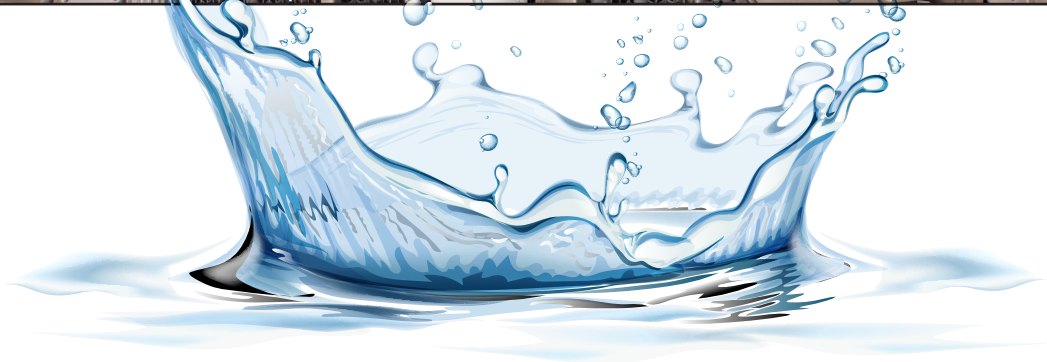




# Installation, Operation & Maintenance Manual



*EVAPCO...SPECIALISTS IN HEAT TRANSFER PRODUCTS  
AND INNOVATIVE TREATMENT SOLUTIONS*



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## 1.0 Components and Function

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- 1.1 The EVAPCO Smart Shield™ consists of three separate components that work together to provide convenient and effective water treatment. These three components are:
  - 1.1.1 An EVAPCO Conductivity Controller with self-draining pre-piped manifold,
  - 1.1.2 A Factory Mounted Feeder (**FMF**), and
  - 1.1.3 A Biological Control Feeder (**BCF**) (s).
- 1.2 The conductivity controller maintains the recirculating water's cycles of concentration by continually measuring the conductivity of the recirculating water with a toroidal sensor. When the conductivity exceeds the site's programmed set point, the controller energizes a motorized ball-valve to bleed higher conductivity water from the system. Lower conductivity make-up water replaces the water bleed-off thereby reducing the conductivity of the recirculating water. When the conductivity drops below the set point and programmed dead band, the controller de-energizes the motorized ball valve. This action maintains the conductivity of the spray water within a defined band which helps to maintain water efficiency by controlling spray water cycles of concentration.
- 1.3 The **FMF** is designed to hold and diffuse multiple solid chemistry inhibitor cartridges. These easy and safe cartridges provide scale and corrosion inhibition via patented controlled release solid chemistry. The corrosion and scale inhibitor residual in the recirculating water system is easily controlled by the number of 1 kilogram (2.2 pound) cartridges which are loaded into the **FMF**. Each cartridge is designed to release chemistry consistently over a 30-day period of operation. Replacement cartridges are available at <https://smartshield.EVAPCO.com>
- 1.4 The **BCF** is designed to hold and diffuse specific granulated biocides. The **BCF** contains two baskets with each basket divided into multiple chambers. The specific biocide designed to be used in your **BCF** will be noted on the top of these baskets. Each chamber will release a consistent quantity of biocide over a 28 to 30 day period of wet operation. The quantity of biocide added to the system is controlled by the number of chambers filled. The specific limitations for dosing are found on the refill box's label.
- 1.5 Both the **FMF** and the **BCF** are designed for operation with integral-pump closed circuit coolers and condensers. DO NOT use these Smart Shield™ components on any other type of equipment without written authorization from EVAPCO.
- 1.6 Discharge water (blowdown and overflow) from all chemically-treated cooling systems (including systems using EVAPCO Smart Shield™) must comply with local discharge regulations. This usually requires that the overflow and discharge from all treated evaporative systems be piped to the sanitary sewer. Check local sewer and discharge regulations before operating the cooling system with EVAPCO Smart Shield™.

## 2.0 Field Connections

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EVAPCO's Smart Shield™ system is designed to ship factory mounted on a closed circuit cooler or evaporative condenser. A few field connections, Figure 1, should be verified before commissioning the Smart Shield system.

