainless steel valve shall be provided at each pump discharge.

E. Pump

1. The chemical metering pump shall be of the hydraulically actuated, high pressure, diaphragm type, equal to Neptune Series 500"dia-Pump" capable of operation against a minimum of 150 psi. Pump capacity and materials of construction shall be as shown on the Pump Data Sheet. Pump shall use a Teflon disc/Viton tubular diaphragm.
2. Pump capacity must be adjustable through 100% of range by automatic electric positioner with manual override while the pump is running or stopped. The micrometer dial shall have a bright, high contrast scale easily read in low level light. The micrometer scale shall be protected with a chemically resistant clear plastic cover. Pump stroking speed shall not exceed 150 spm. All parts of the power train must operate submerged in oil.
3. Pump shall be sized to deliver the required capacity at 85% of maximum stroke length. Stroke adjustment shall be variable oil by-pass type mechanism with the plunger powered through its entire travel. Lost motion designs are not acceptable.
4. Pump shall include an automatic vent and refill mechanism on the hydraulic side, which operates once each stroke. The pump shall have an internal hydraulic relief valve which is externally adjustable.
5. Double ball (304 ss) check valves shall be provided on both suction and discharge to insure accurate repeatable metering. The pump valves shall be removable for cleaning or replacement without the need to disturb suction or discharge piping.
6. Pump shall be field convertible to automatic stroke adjustment without the use of special tools and without the need to replace any major frame parts.
7. Pump shall be furnished with a factory mounted driver suitably sized for continuous operation at the maximum relief setting. Motor shall be sized for the maximum relief setting. Motor shall be integrally mounted direct coupled. No belts or pulleys should be used in the drive train or for capacity adjustment. Pump and motor shall be suitable for indoor operation in nonhazardous area, as shown on the Pump Data Sheet.
8. Pumps shall be furnished with automatic electric stroke length positioner to follow a 4-20 mA signal proportional to flow. Stroke positioner will include provision for local manual override and will include a local position indicator.

9. Positioner should be suitable for connection to 115v single phase power without external transformers. Units shall be suitable for use with either milliamp or voltage inputs without field modifications. Positioner will include adjustable limit switches with outputs for alarm purposes and will provide an isolated 4 - 20 mA output signal for remote monitoring.
10. The stroke positioner shall include necessary logic and terminals to allow connection to remote control stations if desired. Positioner should allow remote features to be added without modification or replacement. Only the purchase of the actual control stations should be necessary to achieve remote stroke length display, remote auto/manual selection and the ability to manually override the stroke length from the remote location.
11. On loss of signal, the control unit must be able to "FAIL" in the last command position or to "FAIL" to a pre-selected adjustable position. Positioner should provide contacts to alarm or loss of signal.

F. Accessories

1. Calibration column with isolation valve, provided on suction line branched between tank isolation valve and strainer. Column shall be sized to allow at least a one minute draw-down test.
2. Pressure gauge with diaphragm seal shall be mounted on each pump discharge. Gauge shall be furnished with valves for isolation and test. Pressure gauge should be sized at least 25% higher than the maximum pump internal relief valve setting.
3. Back pressure valve sized to provide necessary back pressure.
4. Relief valve and return line to tank shall be provided at the discharge of each metering pump. External relief valve shall be set at a pressure lower than the pump internal relief valve. Return piping shall be transparent to allow viewing of liquid in the line.
5. Level switch stainless steel float type, SPDT rated 10 amp to actuate 1" above suction outlet.
6. Level gauge valve, tubular level gauge shall be included.
7. Measuring tank with piping and valve shall be mounted on tank lid. Measuring tank shall include a calibrated level indicator to allow accurate measurement of concentrated chemicals for dilution.
8. Injection point assemblies shall be provided for each discharge. Provide a 316SS injection quill with isolation valve for each injection point.

G. Controls

1. Chemical Feed Systems shall be provided with all necessary controls including motor starters and appropriately sized overloads such that connection to a single 1PH-120V. power supply is the only required field electrical work. A motor starter with ON/OFF switch shall be provided for each motor on the chemical feed system. Running lights shall be provided for each motor. All switches, lights and other electrical components shall be NEMA4. All electrical devices shall be wired in conduit to the control panel.
2. Signal wiring for milliamp or voltage follower signals shall not be run in the same conduit and shall not be terminated in the same enclosure box as power and motor control wiring.

