



# CONTROLLED RELEASE SYSTEM

## 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 EVAPCO's Smart Shield® for cooling tower and remote sump applications incorporates four separate components that work together to provide convenient and effective water treatment. These four components are:
  - 1.1.1 Conductivity Controller
  - 1.1.2 Controlled Release Feeder(s) (**CRF**)
  - 1.1.3 Bio-Control Feeder – Non-Oxidizer (**BCF-NX**)
  - 1.1.4 Bio-Control Feeder – Oxidizer (**BCF-OX**)
- 1.2 The conductivity controller maintains the recirculating water's cycles of concentration by continually measuring the conductivity of the recirculating water during system operation. When the recirculating water conductivity exceeds the programmed set point, the controller energizes a motorized ball-valve to bleed higher conductivity water from the system. Lower conductivity make-up water replaces bleed-off thereby reducing the conductivity of the system water. When the conductivity drops below the programmed differential, the controller closes the motorized ball-valve. This process maintains the conductivity of the system water within a defined band which helps to ensure water treatment success and water efficiency.
- 1.3 The Controlled Release Feeder(s) (**CRF**) is designed to provide safe and reliable feed of EVAPCO's CR (Controlled Release) scale and corrosion inhibitor chemistry. The CR chemistry is packaged in easy-to-handle mesh bags that provide scale and corrosion inhibition via patented controlled release of solid chemistry. The corrosion and scale inhibitor residual in the recirculating water system is easily controlled by the amount of chemistry that is loaded in the **CRF** feeder(s). The CR chemistry is designed to release inhibitor consistently over a 30-day period of operation. Contact your EVAPCO Representative or Authorized Water Systems Service Provider for information on the appropriate type and amount of CR inhibitor chemistry required for your system.
- 1.4 A dual biocide treatment approach is utilized for cooling tower and remote sump applications. The biocide treatment may include **BCF-NX** feeder designed to hold and diffuse non-oxidizing biocides and/or **BCF-OX** feeder(s) designed to hold and diffuse oxidizing biocides. The specific biocide designed to be used in your system's **BCF** will be noted on a label attached to the placard next to the feeder. Contact your EVAPCO Representative or Authorized Water Systems Service Provider for information on the appropriate type and amount of biocide chemistry required for your system.
- 1.5 The **BCF-NX** feeder is designed to minimize microbiological populations over a 30-day period by releasing non-oxidizing biocide chemistry into the system on a timed sequence basis.
- 1.6 The **BCF-OX** feeder(s) is designed to minimize microbiological populations over a 30-day period by releasing oxidizing biocide chemistry into the system. **BCF-OX** feeders are designed for semi-continuous timed biocide feed during system operation. **BCF-OX** feeders require a dedicated return pipe from the feeder back to the low pressure side of the system pump or the remote sump.
- 1.7 The **CRF**, **BCF-NX**, and **BCF-OX** are designed for operation with evaporative cooling towers and remote sump systems which have maximum system pressure of 125 psi (860 kPa) at 73 degrees Fahrenheit (23 degrees Celsius). The desired system pressure differential is 15 psi (100 kPa) to ensure consistent flow through the treatment system. If the operating pressure differential is less than 12 psi (80 kPa), or you have any questions, consult your EVAPCO Representative or Authorized Water Systems Service Provider. **DO NOT** use these Smart Shield® components on any other type of equipment without written authorization from EVAPCO.
- 1.8 Discharge water (blow down 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 CRF System Assembly

The EVAPCO Smart Shield® system for cooling tower and remote sump applications is designed for installation on the floor in a facility's mechanical room. The Smart Shield® is provided in easy-to-assemble modules which are sized to fit through a standard doorway and light enough to be moved by two people. All hardware necessary for system assembly is provided. The modules shall be assembled inside a mechanical room by the installing contractor (or by others) prior to evaporative cooling equipment commissioning.

- 2.1 Required tools: 1/2" (13 mm) nut driver -OR- slim 1/2" (13 mm) socket extension (<7/8" or 22 mm OD)  
 1/2" (13 mm) wrench -OR- socket  
 7/16" (10 mm) wrench -OR- socket  
 Thread sealant (Hercules Brush-on Blue Block™ or equivalent)  
 Metric thread sealant (Kolmat Fibre Seal or equivalent) Europe and Asia only
- 2.2 Before uncrating, assembly, and installation of the Smart Shield® system, consider the location of the recirculating water's (2) supply and (2) return taps in the system piping headers. Each header tap should include an isolation valve at the header and be installed on the side of the pipe (see Figure 13). Consider sanitary drain location. Drain piping should provide for gravity flow. Also consider install location for both the **CRF** and **BCF-OX** systems, as motorized valves on the **BCF-OX** are field wired into the controller located on the **CRF** system. The **CRF** system may be located against a wall or in a corner of the mechanical room. Allow sufficient space for supply, return, and drain piping (minimum of 24" [610 mm]). Allow a minimum of 30" (760 mm) unobstructed space in front and to the side of the **CRF** system for routine servicing. Allow a minimum of 36" (915 mm) unobstructed space above feeders for routine servicing. See Figures 1 and 2.

Assembled Dimensions	LENGTH, in (mm)	WIDTH, in (mm)	HEIGHT, in (mm)
<b>CRF-1 System</b>	79 (2005)	33 1/4 (845)	49 (1245)
<b>CRF-2 System</b>	95 5/8 (2430)	33 1/4 (845)	49 (1245)
<b>CRF-3 System</b>	83 (2105)	33 1/4 (845)	49 (1245)