### 2.1 Union Ball Valve

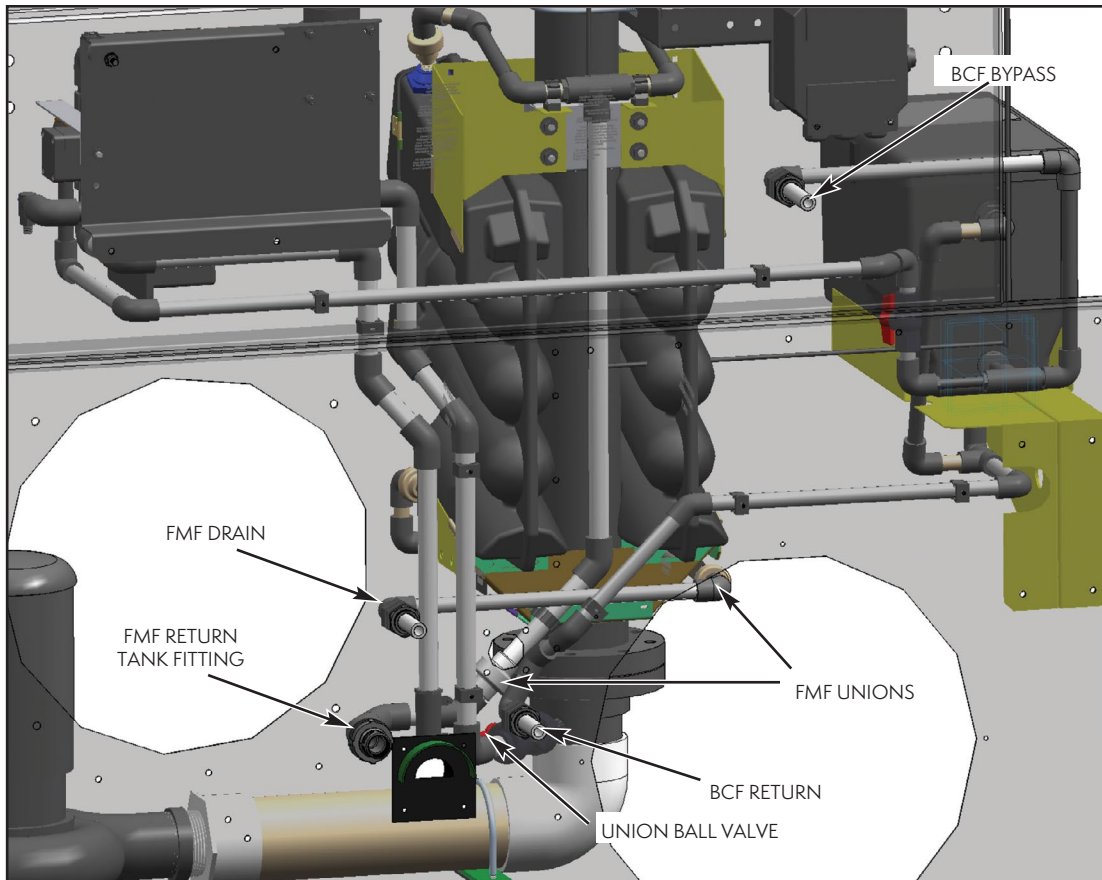
One union ball valve which connects the conductivity probe manifold to the unit's riser pipe ships disassembled. The installation of this union ball valve shall be completed by the contractor prior to equipment commissioning.

### 2.2 Unions

Each Factory Mounted Feeder (FMF) provided includes two unions which connect the return piping from the FMF to the basin. These unions ship disassembled and require connection by the contractor prior to equipment commissioning.

### 2.3 Bulkhead Fittings

Each FMF provided includes two bulkhead fittings located where the return piping penetrates the unit's casing. These bulkhead fittings require hand tightening by the contractor prior to equipment commissioning.



**Figure 1 – Bulkhead Fittings**

## 2.4 Factory Prep Units

Some closed circuit coolers or evaporative condensers require the **FMF** to be shipped loose and disassembled from the unit's riser piping. In these limited cases, the installing contractor shall mount the **FMF** on the riser pipe using the provided flanges and gaskets.

- 2.4.1 Be sure that the faces of the mating surfaces of the flanges are flush against the gasket.
- 2.4.2 Use two flat washers with each bolt. Tighten bolts by hand until snug.
- 2.4.3 Bolts should be tightened in a 180° opposing pattern in 5 ft-lb (7 N-m) increments until the recommended torque reaches as specified in 2.4.4 and 2.4.5..
- 2.4.4 Feeders with six tubes (3 and 4 inch riser pipes) utilize 5/8-inch bolts tightened to 25 foot pounds of torque.
- 2.4.5 Feeders with ten tubes (6 and 8 inch riser pipes) utilize 3/4-inch bolts tightened to 40 foot pounds of torque.

## 3.0 Conductivity Controller

**For details of operation see the Installation, Operation, and Maintenance (IOM) Manual associated with the provided conductivity controller.**

All EVAPCO Conductivity Controllers are supplied with a temperature-compensated toroidal conductivity sensor. EVAPCO Conductivity Controllers are microprocessor-driven type with on/off control outputs.

## 4.0 Bio-Control Feeder (BCF)

The **BCF** is engineered to release a solid biocide into the spray water of a fluid cooler or evaporative condenser. The **BCF** is designed to have recirculating water pass through the **BCF** and back to the basin whenever the spray water pump is in operation but the system is not blowing down. When the spray pump is de-energized water drains by gravity out of the **BCF**, and associated piping, preventing freezing concerns in most locations.

### 4.1 Biocides

Replenishment biocides for your **BCF** are supplied in easy-pouring plastic bags. Each bag has a notched spout for easy opening and no-spill pouring. The **BCF** is designed to handle only EVAPCO supplied product. Other products may not release properly and could result in either insufficient biological control or a violation of local pesticide regulations. It is unlawful to use this product other than as detailed on the label. Review **BCF** label and biocide Material Safety Data Sheet (MSDS) prior to use.

### 4.2 Biocide Storage

Replenishment biocide bags should be stored in a cool dry area away from direct sunlight. Biocide packages have a storage life of 12 months from the shipment or 18-months from the date of manufacturing, whichever is less.

### 4.3 BCF Configuration

The **BCF** consists of two baskets with each basket containing multiple chambers. Each of the baskets has a cover with integral pouring spouts. The spouts allow the biocide granules to be added to the chambers with a minimum of spillage or dust generation. Figure 2 illustrates a **BCF** with two 3-chambered baskets. The small chambers will release approximately one-pound of biocide granules per month while the large chambers will release approximately two-pounds per month.

