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BuildingName
The Description of the Project
P00000000 0000

SPECIFICATION DIVISION 22

NUMBER SECTION DESCRIPTION

DIVISION 22 PLUMBING
SECTION 223116 – WATER SOFTENER

END OF CONTENTS TABLE

DIVISION 22 PLUMBING
SECTION 223116 – WATER SOFTENER

2012-09-17: NEW VERSION ISSUED.

2014-01-06: IMPROVED LEAD FREE REQUIRMENTS TO REFLECT U.S SAFE DRINKING WATER ACT REQUIREMENTS THAT WENT INTO EFFECT JAN. 4, 2014. D.KARLE FOR MTT.

APRIL 2018: REVISED TO LIST MFR.S FROM PML. R BENEDEK

2024-01-02: REPLACED PNEUMATICALLY ACTUATED CONTROL VALVES WITH ELECTRONICALLY ACTUATED CONTROL VALVES.

2024-04-29: UPDATED MANUFACTURERS.

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

INCLUDE PARAGRAPH 1.1.A AND B IN EVERY SPECIFICATION SECTION. EDIT RELATED SECTIONS 1.1.B TO MAKE IT PROJECT SPECIFIC.

A. Drawings and general provisions of the Contract, Standard General and Supplementary General Conditions, Division 1 Specification Sections, and other applicable Specification Sections including the Related Sections listed below, apply to this Section.

B. Related Sections:

1. 220500 Common Work Results for Mechanical
2. 221113 Piping Materials and Methods
3. 220523 Valves
4. 220519 Thermometers, Pressure Gauges, and Accessories
5. 221119 Domestic Water Piping Specialties
6. Division 26: Electrical.

SPEC EDITOR: WHEN EDITING THIS SPEC TO MAKE IT PROJECT SPECIFIC, REVISE THE SUMMARY SECTION BELOW ACCORDINGLY.

1.2 SUMMARY

A. Section Includes:

1. Brine Regenerated Water Softening Systems.

1.3 SUBMITTALS

A. Product Data: For each type of fixture product.

1. Water softening system and accessories including rated capacities, operating characteristics, furnished specialties, accessories, dimensions of individual components and profiles.
2. Construction details and piping diagrams of water softening system and components.

3. Wiring diagrams for power, signal, control wiring and monitoring points tied into the owners building monitoring system.
4. Proof of NSF 61 compliance for softeners used for drinking water systems.
5. Operation and maintenance manuals.

1.4 QUALITY ASSURANCE

SPEC EDITOR: RETAIN PARAGRAPHS A AND B IN EVERY PROJECT SPECIFICATION.

A. Manufacturers and Products: The products and manufacturers specified in this Section establish the standard of quality for the Work. Subject to compliance with all requirements, provide specified products from the manufacturers named in Part 2.

SPEC EDITOR: REVISE THE REFERENCE STANDARDS FOR PROJECT REQUIREMENTS.

B. Reference Standards: Products in this section shall be built, tested, and installed in compliance with the following quality assurance standards; latest editions, unless noted otherwise.

1. Michigan Plumbing Code
2. Electrical components, devices and accessories: UL Listed and labeled as defined as in NFPA 70, Article 100.
3. ASME Boiler and Pressure Vessel Code: Section VII, Division 01, where indicated.
4. ASME compliance for FRP Tanks: Fabricate and label mineral tanks to comply with ASME Boiler and Pressure Vessel Code
5. National Sanitation Foundation NSF/ANSI-61 (potable drinking water) and NSF-61 Annex G (listed as ≤ 0.25% weighted average lead content) (and/or NSF/ANSI-372) and Annex F.
6. U.S Safe Drinking Water Act.

1.5 COORDINATION

A. Coordinate size and location of concrete bases.

1.6 WARRANTY

A. Provide a complete parts and labor warranty for a minimum of one year from the date of Substantial Completion.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. Acceptable Manufacturers:

1. Evoqua
2. Veolia North America
3. R.A. Bruner
4. Marmon Industrial Water

2.2 WATER SOFTENER

A. Provide a factory assembled, pressure type packaged water softener, consisting of a softener tank, valve, brine tank (including first full fill of the brine tank), etc., all as required for a complete system. Constructed to handle up to 120 degree Fahrenheit water.

