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DETAILED EQUIPMENT SPECIFICATION

MHC SERIES WATER SOFTENERS

1.0 SCOPE

- 1.1 Provide as indicated a factory assembled vertical pressure type water softener system shipped with manifold piping attached to the resin tank for ease of installation and startup. The system shall be of an approved design as fabricated by a manufacturer regularly engaged in the production of water treatment equipment. All equipment and material shall be supplied in compliance with the specifications as intended for a complete and operational system.
- 1.2 Qualified manufacturers of water treatment equipment of the type specified are Marlo, Inc. or engineer's approved equal.

2.0 GENERAL DESCRIPTION

- 2.1 The system in compliance with equipment specifications is described as an automatic **(single) (parallel twin) (alternating twin) (parallel triple) (alternating triple)** water softener system meeting the performance and design data requirements as hereinafter specified.
- 2.2 The system specifications are based on Marlo Model MHC-_____.

3.0 PERFORMANCE & DESIGN DATA

- 3.1 INFLUENT WATER ANALYSIS
 - Total Hardness _____ GPG as CaCO₃
 - Iron (Fe) _____ ppm
 - Turbidity _____ NTU
 - pH _____
- 3.2 EFFLUENT WATER QUALITY _____ ZERO GPG Hardness
 (ASTM Soap Test Method)
- 3.3 DESIGN PARAMETERS
 - Continuous System Flow & Pressure Drop _____ GPM @ _____ psi
 - Peak System Flow & Pressure Drop _____ GPM @ _____ psi
 - Daily Water Usage _____ Gallons/Day
 - Daily Hours of Water Demand _____ Hours/Day
 - Operating Temperature Range 35 - 110°F
 - Operating Pressure Range (System) _____ PSIG
 - Electrical Requirements 120 V 60 Hz
 - System Dimensions (LxWxH) _____ L _____ W _____ H
- 3.4 EQUIPMENT SCHEDULE
 - Softener Tanks Qty. _____ Dia. _____ in. Side Shell _____ in.
 - Service Valves Size _____ Type _____
 - Softening Resin Qty. _____ ft³/tank _____ ft³ total
 - Brine Maker Qty. _____ Dia. _____ in. Height _____ in.

Salt Storage _____ lbs.
 Regeneration Type **(Time Clock) (Metered)**
 Water Meter(s) Qty. _____ Size _____ in. Type _____

4.0 EQUIPMENT DESCRIPTION

4.1 SOFTENER TANKS

Tanks shall be of welded construction of tank-quality carbon steel. The tank(s) shall have threaded or flanged openings for pipe connections and an 11" x 15" manhole in the top head. The tank(s) shall be rated for 100 psig working pressure and 150 psig test pressure. Support legs shall be structural steel angle type with pad feet. The tank(s) shall have a 2-3 DFT prime coated exterior and a 10-12 mils DFT epoxy lined interior. A minimum freeboard of 50% shall be provided for backwash expansion above the normal ion exchange resin bed level.

4.1.1 TANK OPTION

The softener vessels shall be fabricated in accordance with ASME Section VIII, certified and stamped. Working pressure to be either 100, 125, or 150 psig and hydrotested to 150, 187.5, or 225 psig.

4.1.2 TANK OPTION

Provide safety blue epoxy finish paint 6-8 mils DFT over exterior tank and valve surfaces.

4.2 UPPER DISTRIBUTOR

The upper distribution system shall be a single point baffle constructed of Schedule-40 galvanized steel pipe and fittings.

4.3 LOWER DISTRIBUTOR

The lower distributor system shall be of the hub and radial type design, constructed of PVC with slotted full flow non-clogging replaceable ABS strainers and covered with a subfill of 1/8"x 1/16" washed gravel.

4.4 MAIN OPERATING VALVES

The main operating valves shall be a nest of individual diaphragm valves on vessels with 4" piping and smaller. The valves shall have cast iron bodies, BUNA-N diaphragms, and stainless steel/brass internal parts.

The inlet/outlet service valves shall be butterfly valves on softeners with 6" piping and larger. The butterfly valves shall have epoxy-coated cast iron bodies, EPDM seats, and stainless steel discs and stems. Valves are operated with double-acting actuators.