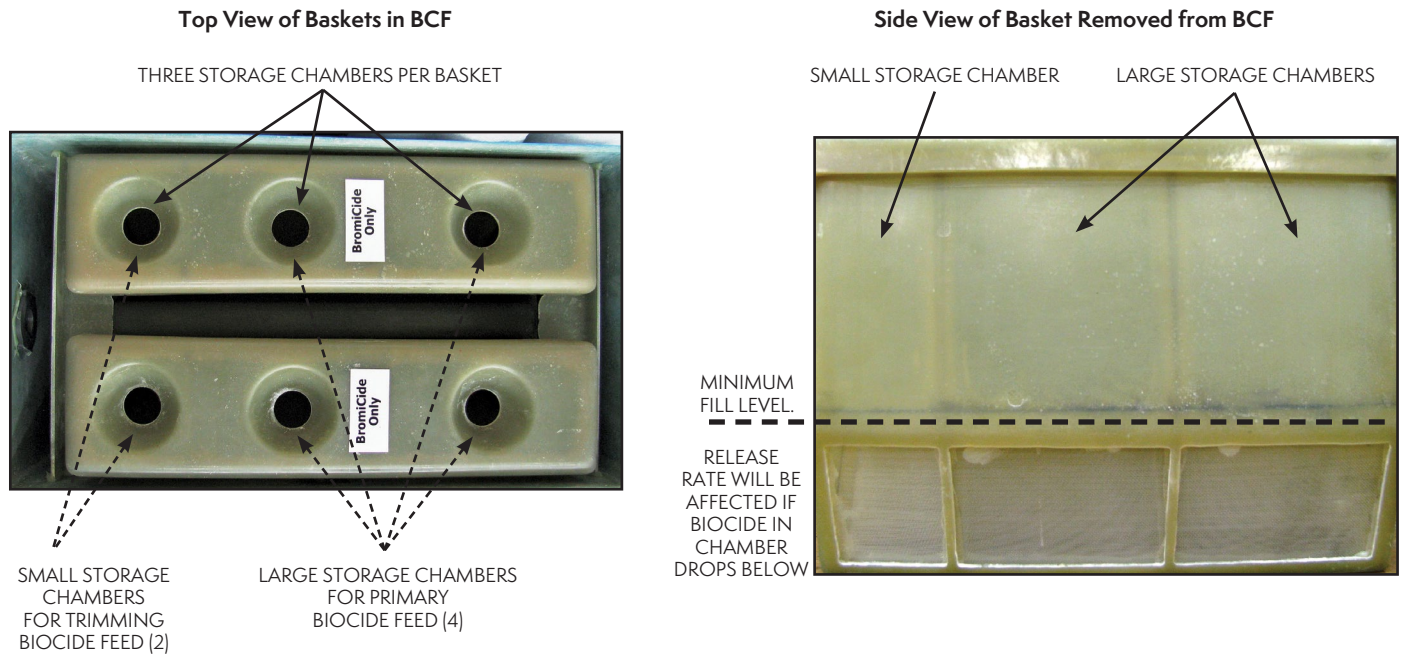


Figure 2 – BCF with Two Baskets with Each Basket Having Three Separate Chambers

## 4.4 Loading the BCF

The **BCF** is piped in line after the conductivity controller probe and blowdown valve. Before loading the **BCF**, close the isolation valve to this line at the riser. Remove the cover and verify that the water is draining out of the **BCF** housing. There is a drain opening in the back of the **BCF** as shown in Figure 3.

After confirming that the **BCF** is draining when flow is interrupted, manually adjust the isolation valve at the riser until water flowing thru the **BCF** completely covers the weir in the front of the unit from side to side.

Add the biocide granules from the easy-pour bag to the required number of individual chambers in your **BCF** baskets. Initial loading of the **BCF** will require at least two bags per small chamber and three bags per large chamber to ensure that there is a full bag of Biocide above the mesh area located on the bottom portion of the basket. The biocide stored above the mesh area helps to ensure consistent release of the biocide over a 30-day period of operation. Replace and fasten the **BCF** cover. *Local regulations may allow disposal of empty bags without rinsing. Follow all local disposal requirements for the empty bags.*

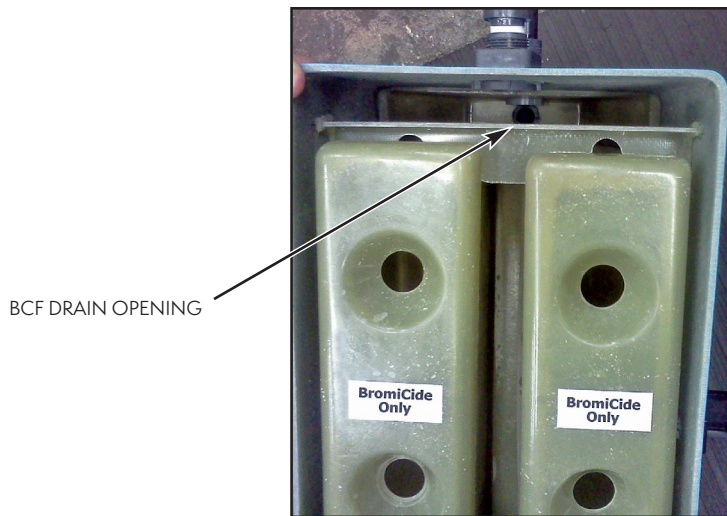


Figure 3 – BCF Drain Opening Location

**NOTE:** The **BCF** drain opening should be inspected monthly and cleaned as required to maintain proper draining of the **BCF**.

## 4.5 Biocide Feed Calculations

This product should be used in accordance with control parameters established for your specific application by your EVAPCO water treatment provider. Your EVAPCO-authorized water treatment service provider will determine the number of individual chambers that need to be filled in your **BCF** baskets based on the ambient conditions, load, make-up water quality and other local conditions. This quantity may vary from month to month.

