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DETAILED EQUIPMENT SPECIFICATION

MR 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 start up. 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 engineers approval 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 _____.

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	_____ °F Maximum
Operating Pressure Range (System)	_____ PSIG
Electrical Requirements	_____ V _____ Hz

3.3 EQUIPMENT SCHEDULE

Softener Tanks	Qty. _____ Dia. _____ in. Side Shell _____ in.
Service Valves	Size _____ in. Type _____.
Softening Resin	Qty. _____ cu. ft.

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

- 4.1 Tank
 Softener tank(s) shall be of welded construction of tank-quality carbon steel. The tank(s) shall have threaded openings for pipe connections and an 11" x 15" manhole in the top head (for tanks 30" diameter and smaller; two 4" x 6" handholes shall be provided in the top head and lower side shell). The tank(s) shall be rated for 100 psig working pressure and 150 psig test pressure. Support legs shall be the strap-type permanently welded to the lower tank head. The tank(s) shall have their exterior and interior protected with a hot dipped galvanized application after fabrication. A minimum freeboard of 50% shall be provided for backwash expansion above the normal ion exchange resin bed level.
- 4.2 Tank Option
 Provide pressure vessel in accordance with ASME Section VII. Working pressure to be 100, 125 or 150 pounds, hydrotested to 150, 187.5 or 225 psig stamped and certified.
- 4.3 Tank Option
 Provide cold-set epoxy internal lining with a minimum of 10 – 12 mils DFT and a rust resistant prime coat external coating 2 – 3 mils DFT.
- 4.4 Tank Option
 Provide safety blue epoxy finish paint 6 – 8 mils DFT over exterior tank and valve surfaces.
- 4.5 Upper Distributor
 The upper distribution system shall be a single point baffle constructed of Schedule-40 galvanized steel pipe and fittings.
- 4.6 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.
- 4.7 Main Operating Valves
 The main operating valves shall be a nest of individual diaphragm valves. The valves shall have cast iron bodies, Buna-N diaphragm and stainless steel and brass internal parts. The 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.
- 4.8 Brine System
 The brine system shall be platform type with a dry salt storage compartment and a saturated brine compartment sufficient for at least four regenerations at full salting. The tank shall be of polyethylene construction. It shall be equipped with a float operated plastic brine valve and allow for simple adjustment of salt dosage without removal of salt or salt shelf system.

- 4.9 Resin
Resin shall be of a premium grade high capacity synthetic sulfonamide styrene divinyl benzene type, to be furnished in the sodium form. It shall be stable over the entire pH range, have good resistance to bead fracture, and be insoluble in all common solvents. The resin shall be capable of 30,000 grains per cubic foot capacity when regenerated with 15 lbs. NaCl.
- 4.10 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.
- 4.11 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 galvanized steel. Galvanized fittings shall be standard Class 150 threaded malleable iron.
- 4.12 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 site 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 a power failure.

5.0 REGENERATION INITIATION OPTIONS (Choose One)

- 5.1 Time Clock
The 12-Day electrical time clock controller 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 Tank)
The single water softener 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.
- Meter register shall be mounted in a NEMA-3R environmental enclosure and have digital display of continuous flow rate and volume totalization.
- 5.3 MF-ET Automatic Reset Meter (Twin Alternating)
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.

5.4 MX Electronic Programmable Controller

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

- Alternating – One (1) media tank will be in standby or regeneration and **one (1) or two (2)** media tanks will be on-line. At a user-specified volume the standby tank will go on-line and the exhausted tank will go into regeneration. After regeneration this tank will go into standby until its rotation to go back on-line.
- Parallel - All media 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) media 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 standby to on-line and back to standby as needed. When the primary media tank regenerates, the next media tank in sequence shall become the primary.

As each media tank user set volume is reached, it will immediately be taken off-line, regenerated and placed immediately back on-line or standby depending on treated water flow demand. The controller shall be capable of continuously determining the exhaustion rate of each media 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 mineral tanks shall be skid mounted on a 4" channel iron skid (7.25 lbs. per foot, ASTM grade A-36). The skid shall be cross-braced with 4" channel or angle iron. All steel surfaces shall be finish coated to match exterior of softener tanks. All interconnecting piping shall be the same material as the valve nest manifold piping and shall be assembled by the manufacturer.

This shall include inlet and outlet bronze isolation valves for each tank and a bronze system bypass valve. 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 inter unit wiring shall be contained in waterproof conduit. All inter-tank hydraulic or pneumatic tubing shall be installed as part of the skid package.

The mineral 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 GUARANTEES

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

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.

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.