Figure 1 – CRF System Dimensions

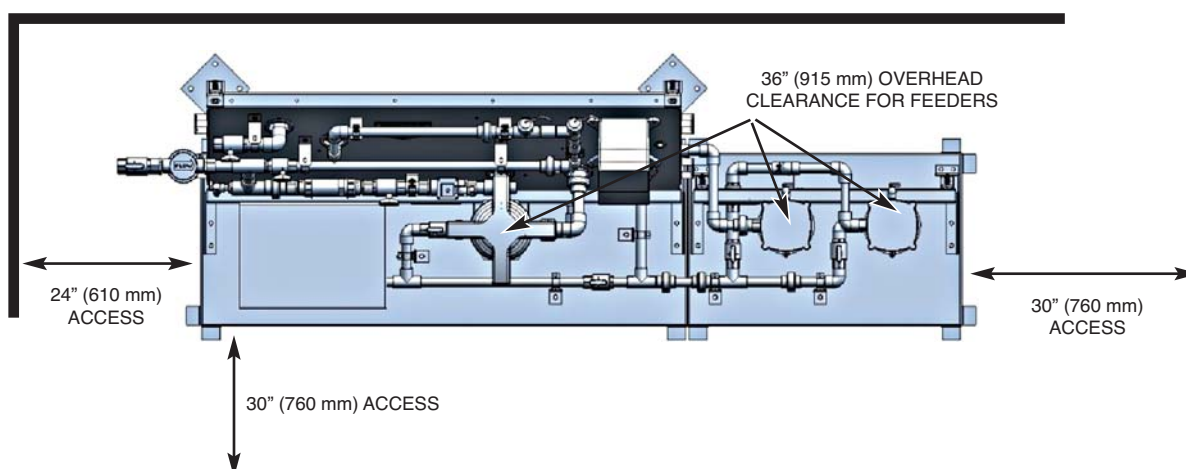
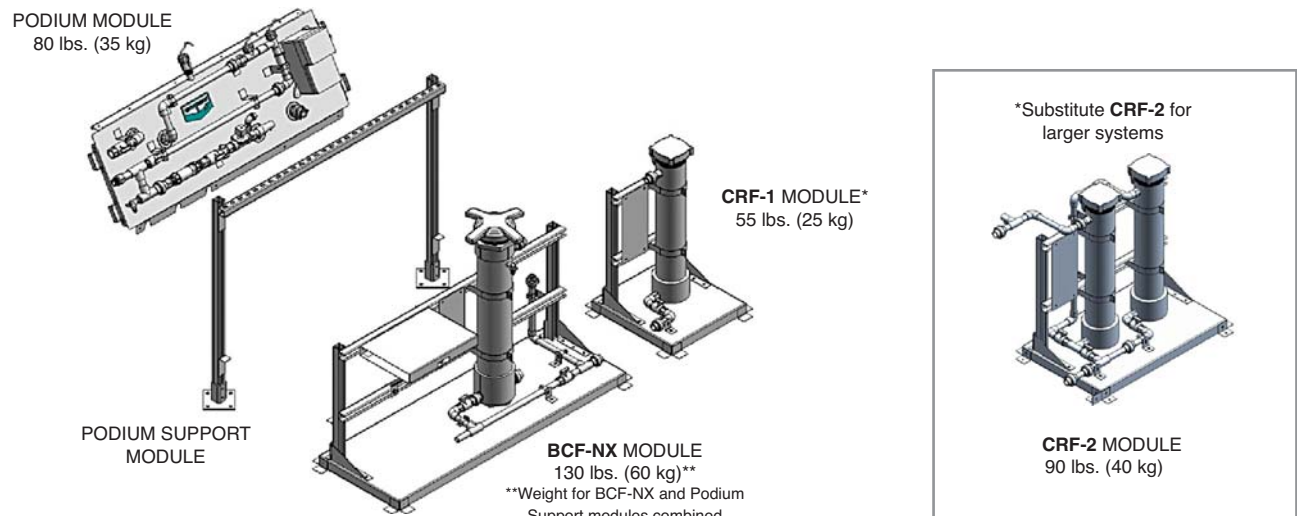


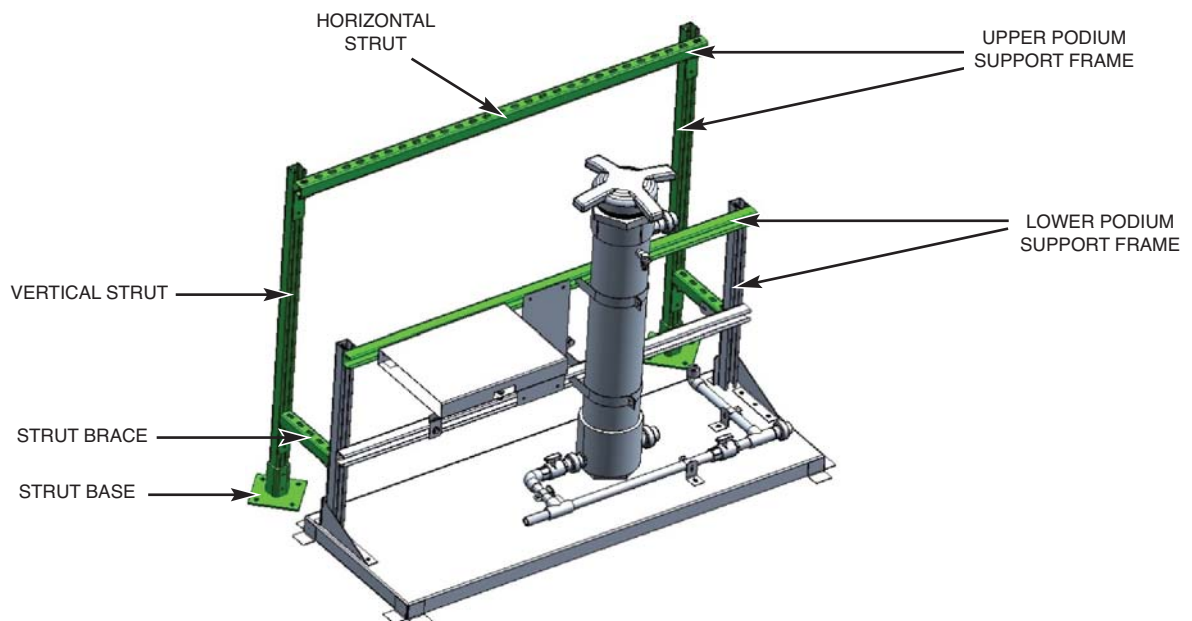
Figure 2 – Top View of System with Required Access

2.3 The **CRF** system consists of four modules: **BCF-NX**, Podium, Podium Support, and **CRF**. See Figure 3.



**Figure 3 – CRF System Overview of Modules**

- 2.4 **DO NOT** remove the Podium Module from the shipping crate until it is ready to be installed on the Upper and Lower Podium Support Frames. Care should be taken while moving and installing the Podium Module to avoid damage to the podium's piping and wiring.
- 2.5 Secure (2) Vertical Struts to (2) Strut Bases using the supplied hardware for Podium Support Module. Set module in desired location. See Figures 4.
- 2.6 Attach the Horizontal Strut, open side down, to the supports using the supplied spring nuts to complete the Upper Podium Support Frame. See Figures 4 and 5.
- 2.7 Set the **BCF-NX** Module in front of Podium Support Module, leaving room for Strut Brace connections.
- 2.8 Connect the Vertical Struts to the **BCF-NX** Module using the (2) Strut Braces. See Figures 4 and 5.