## 4.6 BCF Piping

Variable flow rates through the **BCF** may cause inconsistent release of the biocide granules. The by-pass loop will direct a consistent flow through the **BCF**. For some units the by-pass consists of multiple flow restrictors in the inlet piping and a horizontal by-pass piping back to the basin at a specific height above the feeder. For other designs, the by-pass piping loops down to the basin. Where the piping loops down, a vent hole is added to the top of the tee as a vacuum break to prevent siphoning. See Figure 4 for the layout of a horizontal by-pass and Figure 5 for a layout of the looped by-pass.

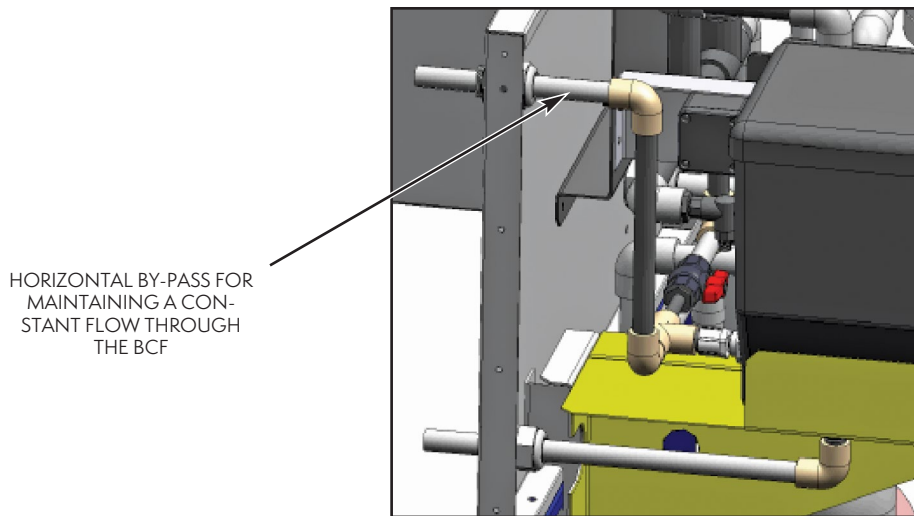


Figure 4 – Horizontal By-Pass on BCF

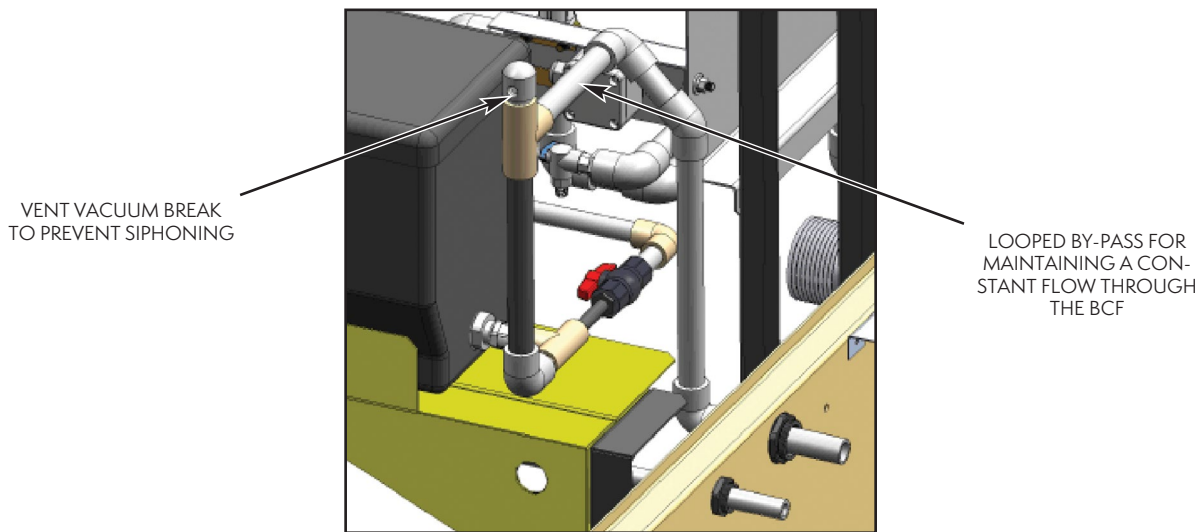


Figure 5 – Looped By-Pass on BCF

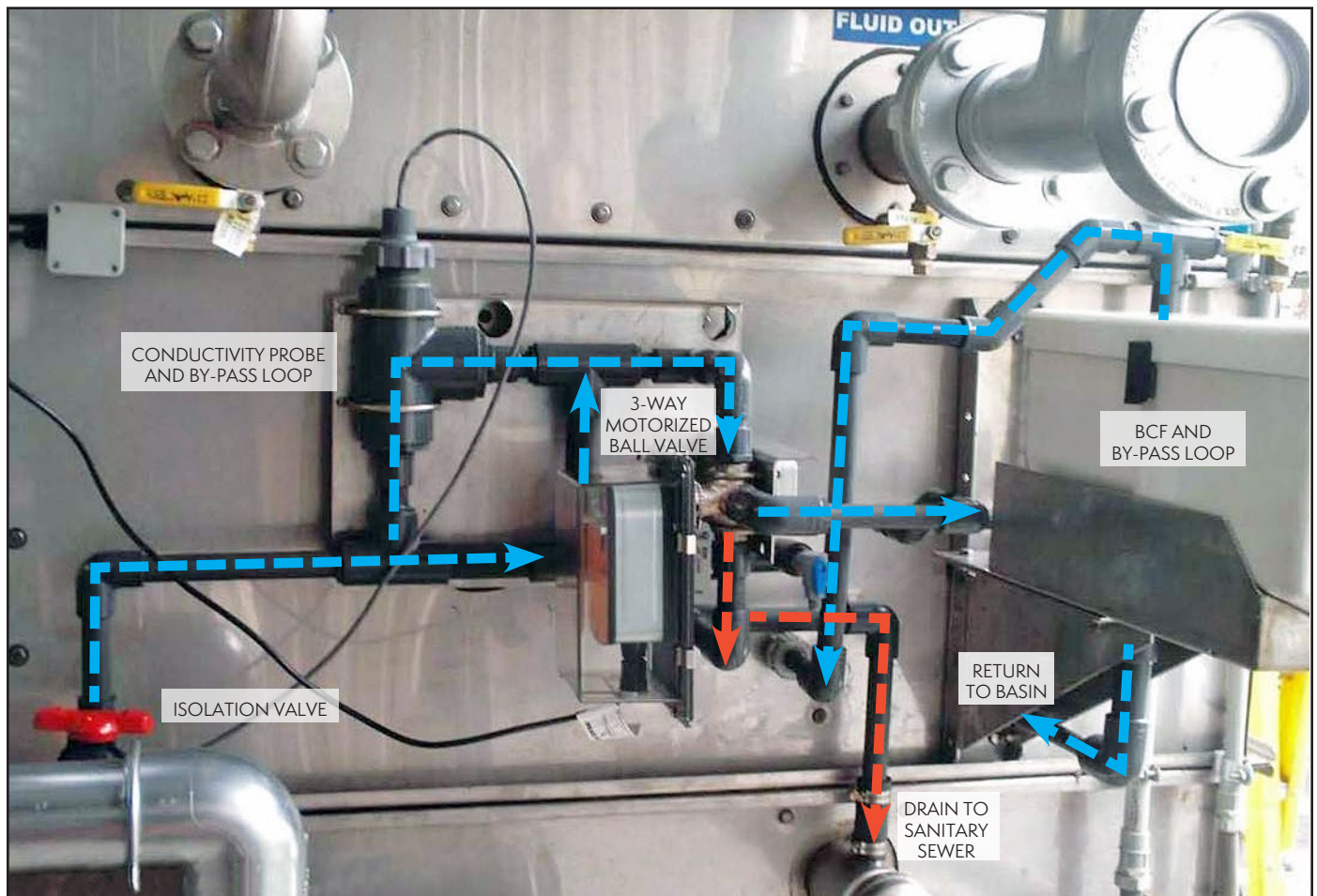
#### 4.7 Periodic Testing

Periodic testing by an EVAPCO-authorized water treatment provider must be performed to verify that the system is performing as designed and to adjust the quantity of chambers filled based on changes in load, ambient conditions, make-up water quality or other local conditions.

Individual **BCF** baskets which contain biocide should be inspected monthly to assure that the product has not bridged at the waterline.

## 5.0 Conductivity Probe Manifold/Blowdown Valve/BCF Piping

- 5.1 The conductivity probe, motorized ball-valve and the **BCF** are all piped together on a single loop off of the spray-pump riser. The patent-pending piping arrangement allows water to drain back to the basin when the spray water pump is not in operation thereby minimizing the need for heat trace and insulation.
- 5.2 When the spray pump is operating, water flows from the riser through an isolation valve and then through the conductivity probe manifold. Water passes both the toroidal probe and around the by-pass which allows a high flow of water to be used for blowdown without subjecting the probe to high turbulence.
- 5.3 During periods of spray pump operation when blowdown is not required, water passes through the **BCF** and another by-pass loop. This **BCF** by-pass loop is designed to regulate flow thru the **BCF** and minimize the potential of the BCF flooding. Water passes through and around the **BCF** and then back into the basin. This flow is shown in Figure 6 with blue arrows.