2.04 STAINLESS-STEEL PIPES AND FITTINGS

- A. Stainless-Steel Tubing: Comply with ASTM A 269, Type 316.
- B. Stainless-Steel Fittings: Comply with ASTM A 815/A 815M, Type 316, Grade WP-S.
- C. Two-Piece, Full-Port, Stainless-Steel Ball Valves: ASTM A351/A351M, Type 316 stainless-steel body; ASTM A 276, Type 316 stainless-steel stem and vented ball, carbon-filled TFE seats, threaded body design with adjustable stem packing, threaded ends, and 250-psig steam working-pressure rating and 600-psig cold working-pressure rating.

2.05 CHEMICALS

- A. Chemicals shall be as recommended by water-treatment system manufacturer that are compatible with piping system components and connected equipment and that can attain water quality specified in "Performance Requirements" Article.

PART 3 - EXECUTION

3.01 WATER ANALYSIS

- A. Perform an analysis of supply water to determine quality of water available at Project site.
- B. System Design.
 - 1. The vendor must prepare a separate set of schematic equipment and piping flow diagram to show all the required isolation valves and temporary pump(s) for the purpose of cleaning and flushing of the condenser and chilled water systems. The flow diagram must be reviewed and approved by NYCHA and EOR in Submittal Phase. Isolation valves must be provided to isolate the new chemical feed systems and new steam plant.
 - 2. Electrical devices, motors, wiring and conduit in accordance with the applicable sections of the electrical specifications must be provided.
 - 3. The design documents must include initial treatment program to be implemented during construction phase for all HVAC systems on a complete system fluid analysis prior to the equipment installation.
 - 4. The vendor must also prepare the service and maintenance specifications for the designed water treatment system. This includes but is not limited to frequency of the service visits, water treatment analysis, equipment inspections, chemical treatment requirements, corrective actions, technical assistance, and typewritten field service report after visits. The maintenance specifications must be reviewed and approved by NYCHA's independent water treatment consultant. The vendor must provide all required laboratory and technical services.
 - 5. The approved maintenance specifications must be implemented by the chemical treatment vendor during the construction phase until the system officially is turned over to NYCHA. At that time, the approved maintenance specifications will be provided to NYCHA to supplement or amend their current maintenance service agreement with the water treatment vendor.
 - 6. The final design documents must be reviewed and approved by NYCHA's water treatment consultant.
 - 7. The quantity of all required chemicals for each system must be included in the contract submittal.
 - 8. The water treatment submitted documents must include the name of the water treatment vendor who is currently providing the water treatment services for Site. This water treatment vendor must be retained by the contractor as single source vendor to provide the water treatment services during construction until the systems are accepted and is officially turned over to NYCHA.
 - 9. Once the water treatment system design is developed by the vendor and reviewed and approved by NYCHA's independent water treatment consultant. Provide allowances for the cost based upon:
 - a. Quantity of each type of chemical
 - b. Cost for each type of chemical.
 - c. Equipment Cost
 - d. Applicable labor cost
 - e. Field visit services
 - f. Other applicable cost

3.02 INSTALLATION

- A. Install chemical application equipment on concrete bases, level and plumb. Maintain manufacturer's recommended clearances. Arrange units so controls and devices that require servicing are accessible. Anchor chemical tanks and floor-mounting accessories to substrate.
- B. Install water testing equipment on wall near water chemical application equipment.
- C. Install interconnecting control wiring for chemical treatment controls and sensors.
- D. Mount sensors and injectors in piping circuits.
- E. Install automatic chemical-feed equipment for steam boiler and steam condensate systems and include the following:
 - 1. Water meter installed in makeup-water supply by others.
 - 2. Install inhibitor injection pumps and solution tanks with injection timer sensing contacts in water meter.
 - a. Pumps shall operate for timed interval on contact closure at water meter in makeup-water supply connection. Injection pump shall discharge into receiver/surge tank or feedwater supply header at deaerator tank.
 - 3. Install test equipment and provide test-kit to Owner. Install test-coupon assembly in bypass circuit around circulating pumps unless otherwise indicated on Drawings.
 - 4. Install TSS controller with sensor and bleed valves.
 - a. Bleed valves shall cycle to maintain maximum TSS concentration.
 - 5. Install pH sensor and controller with injection pumps and solution tanks.
 - a. Injector pumps shall operate to maintain required pH.