**Figure 4 – Assemble BCF-NX and Podium Support Modules**

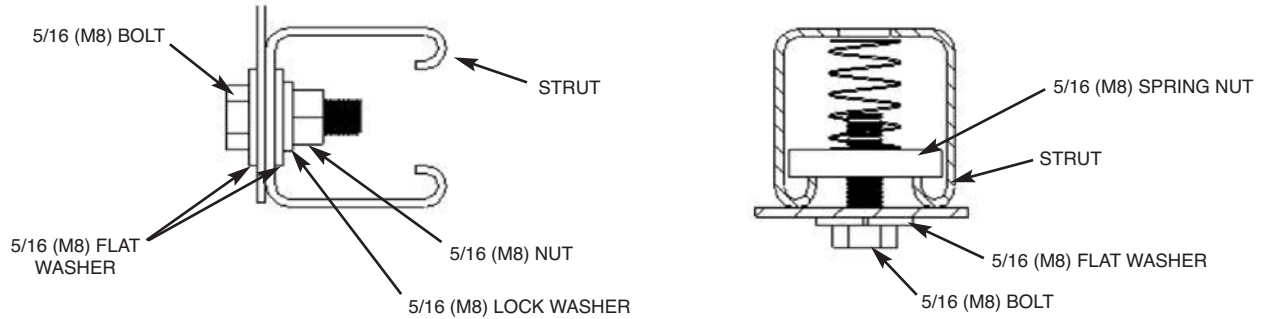


Figure 5 – Typical Hardware Details

- 2.9 **Before removing the Podium Module from its shipping assembly:** Remove supplied hardware from upper and lower flanges of the Podium Module. Unscrew conductivity probe and flow switch from piping and secure their O-rings. See Figure 6.
- 2.10 **This step requires 2 people:** Rest the Upper Podium Flange over the Upper Podium Support as shown in Figure 8, making sure that the probe wiring is clear of the podium support. Loosely secure the Lower Podium Flange to the rear of the Lower Podium Support. Then loosely secure the Upper Podium Flange. This hardware will be tightened after piping is completed. See Figure 8. Reinstall conductivity probe and flow switch into their respective manifolds, first making sure that O-rings are in place. See Figure 7.

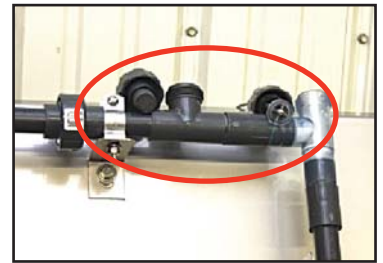


Figure 6 – Probe and Flow Switch

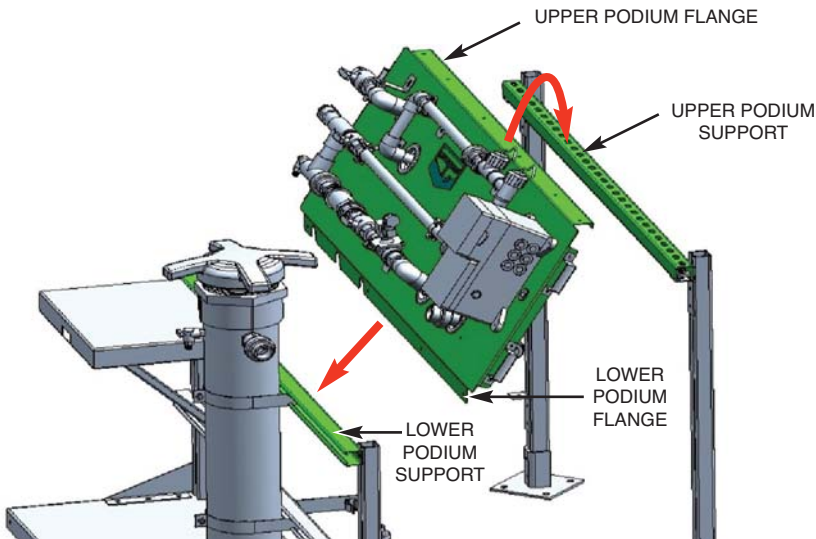
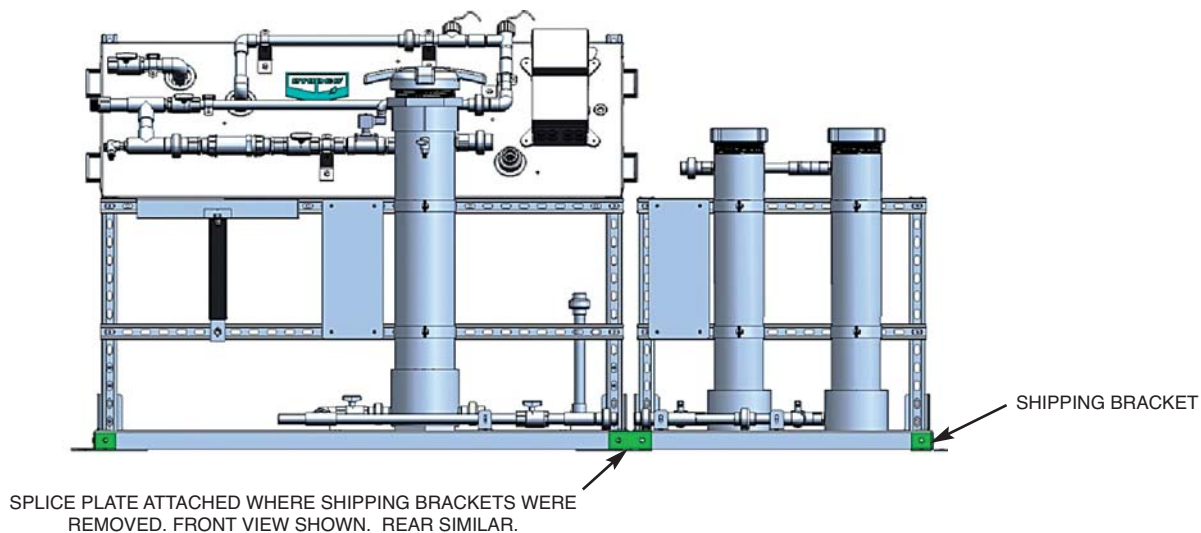


