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## DETAILED EQUIPMENT SPECIFICATION

### MFS SERIES FILTERS

#### **1.0 SCOPE**

- 1.1 Provide as indicated a factory assembled vertical pressure type filter system shipped with manifold piping attached to the filter 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 The filter system is intended for \_\_\_\_\_. Choose one of the following: (Iron / Manganese Removal) (Acid Neutralization) (Sediment Removal) (Taste / Odor, Organic Reduction, Chlorine Removal) (Other).
- 1.3 Qualified manufacturers of water conditioning equipment shall be engaged in the manufacture of this type of equipment for a period of not less than (10) years. Acceptable manufacturers are Marlo Inc, or engineer's approval equal.

#### **2.0 GENERAL DESCRIPTION**

- 2.1 The system, in compliance with equipment specifications, is described as a manual \_\_\_\_\_ Choose one of the following:(Single) (Twin) (Triple) (Quad) (Other) water filter system meeting the design data requirements as hereinafter specified.
- 2.2 The system specifications are based on Marlo Model\_\_\_\_\_.

#### **3.0 DESIGN DATA**

- 3.1 Normal System Flow & Pressure Drop \_\_\_ GPM@ \_\_\_ PSI per vessel  
Maximum System Flow & Pressure Drop \_\_\_ GPM@ \_\_\_ PSI per vessel  
Daily Water Usage \_\_\_\_\_Gallons/Day  
Daily Hours of Water Demand \_\_\_\_\_Hours/Day  
Backwash Flow \_\_\_ GPM  
Filter Tank Freeboard \_\_\_\_\_% minimum.  
Operating Temperature Range \_\_\_\_\_°F  
Operating Pressure Range (System) \_\_\_\_\_PSIG  
Electrical Requirement \_\_\_\_\_  
System Dimensions (LxWxH) \_\_\_\_\_

(Note – pressure drop with unit(s) on line and backwashed clean).

### 3.2 EQUIPMENT SCHEDULE

Filter Tanks Qty. \_\_\_\_\_ Dia. \_\_\_\_\_ in. SideShell \_\_\_\_\_ in.  
Service Valves Size \_\_\_\_\_ in. Type \_\_\_\_\_  
Filter Media Qty. \_\_\_\_\_ cu. ft./tank \_\_\_\_\_ cu.ft.total

Backwash / Regeneration Controller Type \_\_\_\_\_.

## 4.0

### EQUIPMENT

#### 4.1 Filter Tank (s)

Filter tank (s) shall be of welded construction of tank-quality carbon steel. Each tank shall be \_\_\_\_\_" diameter with a \_\_\_\_\_" straight side shell height. 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 on tanks 20" diameter through 42" diameter. Structural angle iron legs welded to tank side shell shall be provided on tanks 48" diameter through 72" diameter tanks. The tank(s) shall have their interior protected with cold-set epoxy internal lining with a minimum of 10-12 mils DFT and rust resistant prime coat external coating 2-3 mils DFT after fabrications. A minimum free-board of 50% shall be provided for backwash expansion above the normal filter media bed level.

##### 4.1.1 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.

##### 4.1.2 Tank Option

Provide safety blue epoxy finish paint 6–8 mils DFT over exterior tank and valve surfaces. To be applied on channel iron skid surface if applicable.

#### 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. 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 services the valves. Valves can be operated either hydraulically or pneumatically.

##### 4.4.1 Manual Valve Option

The main operating valves shall be a nest of individual gate valves. The valves shall be bronze bodied with bronze trim and non-rising stem.

- 4.5 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 filed adjustment.
- 4.6 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 Scheduled 40 galvanized steel. Galvanized fittings shall be standard Class 150 threaded malleable iron.
- 4.6.1 Separate Source Backwash Option  
The filter system shall be furnished with a piping system which allows use of a separate source of water for backwashing.

## **5.0 REGENERATION INITIATION OPTIONS (Choose One)**

- 5.1 Control  
A NEMA 12 rated, factory mounted and wired electrical enclosure with all timing and sequencing controls for each filter shall be manufactured and provided by the same vendor providing the water treatment hardware. The controls shall include an automatic regeneration sequencer having the capability of providing site adjustable regeneration steps of backwash, flush and return to service. An indicator on the pilot stager indicates the cycle of operation at all times. Complete function and control of all regeneration steps can be performed by manual operation of the pilot stager. The 12-Day Electrical Time Clock Controller shall be fully adjustable to initiate backwash at any hour of the day and any day of the week.
- 5.1.1 Control Option  
Differential pressure switch initiation controller. Backwash shall be initiated based on a measurement of increased pressure loss across the system.
- 5.1.2 Control Option.  
An auxiliary switch shall be provided to allow the filter to be interlocked with other equipment during the regeneration cycle.