All operating valves shall be slow opening and closing, and free of water hammer. There shall be no contact of dissimilar metals within the valves and no special tools shall be required to service the valves. Valves can be operated either hydraulically or pneumatically.

4.5 BRINE SYSTEM

The brine system shall be a wet-salt combination salt storage-brine measuring type with sufficient capacity for at least four softener regenerations at full salting. The tank shall be of polyethylene or FRP construction. It shall be equipped with a float-operated, diaphragm type brine valve for precise control of brine draw and tank re-fill and field-adjustable for varying salt dosages. Brine shall be transferred and diluted to the softener vessel via a venturi type injector. The injector shall be constructed of PVC with a self-adjusting compensator to convey brine at the correct flow rate regardless variations of water pressure.

4.6 SOFTENING RESIN

Resin shall be of a premium grade, high capacity sulfonated polystyrene type, furnished in the sodium form. It shall be stable over the entire pH range, with good resistance to bead fracture from attrition or osmotic shock. The resin shall be capable of 30,000 grains of hardness capacity (as CaCO₃) per cubic foot when regenerated with 15 lbs. NaCl salt.

4.7 FLOW CONTROL

An automatic backwash control shall be provided to maintain a proper backwash and fast flush flows over wide variations of operating pressure. Controller shall contain no moving parts, and require no field adjustment.

4.8 PIPING AND FITTINGS

The main operating valves and manifold piping shall be factory assembled and shipped attached to the resin tank for ease of installation and start-up. Piping shall be Schedule 40 carbon steel. Galvanized fittings shall be standard Class 150 threaded malleable iron for fittings 4" diameter and smaller. Cast iron flanged shall be used for fittings 6" diameter and larger.

4.9 CONTROL SYSTEM

A NEMA 12 rated, factory mounted and wired electrical enclosure with all timing and sequencing controls for each softener shall be manufactured and provided by the same vendor providing the water treatment hardware.

The controls shall include an automatic regeneration timer having the capability of providing adjustable regeneration steps of backwash, brine injection, brine displacement, flush and return to service. Indicator lights on the panel door shall display the current status of the system.

A multi-ported pilot control stager shall be factory wired and pre-tubed to automatically pressure activate the main operating valves through the steps of regeneration. An indicator on the stager indicates the cycle of operation at all times. Complete function and control of all regeneration steps can be performed manually in the event of power failure.

5.0 REGENERATION INITIATION OPTIONS (Choose One)

5.1 TIME CLOCK (Single or Parallel Tank Systems)

Each water softener shall be equipped with a 12-Day electrical time clock controller. It shall be fully adjustable to initiate regeneration at any hour of the day and any day of the week.

5.2 MF-ET AUTOMATIC RESET METER (Single or Parallel Tank Systems)

Each water softener vessel shall be equipped with a single, impeller type water meter in the outlet piping. When the user specified volume is reached, the meter register will send a 120 volt signal to the control system that will direct the softener to begin regeneration immediately or delayed to a user set time. Electrical lock-outs shall be provided to prevent simultaneous regeneration of the softener vessels. Meter register shall be mounted in a NEMA-3R environmental enclosure and have digital display of continuous flow rate and volume totalization. For use for systems with service piping 3" diameter and smaller.

5.3 MF-ET AUTOMATIC RESET METER (Twin Alternating Systems)

The twin water softener shall be equipped with a single, impeller type water meter in the common outlet header. When the user specified volume is reached, the meter register will send a 120 volt signal to an alternator stager that will direct the softener presently on-line to begin regeneration immediately while placing the stand-by softener into service mode. System shall produce a continuous supply of soft water. Meter register shall be mounted in a NEMA-3R environmental enclosure and have digital display of continuous flow rate and volume totalization. For use for systems with outlet service piping 3" diameter and smaller.

5.4 MB-AR AUTOMATIC RESET METER (Twin Alternating Systems)

The twin water softener shall be equipped with a single, turbine type water meter in the common outlet header. When the user specified volume is reached, the meter register will send a 120 volt signal to an alternator stager that will direct the softener presently on-line to begin regeneration immediately while placing the stand-by softener into service mode. System shall produce a continuous supply of soft water. The AR meter register shall totalize the flow mechanically. For use for systems with outlet service piping 6" diameter and smaller.