Figure 8 – Mount Podium Module



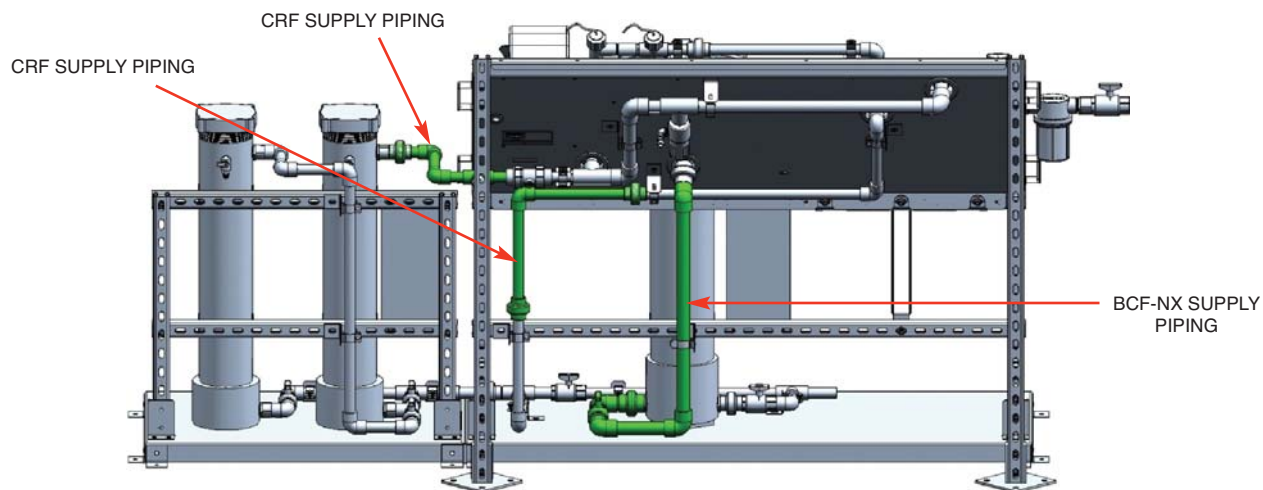
Figure 7 – O-Ring for Conductivity Probe

- 2.11 Connect the **CRF** Module to the right side of the **BCF-NX** Module. It will be necessary to remove shipping brackets to properly join modules. Reuse shipping bracket hardware to attach the supplied splice plates across the front and rear joints between modules. See Figure 9.



**Figure 9 – Attach CRF Module**

- 2.12 Complete the piping by installing the six (6) shipped loose sections shown in green. Pipe sections include union fittings for tool-free installation. Verify that O-rings are in place prior to making each connection. O-rings, shown in Figure 12, are required on every union. The Supply Strainer and Isolation Valve section has a threaded connection. Use recommended thread sealant for this installation. See Figures 10, 11 and 12.



**Figure 10 – Rear View of Piping**

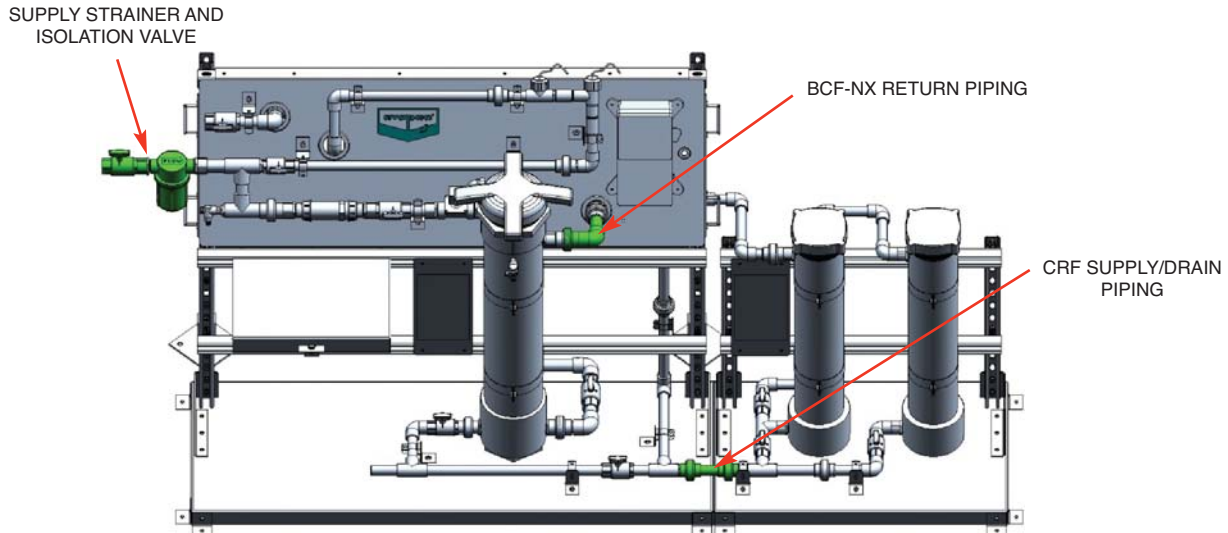


Figure 11 – Front View of Piping

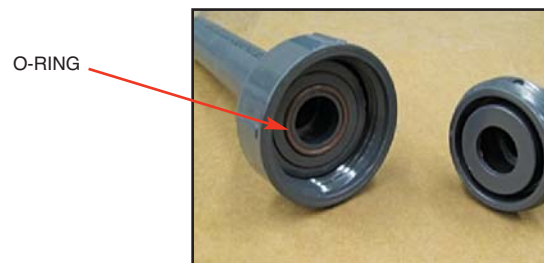


Figure 12 – Verify Union O-Ring Placement Prior to Making Connections

- 2.13 Once piping is completely installed, tighten podium flange hardware ensuring podium is secure. Reference Section 2.9 and Figure 8.