## **6.0 FILTER MEDIA – CHOOSE ONE OF THE FOLLOWING:**

- 6.1 Manganese Greensand  
The filter bed shall be provided for iron, manganese and suspended solids removal. The media has an effective size of 0.3 to 0.35 mm and filter requires a minimum bed depth of 30 inches. Regeneration with potassium permanganate is needed for efficient iron and manganese removal.
- 6.2 Manganese Greensand / Anthracite  
A dual-media filter bed shall be provided for efficient iron, manganese and suspended solids removal. The filter bed consists of two layers of media to reduce filter pressure drop, provide deep bed filtration and long filter runs. The first layer will consist of hard coal anthracite with an effective size of 0.6 to 0.8 mm. The second layer consists of manganese greensand with an effective size of 0.3 to 0.35 mm. Total bed depth shall be a minimum of 30 inches. The manganese greensand can be regenerated with potassium permanganate and chlorine for efficient iron and manganese removal.

- 6.1 **Activated Carbon**  
An activated carbon filter bed will be provided for chlorine, organic, color, taste and odor removal. The carbon shall be manufactured from bituminous coal with a 12 x 40 mesh particle size and has approximately 900 square meters or surface area per gram. The carbon will have a minimum iodine number of 800 and a minimum abrasion number of 75. The carbon bed depth shall be a minimum of 30 inches.
- 6.2 **Multi – media**  
A multi-media filter bed will be provided for superior quality effluent and long filter runs. The filter bed shall be constructed of graded layers of media to provide deep bed filtration, low pressure drop and the ability to remove particles down to 10 microns. The top layer will consist of hard coal anthracite with an effective size of 0.6 to 0.8 mm. The second layer consist of sand with an effective size of 0.45 to 0.55 mm. The third layer consists of 30 to 40 mesh garnet with and effective size of 0.25 to 0.42 mm. The fourth layer consists of 8 – 12 mesh garnet with and effective size of 1.4 mm. Total bed depth shall be a minimum of 30 inches.
- 6.3 **Filter AG**  
The filter media shall be a non-hydrous aluminum silicate with irregular surface characteristics affording maximum removal of suspended matter throughout the filter bed. The media shall not be affected by chlorine nor require any type of chemical regeneration. Particle retention shall be forty (40) micron or larger.
- 6.4 **Calcite / Corosex**  
The filter media shall be crushed and screened white marble material. The media shall slowly dissolve in contact with acidic water to elevate the pH and increase alkalinity. pH elevation to the range 6.8 to 8.5 shall be accomplished without the use of chemical additives.

## 7.0

### **CHEMICAL REGENERATION SYSTEM OPTION**

Manganese greensand requires regeneration with potassium permanganate in order to provide efficient oxidation / filtration of iron and manganese. Choose one of the following:

- 7.1.0 **Continuous Feed Regeneration**  
An inline flow meter with magnetically operated read switch to provide a contact closure proportional to system flow rate. Meters " through 3" shall be a cast brass body with direct multijet high-speed impeller. Meters 4" and above shall be a paddle type with saddle installation fitting.
- 7.1.1 **An electronically controlled diaphragm type chemical feed pump properly sized for the system flow rate. The pump shall automatically adjust the frequency of stroke based on contacts supplied by the inline flow meter specified in section 7.1.0. The wet end of the pump shall be compatible to the type of chemical required.**
- 7.1.2 **A suitably sized polyethylene tank assembly shall be provided with a minimum capacity of 30 gallons. The tank shall allow for mounting or the pump specified in section 7.1.1 and contain a straightening tube to be run over the pump suction tubing.**
- 7.1.3 **A suitably sized agitator shall be provided for mixing and dissolving the chemicals. The meter shall be totally enclosed fan cooled with an internal on-off switch. The shaft and impeller on the agitator shall be stainless steel with an epoxy coating suitable for the service. The agitator shall be mounted directly to the tank assembly specified in section 7.1.2.**

7.2

#### Batch Regeneration

A chemical regenerant tank shall be supplied to hold potassium permanganate for regeneration of the manganese greensand bed. Tank size diameter \_\_\_\_\_ in. Height \_\_\_\_\_ in. with draw assembly and eductor for periodic batch regeneration.

**8.0**

### **SKID MOUNT, PREPIPE AND PREWIRE OPTION**

The filter mineral tanks shall be skid mounted on a channel iron skid. The skid shall be cross-braced with 4" channel or angle iron. All steel surfaces shall be prime coated. 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 isolation valves for each tank and a 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.

**9.0**

### **ACCESSORIES OPTION**

9.1 Pressure Gauges for raw water inlet and filtered water outlet.

9.2 Sampling Cocks for raw water inlet and filtered water outlet.

**10.0**

### **INSTRUCTIONS**

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

**11.0**

### **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.

**12.0**

### **GUARANTEE**

Under normal operating conditions, the media shall not be washed out of the system during backwash or service. Any mechanical equipment proving defective in workmanship or material within one year after installation or 18 months after shipment, whichever comes first, shall be replaced FOB factory.