5.5 MX ELECTRONIC PROGRAMMABLE CONTROLLER

The system shall consist of **(two)** or **(three)** softener tanks each having a dedicated insertion type paddle wheel flow sensor in the softener outlet piping and operate in either of these user selected modes:

- Alternating – One (1) softener tank will be in stand-by or regeneration and **one (1)** or **two (2)** media tank(s) will be on-line. At a user-specified volume the stand-by tank will go on-line and the exhausted tank will go into regeneration. After regeneration this tank will go into stand-by until its rotation to go back on-line.
- Parallel – All softener tanks are on-line simultaneously. As each media tank's user specified volume is reached it shall immediately be taken off-line, regenerated, and placed immediately back on-line.
- Additive Flow – One (1) softener tank, designated as the primary, will remain on-line at all times. Variation of treated water flow demand shall automatically cause one additional media tank (up to two additional media tanks) to change status from stand-by to on-line and back to stand-by as needed. When the primary softener tank regenerates, the next media tank in sequence shall become the primary.

As each softener tank user set volume is reached, it will immediately be taken off-line, regenerated and placed immediately back on-line or stand-by depending treated water flow demand. The controller shall be capable of continuously determining the exhaustion rate of each softener tank thus automatically avoiding the possibility of a simultaneous regeneration attempt. Simultaneous regenerations are not possible.

The exchange capacity of each softener can be the same or different. Flow rate or peak flow rate indication shall be continuously displayed for each unit. The continuous flow range is 0-999 flow units per minute (gallons, cu-ft., liters, cu-m., etc). Cumulative volume totalization to eight (8) digits shall be continuously displayed for each unit.

6.0 SKID MOUNT, PREPIPE AND PREWIRE OPTION

The softener tanks shall be skid mounted on a 6" channel iron skid (13.0 lbs. per foot, ASTM grade A-36). The skid shall be cross-braced with 6" channel or angle iron. All steel surfaces shall be finish coated to match exterior of softener tanks. All interconnecting shall be the same material as the valve nest manifold piping and shall be assembled by the manufacturer.

This shall include inlet and outlet isolation valves for each tank and a system bypass valve. Isolation valves 3" diameter and smaller shall be gate type and constructed of cast bronze. Isolation valves 4" diameter and larger shall be butterfly type with epoxy-coated cast iron bodies, EPDM seats, stainless steel discs/stems, and a 10-position locking operator handle. Inlet, outlet, and drain headers shall be provided and terminated at the skid edge. All piping shall be suitably supported by channel supports anchored to the skid. Electric wiring, where applicable, shall be complete between all inter unit controls and require only a single power source connection.

The interconnecting wiring shall be contained in waterproof conduit. All inter-tank hydraulic or pneumatic tubing shall be installed as part of the skid package.

The softener tanks are to be bolted to the skid. Permanent attachment, or welding, will not be acceptable. The entire skid mounted system shall be leak and electrically tested as a unit by the manufacturer before shipment.

7.0 ACCESSORIES

- 7.1 Water test kits for hardness test shall be supplied to conduct soap drop test.
- 7.2 Pressure gauges for hard water inlet and soft water outlet.

7.3 Sampling cocks for hard water inlet and soft water outlet.

8.0 INSTRUCTIONS

A complete set of installation, operating, and maintenance manuals shall be provided.

9.0 FIELD SERVICE

The services of a factory authorized service representative shall be made available to supervise, inspect, and provide operator training as required for initial start-up and system operation.

10.0 WARRANTY/GUARANTEE

Attrition loss of resin is guaranteed not to exceed 3% per year for a period of three (3) years.

The manufacturer guarantees that under actual operating conditions the mineral shall not be washed out of the system during the service run or backwashing period; and that the turbidity and color of the effluent, by reason of passing through the softener system, shall not be greater than the incoming water; and that the underdrain system, gravel and minerals shall not become fouled, either with turbidity or by dirt, rust or scale from the softening system while operating as noted in manufacturer's instructions.

All mechanical and electrical equipment is guaranteed for one (1) year against any defects in workmanship or materials. Any part proving defective shall be replaced or repaired within this period at manufacturer's option.