3.03 CONNECTIONS

- A. Where installing piping adjacent to equipment, allow space for service and maintenance.
- B. Make piping connections between steam systems water-treatment equipment and dissimilar-metal piping with dielectric fittings. Comply with requirements in Section 232113 "Hydronic Piping" for dielectric fittings.
- C. Install shutoff valves on steam systems water-treatment equipment inlet and outlet. Metal general-duty valves are specified in Section 230523 "General-Duty Valves for HVAC Piping."
- D. Comply with requirements in Section 221119 "Domestic Water Piping Specialties" for backflow preventers required in makeup-water connections to potable-water systems.
- E. Confirm applicable electrical requirements in electrical Sections for connecting electrical equipment.
- F. Ground equipment according to Section 260526 "Grounding and Bonding for Electrical Systems."
- G. Connect wiring according to Section 260519 "Low-Voltage Electrical Power Conductors and Cables."

3.04 FIELD QUALITY CONTROL

- A. Perform the following tests and inspections with the assistance of a factory-authorized service representative:
 - B. Inspect field-assembled components and equipment installation, including piping and electrical connections.
 - C. Inspect piping and equipment to determine that systems and equipment have been cleaned, flushed, and filled with water, and are fully operational before introducing chemicals for water-treatment system.
 - D. Place steam systems water-treatment system into operation and calibrate controls during the preliminary phase of steam systems' startup procedures.
 - E. Do not enclose, cover, or put piping into operation until it is tested and satisfactory test results are achieved.

- F. Test for leaks and defects. If testing is performed in segments, submit separate report for each test, complete with diagram of portion of piping tested.
- G. Leave uncovered and unconcealed new, altered, extended, and replaced water piping until it has been tested and approved. Expose work that has been covered or concealed before it has been tested and approved.
- H. Cap and subject piping to static water pressure of 50 psig above operating pressure, without exceeding pressure rating of piping system materials. Isolate test source and allow test pressure to stand for four hours. Leaks and loss in test pressure constitute defects.
- I. Repair leaks and defects with new materials and retest piping until no leaks exist.
- J. Equipment will be considered defective if it does not pass tests and inspections.
- K. Prepare test and inspection reports.
- L. Sample boiler water at one-week intervals after boiler startup for a period of five weeks and prepare test report advising Owner of changes necessary to adhere to "Performance Requirements" Article for each required characteristic. Sample boiler water at four-week intervals following the testing noted above to show that automatic chemical-feed systems are maintaining water quality within performance requirements specified in this Section.
- M. Comply with ASTM D 3370 and with the following standards:
 1. Silica: ASTM D 859.
 2. Steam System: ASTM D 1066.
 3. Acidity and Alkalinity: ASTM D 1067.
 4. Iron: ASTM D 1068.
 5. Water Hardness: ASTM D 1126.

3.05 SYSTEM VERIFICATION TESTING

- A. System verification testing is part of the Commissioning Process. Verification testing shall be performed by the contractor and witnessed and documented by the Commissioning Agent. Refer to Section 019113, Project Commissioning Requirements, for detailed commissioning requirements.

3.06 MAINTENANCE SERVICE

- A. Scope of Maintenance Service: Provide chemicals and service program to maintain water conditions required above to inhibit corrosion, scale formation, and biological growth for heating, steam and condensate piping and equipment. Services and chemicals shall be provided for a period of one year from date of Substantial Completion, and shall include the following:
 1. Initial water analysis and steam systems water-treatment recommendations.
 2. Startup assistance for Contractor to flush the systems, clean with detergents, and initially fill systems with required chemical treatment prior to operation.
 3. Periodic field service and consultation.
 4. Customer report charts and log sheets.
 5. Laboratory technical analysis.
 6. Analyses and reports of all chemical items concerning safety and compliance with government regulations.

3.07 DEMONSTRATION

- A. Engage a factory-authorized service representative to train Owner's maintenance personnel to adjust, operate, and maintain steam systems water-treatment systems and equipment.
- B. Training: Provide a "how-to-use" self-contained breathing apparatus video that details exact operating procedures of equipment.

END OF SECTION 23 25 19 23 25 19