- 5.4 When the system requires blowdown, the motorized ball-valve is energized and recirculating water goes to drain as shown by the red arrows in Figure 6.



**Figure 6** – Piping Arrangement for the Conductivity Probe Manifold, Blowdown Valve, and BCF. Water Flow shown in Blue when system is NOT in Blowdown; Water Flow shown in Red during Blowdown.



## 6.0 Factory Mounted Feeder (FMF)

The **FMF** is engineered to consistently release corrosion and scale inhibitor into the spray water of a fluid cooler or evaporative condenser during periods of wet operation. During periods of pump operation, a side-stream flow of spray water passes through the **FMF**, comes in contact with the solid inhibitor cartridges and is piped back to the basin. This combination of easy and safe inhibitor cartridges fed via the **FMF** is designed to supply consistent corrosion and scale inhibition for the recirculating water of an evaporative cooling system for a 30-day period of wet operation.

### 6.1 FMF Configuration

EVAPCO's **FMF** are manufactured with either 6 or 10 individual feed tubes which are each sealed with a cam-actuated plug. Each tube is designed to hold a single reload cartridge. Loading the **FMF** consists of filling the appropriate number of tubes with inhibitor cartridges. Review **FMF** label and inhibitor cartridge Material Safety Data Sheet (MSDS) prior to use.

- 6.1.1** When the spray pump is de-energized, water drains by gravity out of the **FMF** preventing freezing concerns in most geographies. Winterizing or heat trace & insulation may be required in winter weather areas.

### 6.2 Loading the FMF

- 6.2.1** To load, the **FMF** must be isolated from the recirculating water flow and drained. This is accomplished by closing the Water Feed Valve then opening the Drain Valve as shown in Figures 7 and 8.
- 6.2.2** Unfasten the door latches and open to reveal individual cam-locks which seal individual tubes on the **FMF**.
- 6.2.3** The **FMF** may take several minutes to drain completely. Please allow a few minutes between opening the drain valve and moving on to the next step.
- 6.2.4** Each tube is closed with a cam-lock plug. Remove the top plug first to ensure the **FMF** has drained. The cam-lock plugs are opened by 180-degree throw as shown in Figure 7. Plug is removed after cam is moved to the open position as shown in Figure 8.