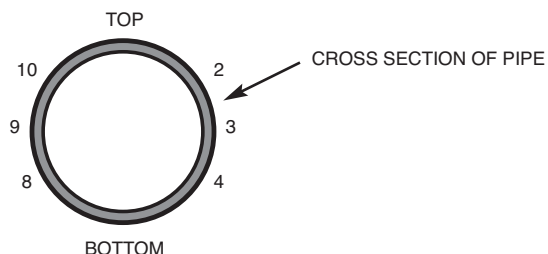
### 3.0 CRF System Installation

General installation arrangements are shown in Figures 14, 15, 16, and 17. For special installations not covered in this manual, please consult your EVAPCO Representative or Authorized Water Systems Service Provider. The **CRF** system is designed to be installed on the floor inside a mechanical room.

#### 3.1 General **CRF** System Installation Requirements

- 3.1.1 Pipe supply water to the **CRF** from the high pressure side of the system (pump discharge), upstream of metering valves and process heat exchangers. **CRF** supply piping shall be 1" (32 mm) minimum schedule 80 (PN16) PVC.
- 3.1.2 Pipe return water from the **CRF** to the low pressure side of the system (pump suction) or to the remote sump. **CRF** return piping shall be 1" (32 mm) minimum schedule 80 (PN16) PVC.

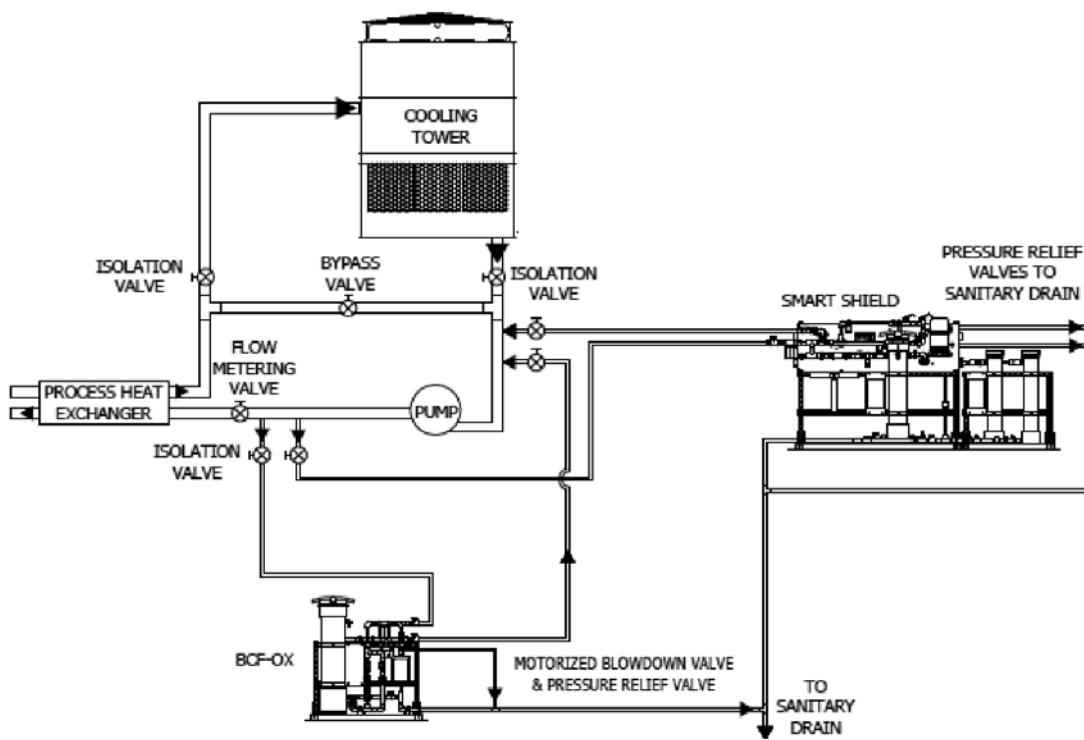
- 3.1.3 Each header tap shall include an isolation valve at the header, supplied by others. See Figure 13 for recommended pipe tap locations.



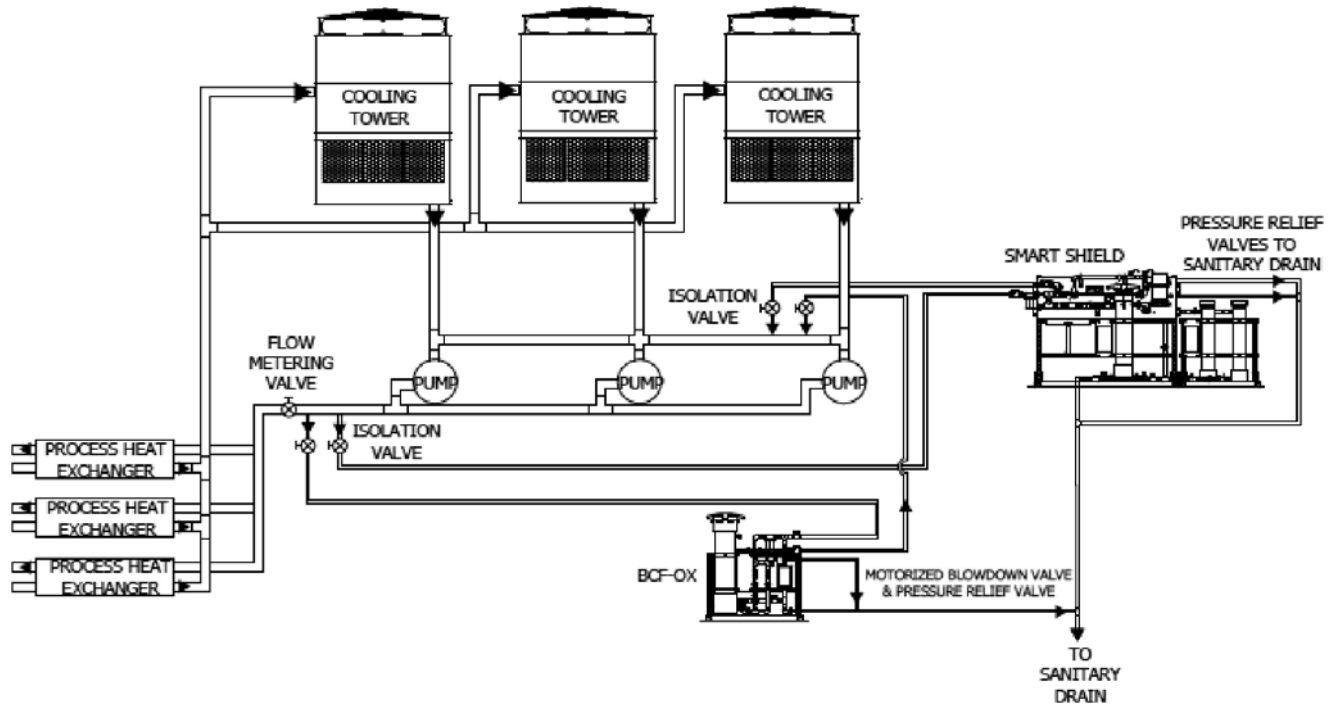
**Figure 13** – Pipe Taps Shall be Between 2-4, or 8-10. Not on Top or Bottom of a Pipe.