B. When used for drinking water systems, water softening system shall comply with NSF 61, "Drinking Water System Components – Health Effects"

SPEC EDITOR: REVISE THE PERFORMANCE FOR PROJECT REQUIREMENTS.

2.3 PERFORMANCE

A. Provide a water softening systems that delivers the output water quality, capacity, and performance indicated below at the specified water input characteristics indicated.

B. Input water characteristics:

1. Raw City of Ann Arbor water. City of Ann Arbor water quality base line data can be found at the following web site: http://www.a2gov.org/government/publicservices/water_treatment.
2. Up to 120 degree Fahrenheit water inlet temperature.

C. Output capacity and performance:

SPEC EDITOR: REVISE TO SIMPLEX RESIN TANK IF CONTINUOUS SOFTENER OPERATION IS NOT REQUIRED.

1. Duplex resin tanks to provide continuous operation.
2. Minimum Control valve pipe size 1".
3. Peak flow rate: _____ GPM @ a maximum 15 psi pressure drop.
4. Total water softened in 24 hours: _____ gallons.
5. Maximum of one regeneration per 72 hour period.
6. Regenerations between brine tank refills: _____.
7. Water quality output conditions in CaCO3 equivalents:
   a. - ppm hardness
   b. - ppm ferrous iron

SPEC EDITOR: REVISE THE TANK PRESSURE RATINGS GIVEN BELOW, IF NECESSARY FOR THE APPLICATION.

2.4 RESIN TANK

A. Resin tank shall have no less than 50% free-board, be designed for 100 psig, and be tested at 150 psig. Tanks shall be steel with phenolic lining or fiberglass wound type. Steel tanks shall be internally lined with a phenolic epoxy to a 4-6 mil thickness and then baked at 400 degrees F. The exterior shall be sand blasted, painted with a rust-inhibiting primer and then finished with a gloss epoxy top coat. Tank shall have a 15 year non-prorated guarantee.

B. Tank shall be equipped with an opening in the top head for mineral filling and periodic inspection.

2.5 BRINE SYSTEM:

A. Brine system shall consist of combination salt storage and brine tank. Tank shall be molded of corrosion-proof, high density polyethylene.

B. Brine tank shall be equipped with an elevated salt plate for brine collection, and a chamber to house a brine valve assembly. The brine valve shall automatically open to admit brine to the resin tank during eduction and close automatically to prevent introduction of air into the resin tank. During refill, the brine valve shall regulate the flow of treated water into the brine tank, working with the timed refill feature of the control valve. Together these components shall admit the correct volume of water to the brine tank in accordance with the salt dosage settings on the control valve. The brine valve shall include a float operated safety shut-off valve as a backup to the timed refill valve on the controller to prevent brine tank overflow

2.6 DISTRIBUTOR SYSTEM:

A. Resin tank shall have a stainless steel upper distributor which shall disperse water laterally to avoid channeling within the resin bed. The lower distributor shall be of all plastic construction in a hub-radial design. It shall incorporate fine slot distributors to avoid passing of resin to service in the event of plumbing system upset. No slots shall face upward to minimize the opportunity of channeling. One layer of gravel shall be provided to aid in the even collection of water and make efficient use of the softening capacity of the resin.

2.7 SOFTENING MEDIA:

A. High-capacity sulfonated polystyrene ion-exchange resin that is stable over the entire pH range of the water being treated with good resistance to bead fracture from attrition or shock. Minimum exchange capacity of 30,000 grains/cu. ft. when regenerated with 15 pounds of salt. The media shall be solid, of the proper particle size and shall contain no agglomerates, shells, plates or other shapes that might interfere with the normal function of the water softener. The resins shall be manufactured to comply with the food additive regulations, 21 CFR 173.25 as set forth by the US FDA.