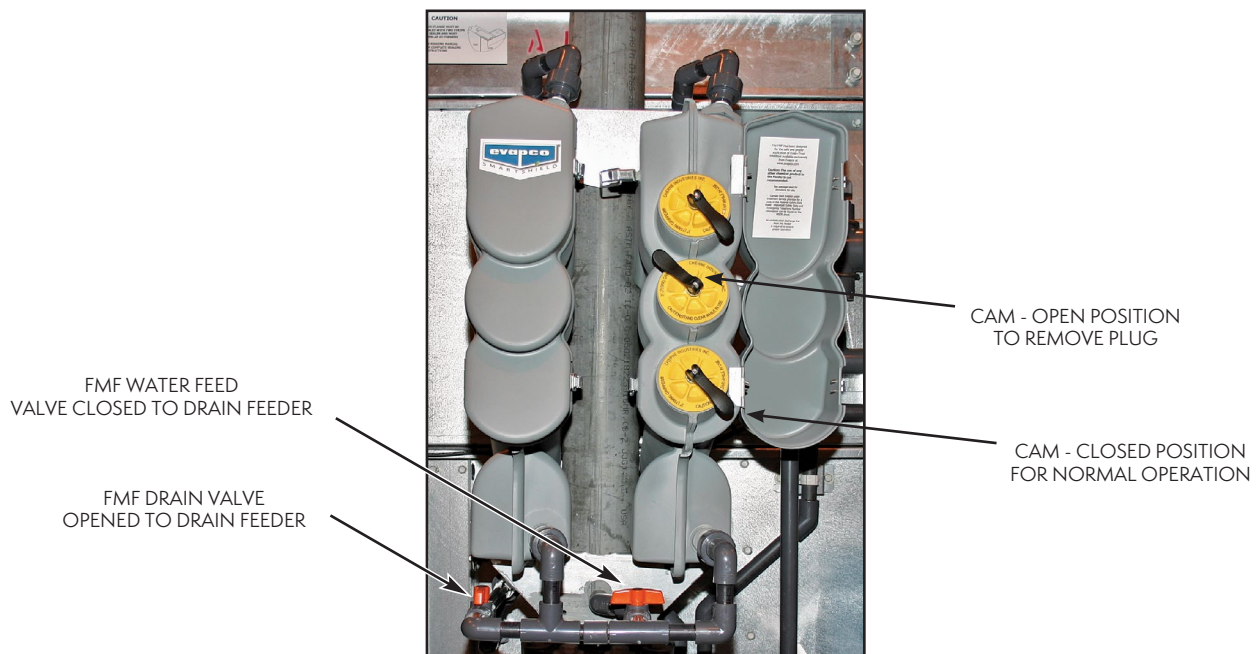


Figure 7 – FMF-6 Cam Lock Positions

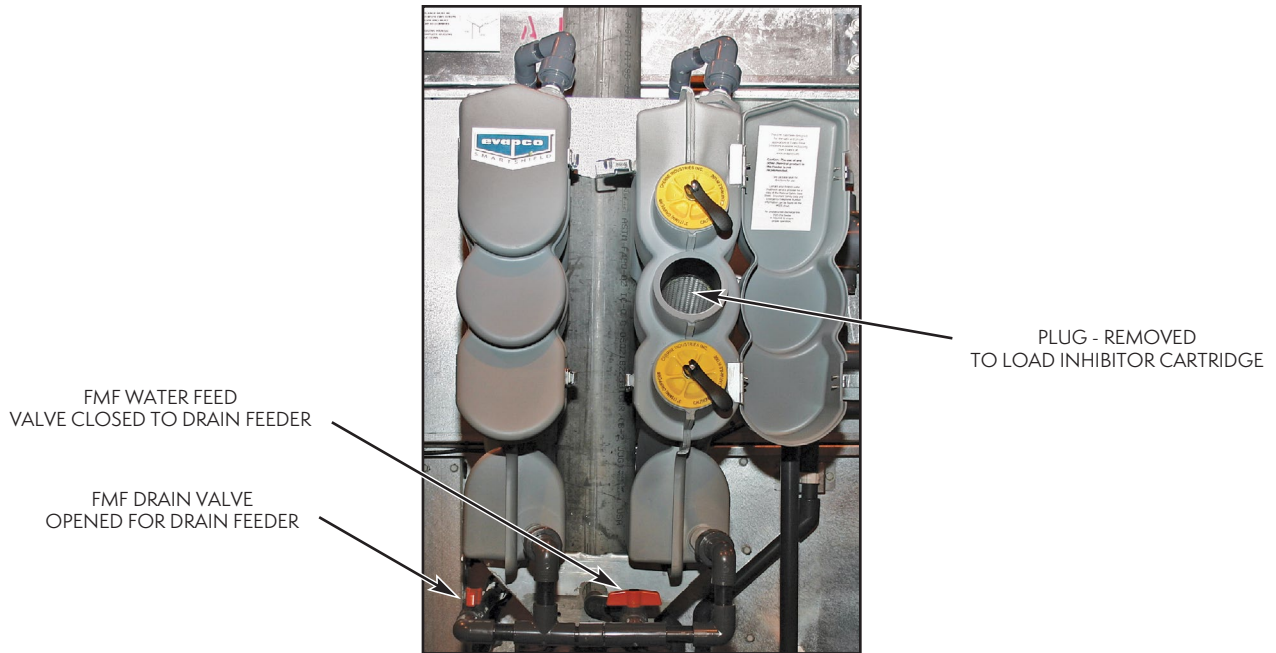


Figure 8 – Inhibitor Reload Tube

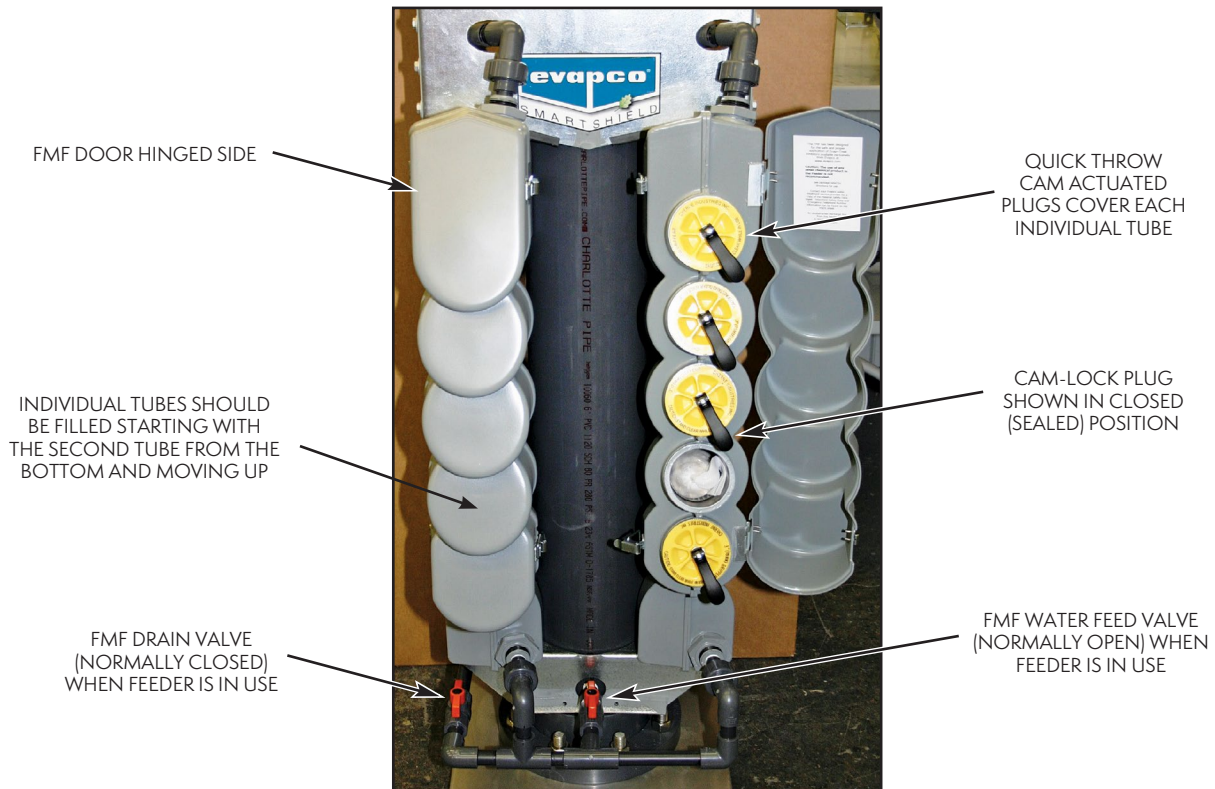


Figure 9 – FMF-10

6.2.5 Each individual **FMF** tube is designed to hold a single reload cartridge as shown in Figure 9. Loading should begin with the second tube from the bottom position and any additional required cartridges should be balanced between the left and right hand feeders.

- 6.2.6 Your EVAPCO-authorized water treatment service provider will determine the number of inhibitor cartridges required based on your system's cycles of concentration, load, make-up water quality and other local conditions. This quantity may vary from month to month.
- 6.2.7 These easy and safe cartridges are designed to release inhibitor over 30-days of continuous operation. If space allows, cartridges may be left in the feeder for up to 60-days of operation.
- 6.2.8 Remove any consumed cartridges and dispose of appropriately. *Local regulations may allow disposal of spent cartridges as municipal solid waste. Follow all local disposal requirements for the spent cartridges.* Replace with new inhibitor cartridges.
- 6.2.9 Replace plug, being sure it seats properly, and then fully close the cam. The cams should be aligned at either the 5 o'clock or 7 o'clock position such that the cam lever points towards the hinged side of the door in the closed position. Once closed, the cam should be finger tight.
- 6.2.10 Verify that the door will fully shut, then close the **FMF**-Drain Valve and open the **FMF**-Water-Feed Valve. Verify that all plugs are water tight then close and latch the door.

### 6.3 Replenishment Chemistry

The easy and safe cartridges are specifically formulated to provide corrosion and scale protection for closed circuit cooler and evaporative condenser spray water systems. These solid chemistry products feature a tableted blend of corrosion inhibitors and polymeric scale inhibitors combined with a patented polymer coating. When used in conjunction with the **FMF**, the polymer coating controls the release of the active chemistry over a 30-day period.