- 3.1.4 The desired operating pressure differential is 15 psi (100 kPa). If operating pressure differential is less than 12 psi (80 kPa), or you have any questions, consult your EVAPCO Representative or Authorized Water Systems Service Provider.
- 3.1.5 Pipe the 3/4" (25 mm) **CRF** drain connection to sanitary drain using hard pipe, providing for gravity flow.
- 3.1.6 Connect the two (2) pressure relief valves to the sanitary drain noted above. Pressure relief valves are fixed at 125 psi (860 kPa).
- 3.1.7 **CRF** and **BCF-OX** systems require separate return piping to the low pressure side (pump suction) of the evaporative cooling system.
- 3.1.8 See **BCF-OX** section (Section 8.0) for additional installation details.
- 3.1.9 Supply field 120/230 VAC field power to the conductivity controller. Refer to wiring diagrams provided in submittal or controller IO&M for details.

## 3.2 Open Tower Schematics

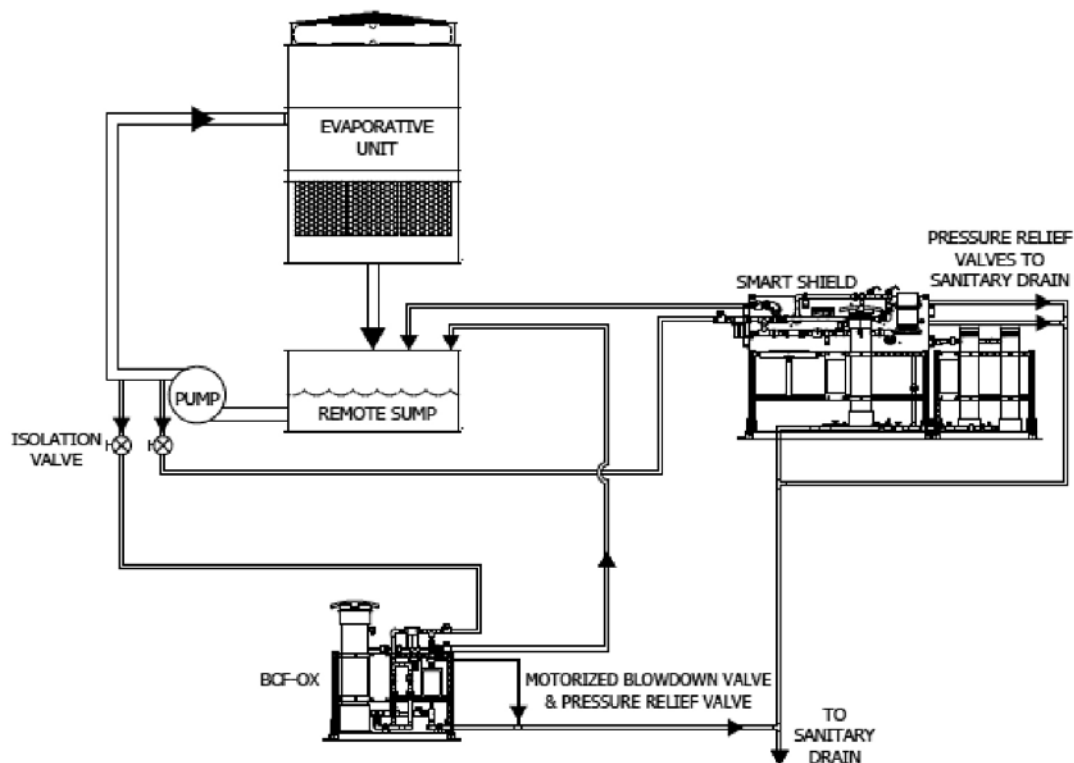


**Figure 14** – General Smart Shield® Installed Arrangement in a System with a Single Cooling Tower Unit with Integral Sump (pump suction operation)