2.8 AUTOMATIC CONTROLS:

A. Automatic controls shall be of top mount design. Provide corrosion proof valve head construction, with no dissimilar metals, utilizing a bolt-down flange connection to permit proper positioning between the valve and the conditioner tank openings. Valve head shall have provisions for either left-hand or right-hand raw water plumbing connections to simplify installation while maintaining a forward facing controller for easy servicing. Provide readily accessible service connections. Provide a fully automatic multi-port control valve operated by a rotary pilot that hydraulically or electronically activates cartridge style diaphragm valves to accomplish regeneration. The multi-port valve shall incorporate self-adjusting flow regulators to control the rate of flow and prevent resin loss during back-wash, brine rinse, and brine refill positions, regardless of pressure fluctuations between 30 and 100 psig. The control shall open and close slowly to prevent noise and hydraulic shock. It shall have provisions for manual by-pass of hard water. The electrical control mechanism shall be enclosed in a gasketed, moisture-and corrosion resistant case. The enclosure shall conform to NEMA 3 enclosure standards.

B. On duplex resin tank systems, the controller shall automatically switched back and forth between charged and expended resin tanks to provide a continuous supply of soft water.

C. Provide a digital demand control system installed on the unit. It shall include a turbine meter and a solid state control device to permit regeneration on a metered volume basis. The totalizing turbine water meter shall be installed in the outlet pipe of the unit. This meter shall continuously measure and record the amount of treated water that has flowed to the service. Regeneration shall not be activated until a user adjustable time of day. The controller shall also indicate the current flow rate and the estimated days' remaining before a brine tank refill is required.

D. Controls shall have an adjustable duration of the various steps in regeneration and allow for pushbutton manual operation. Control system shall have 10 year non prorated guarantee. Regeneration shall be initiated based on total gallons softened (programmable) and average daily use, compensated for extra-high or low use, with time of regeneration preset to a user selectable time.

2.9 AUXILIARY EQUIPMENT

A. Provide pressure gauge on inlet and outlet of softener.

B. Provide test cock to sample water in and soft water out.

2.10 BRINE

A. High-purity sodium chloride, free of dirt and foreign material. Processed, food grade salt pellets, 99% pure. Rock and granulated forms are not acceptable.

2.11 INSTRUCTIONS:

A. Provide 4 complete sets of installation, operation and maintenance manuals covering the equipment.

PART 3 - EXECUTION

3.1 INSTALLATION:

A. Complete installation shall be in accordance with manufacturer's instruction and recommendations. Contractor shall be responsible for receiving all equipment, placing and assembling of all components for a complete and operational system.

B. Install the equipment level on a concrete base sloped so that water will not stand under or around the equipment.

C. Make all connections required. Provide rigid connections to softener input and output water connections, using approved joining methods. Hoses shall not be used.

D. Install service valves to isolate the softener system input and output, and to provide a bypass path around the softener to allow softener servicing.

E. Install brine tank overflow drain line, routed to a floor drain, terminated with an approved air gap. Use approved materials and secure drain line using approved hangers.

F. For softeners used in drinking water systems, flush, clean, and disinfect per Related Section and manufacturer’s instructions.

3.2 CHECK, TEST & START-UP:

A. Check, test and start-up services shall be provided by a factory trained representative as follows:

1. Inspect the equipment to verify proper installation.
2. Set-up the controller and place the equipment into operation.
3. Test to verify all performance.

B. The manufacturer representative's shall provide a written report within 3 days of the Check, Test, Start-up. Report shall include information on services provided, document all controller settings, and indicate the results of the water quality performance tests.

3.3 TRAINING

A. Factory trained representative shall provide training to owner maintenance staff on the control and operation of the softening equipment and accessories. This shall include adjusting controller settings, cleaning of eductor and filters, other general maintenance procedures, and rebuilding the control valve head. Provide a spare control valve head to demonstrate rebuilding.

3.4 COMMISSIONING

A. Perform the commissioning activities as outlined in the Division 01 Section Commissioning and other requirements of the Contract Documents.

END OF SECTION 223116