- 6.3.1 Inhibitor cartridges are packaged in 1 kilogram (2.2 pound) cartridges which slide easily into the feeder. Each cartridge is designed for improved safety and ease of handling with EVAPCO's proprietary 'bag in bag' packaging which makes treatment contact free to the end-user. The non-hazardous polymer coated tablets are first packaged in a soluble bag which maintains the cartridge's shape for easy loading. The outer bag allows the tablet's residual polymer coating to be easily removed from the **FMF** when the inhibitor is consumed.
- 6.3.2 All replenishment chemistry should be stored in a cool dry area. Inhibitor cartridges have a storage life of 18 months from the shipment or 2-years from the date of manufacturing, whichever is less.
- 6.3.3 **FMF** Feed Calculation

This product should be used in accordance with control parameters established for your specific application by your EVAPCO water treatment provider. Your EVAPCO-authorized water treatment service provider will determine the number of individual chambers that need to be filled in your **FMF** based on the ambient conditions, cycles of concentration, load, make-up water quality and other local conditions. This quantity may vary from month to month.

### 6.4 Periodic Testing

Periodic testing by an EVAPCO-authorized water treatment provider must be performed to verify that the system is performing as designed.

## 7.0 Winterization and Shutdown

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Proper winterization and shutdown procedures should be in place and utilized for all evaporative cooling equipment.

### 7.1 Winterization

The EVAPCO Smart Shield™ system is designed to be self-draining during periods when the spray water pump is not in operation. Care should be exercised, however, in areas prone to freezing conditions as moisture may remain in the feeders and associated piping during idle periods. Failure to properly heat trace and insulate portions of the evaporative cooling equipment can lead to damage to feeders, pipes, valves, and other system components.

### 7.2 Shutdown

Intermittent operation and/or stagnant water can cause operational problems. Circulation of the spray water system several times per week is recommended for evaporative cooling equipment which is shut-down for short periods of time. If the system is to be off-line for more than a few weeks, or spray water circulation every three days is not practical, the spray water system should be drained.



### 8.0 Passivation

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All new evaporative cooling equipment which includes any galvanized materials of construction requires initial passivation to maximize the service life of the equipment. Consult your evaporative cooling equipment's instruction, operation and maintenance manual for additional information regarding passivation.

A site-specific passivation plan is not included with a Smart Shield™ system unless it is specifically called out as a separate line item. EVAPCO recommends that the site's water treatment vendor should be contacted several weeks prior to adding any water to a new evaporative cooling system so they can provide a passivation plan along with associated passivation plan costs.

### 9.0 Legionella

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*Legionella* bacteria are commonly present in natural and municipal water systems. Human exposure, and subsequent infection, depends on several concurrent factors. Drift that can emit from evaporative cooling equipment may provide a transmission mode of *Legionella* bacteria to humans. Human infection, however, is dependent on various factors such as the host's susceptibility, the level of contamination, and the virulence of the bacteria.

The Biocides used as part of the Smart Shield™ system have been shown to be effective against *Legionella* bacteria in laboratory testing. Even so, EVAPCO does not claim that using the Smart Shield™ system will eliminate the presence of *Legionella* in water or control the potential risk factors for human infection.

There are many practices which may be effective in reducing the potential for *Legionella* infection. For more information, see ASHRAE Guideline 12-2000, "Minimizing the Risk of Legionellosis Associated with Building Water Systems".



## EVAPCO® STANDARD EXPRESS WARRANTY FOR SMART SHIELD™ ONE YEAR TOTAL PRODUCT INCLUDING OPTIONS AND ACCESSORIES

### EXPRESS WARRANTY

EVAPCO warrants all components of the Smart Shield™ Water Treatment System against failure caused by defects in materials and workmanship for a period of twelve (12) months from the date installation is completed in accordance with good engineering practices or eighteen (18) months from the date of shipment, whichever occurs first. Included in this warranty are the Factory Mounted Feeder, Bio-Control Feeder, Conductivity Controller and Optional equipment, if purchased as part of the Smart Shield system, including conductivity probes, and motorized blowdown valves. All defective parts to be repaired or replaced shall be delivered to EVAPCO, shipping prepaid, with return shipment to the Buyer by EVAPCO to be made F.O.B. the factory, shipping prepaid by the Buyer.

**The product warranty is predicated on system operation and maintenance in accordance with EVAPCO's recommended operation and maintenance procedures.** Failure to follow EVAPCO's recommended operation and maintenance procedures will void these warranties. **Labor costs associated with any repair work performed under the terms of the warranties are NOT included within the warranty.**

The Buyer assumes responsibility for compliance with any regulations, codes, standards or ordinances applicable to the installation, location, operation or maintenance of the products. No person, agent, or dealer is authorized to enlarge upon the warranties set out herein or the obligations of EVAPCO hereunder.

### LIMITATION OF LIABILITY

THE SOLE REMEDY FOR BREACH OF THE EXPRESS WARRANTIES DESCRIBED HEREIN SHALL BE REPAIR OR REPLACEMENT OF THE EQUIPMENT BY EVAPCO, OR REFUNDING THE PURCHASE PRICE FOR THE SMART SHIELD WATER TREATMENT SYSTEM SET FORTH ON THE PURCHASE ORDER. IT SHALL BE IN EVAPCO'S SOLE DISCRETION AS TO WHETHER REPAIR, REPLACEMENT OR REFUND IS THE APPROPRIATE REMEDY. IF EVAPCO DECIDES TO MAKE REPAIRS, EVAPCO HAS THE OPTION OF COMPLETING ALL NECESSARY REPAIRS ITSELF, OR AUTHORIZING A THIRD PARTY TO PERFORM SUCH REPAIRS AT EVAPCO'S EXPENSE. EVAPCO IS NOT RESPONSIBLE FOR ANY REPAIR WORK PERFORMED BY A THIRD PARTY THAT EVAPCO DID NOT APPROVE IN WRITING PRIOR TO THE COMMENCEMENT OF SUCH REPAIRS

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