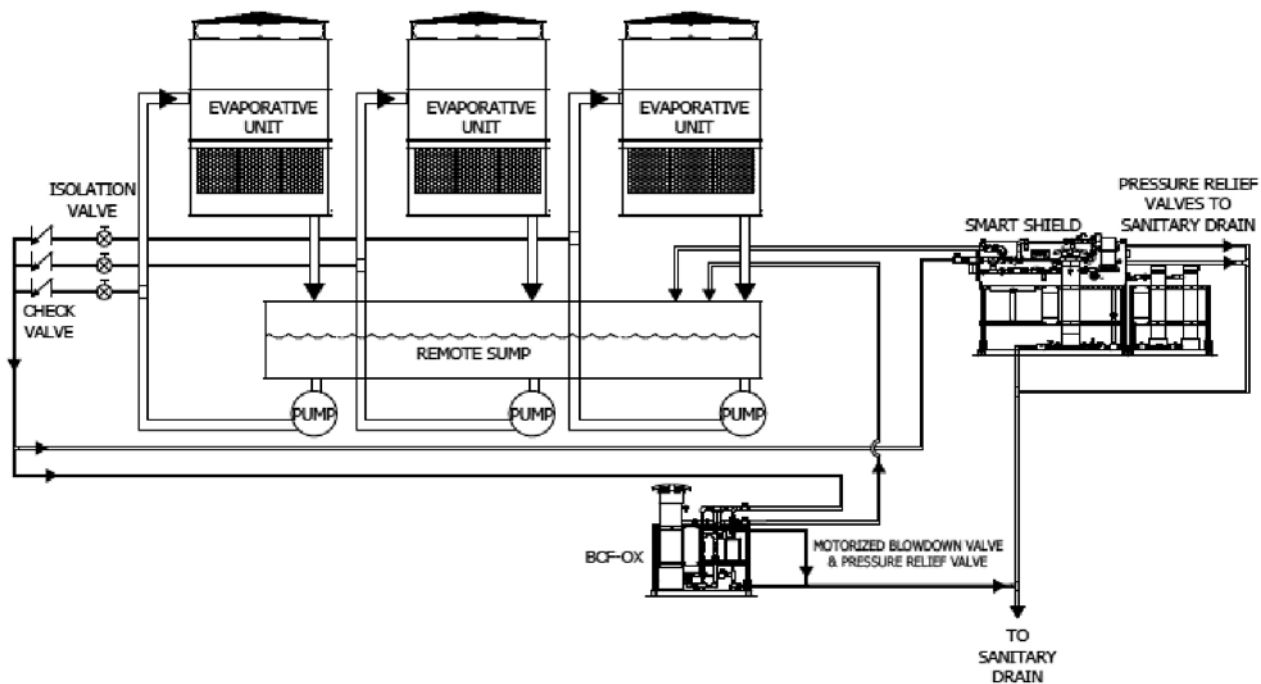


**Figure 15** – General Smart Shield® Installed Arrangement in a System with Multiple Cooling Tower Units with Integral Sump (pump suction operation)

### 3.3 Remote Sump Schematics



**Figure 16** – General Smart Shield® Installed Arrangement in a System with a Single Evaporative Cooling Unit with Remote Sump



**Figure 17** – General Smart Shield® Installed Arrangement in a System with Multiple Evaporative Cooling Units with Single Remote Sump

## 4.0 Conductivity Controller

For details of operation and configuration see the Installation, Operation, and Maintenance (IO&M) Manual for the specific conductivity controller provided with your Smart Shield® system. Refer to wiring diagrams provided in submittal or controller IO&M for relay designations.

## 5.0 CRF System Startup

Contact your EVAPCO Representative or Authorized Water Systems Service Provider at least three business days prior to adding water to the evaporative cooling system for startup.

- 5.1 Configure the controller per EVAPCO's site specific instructions. Contact your Authorized Water Systems Service Provider for your site specific configuration.
  - 5.1.1 Program the conductivity set point per the EVAPCO site specific SSF1.0 form.
  - 5.1.2 Configure the biocide feed schedules per EVAPCO's recommendations. Verify that the feed times are set for normal periods of wet operation.
    - 5.1.2.1 The **BCF-NX** timer should be programmed to feed 2-3 days per week. Program feed and post feed bleed lockout time.
    - 5.1.2.2 For semi-continuous timed feed, the **BCF-OX** timer should be programmed to feed based on EVAPCO's site specific recommendations.
  - 5.1.3 Verify that all relays are interlocked with the flow switch to prevent feeding chemistry or bleeding when the system pumps are offline.

- 5.2 Ensure all normally closed (NC) valves are closed and normally open (NO) valves are open.
- 5.3 Open Isolation Valves and set flow control valves. See Figure 18. The flow control valves should **NOT** be used to isolate piping.
  - 5.3.1 With solenoid closed (set **BCF-NX** Solenoid Relay in 'H-OFF' [hand off]), adjust **CRF**/Conductivity Flow Control Valve to approximately 4 GPM (15 LPM). A flow rate between 3-5 GPM (10-20 LPM) is desired. The flow switch requires 2-3 GPM (7-10 LPM) to register flow, then continue to open valve to achieve approximately 4 GPM (15 LPM).
  - 5.3.2 Using the controller keypad, manually energize **BCF-NX** Solenoid Relay ('H-ON' [hand on]). Adjust flow to specified rate using the **BCF-NX** Flow Control Valve and reading rate from the Flow Meter. Contact your Authorized Water Systems Service Provider if additional information is needed. Ensure Flow Switch is still activated. Adjust as needed. Ensure the **BCF-NX** Solenoid Relay is back in automatic control based on the programmed schedule ('OFF/ON').
  - 5.3.3 Calibrate conductivity probe. See separate IO&M for detailed instructions (Section 4.0).

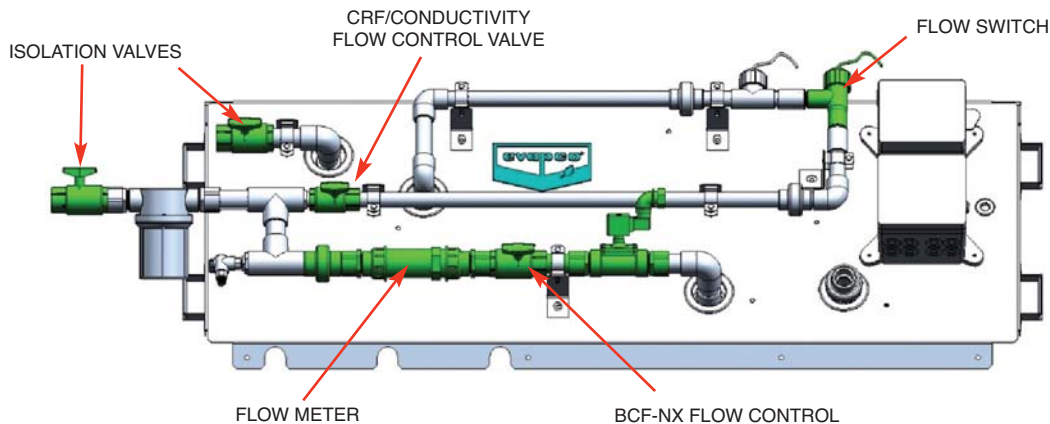


Figure 18 – Flow Control

- 5.4 See **CRF**, **BCF-NX**, and **BCF-OX** sections for details on replenishment chemistry loading.

## 6.0 Controlled Release Feeder (CRF)

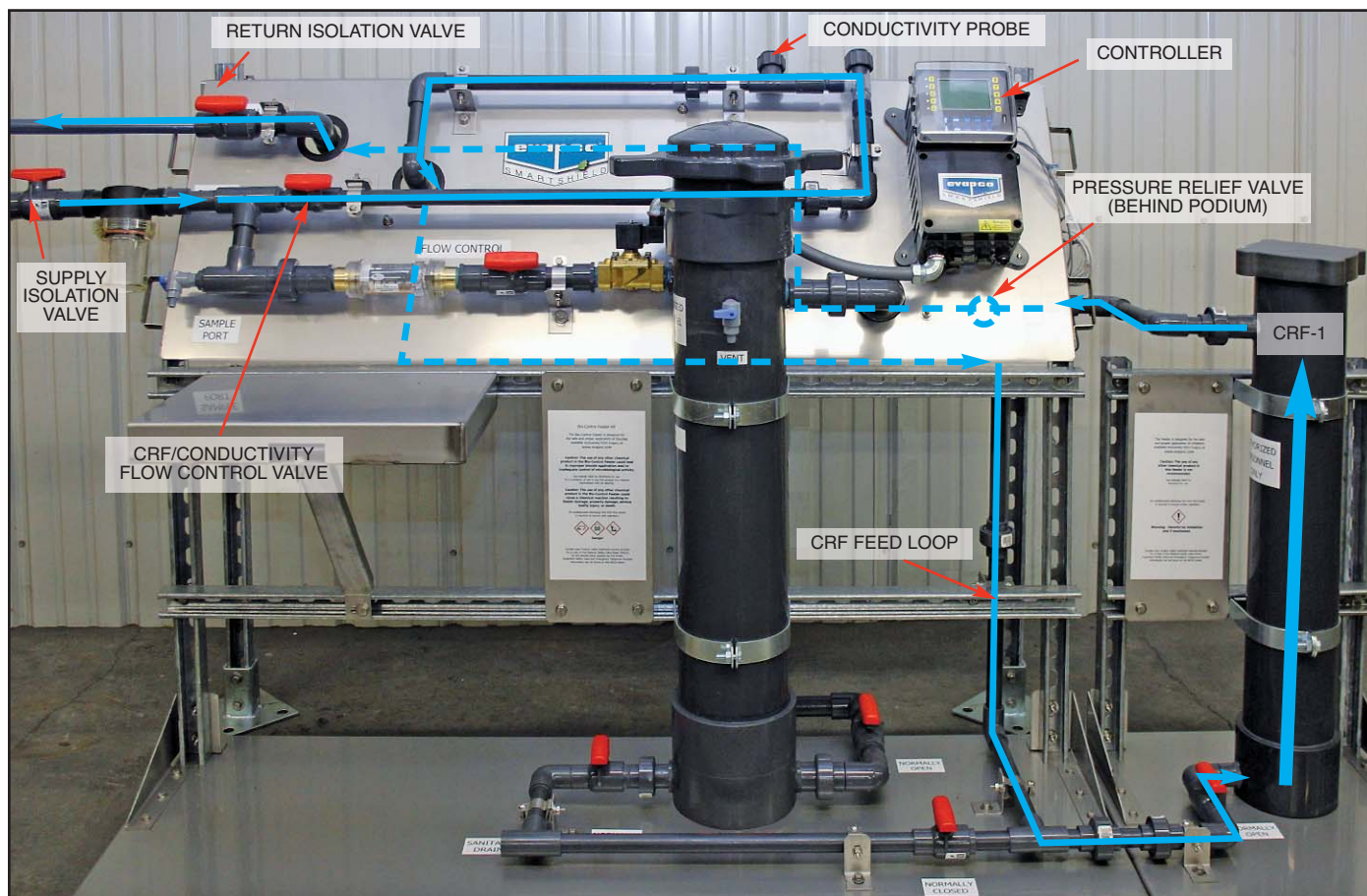
The Controlled Release inhibitor feed system is engineered to consistently release corrosion and scale inhibitor into the recirculating water of an evaporative cooling system during periods of wet operation. When system pumps are in operation, a side-stream flow of recirculating water passes through the **CRF**, comes in contact with the polymer coated inhibitor and returns to the recirculating system. This solid inhibitor fed via the **CRF** is designed to supply corrosion and scale inhibition for the recirculating water of an evaporative cooling system for a 30-day period of wet operation.

### 6.1 CRF Configuration

The Controlled Release inhibitor feed system is supplied with 1 or 2 **CRF(s)**. Each feeder is equipped with isolation valves and a vent for draining. A 125 psi (860 kPa) pressure relief valve is located in the **CRF** feed loop downstream of the feeders. See Figure 19.

## 6.2 CRF Piping

The **CRF** piping is designed for continuous feed whenever the recirculating water system pump is operating. The recirculating water flows into the **CRF** feed loop from the supply through the 20 mesh strainer to the **CRF/Conductivity Flow Control Valve**. This valve controls flow rate through both the conductivity manifold and the **CRF(s)**, which are piped in series. The **CRF** return is piped back to the recirculating water system. See Figure 19.



**Figure 19 – CRF Flow Path during Feed**

## 6.3 Loading the CRF

- 6.3.1 Prior to loading the feeder(s), close the Supply and Return Isolation Valves. See Figure 20.
- 6.3.2 The **CRF** Supply/Drain Valve should be open during both feed and drain operations. For dual **CRFs**, open the additional feeder supply/drain valve. Open the Inhibitor Loop Drain Valve and the **CRF** Vent(s) to drain feeder(s) to sanitary drain.
- 6.3.3 Once the feeder(s) is drained, close the Inhibitor Loop Drain Valve and, for dual **CRFs**, the additional feeder drain valve. The **CRF** Supply/Drain Valve should remain open.
- 6.3.4 Open the feeder(s) by rotating the **CRF** lid(s) counter-clockwise. Remove existing mesh bags of depleted CR chemistry. Local regulations may allow disposal of depleted mesh bags as municipal solid waste. Follow all local disposal requirements.
- 6.3.5 Add the desired quantity of Controlled Release inhibitor bags to the feeder basket.

- 6.3.6 Inspect the lid(s) to ensure O-ring(s) are present, lubricate as needed using a non-petroleum based lubricant, and replace the lid(s). The lid(s) should be secured hand tight. **DO NOT** use tools to tighten. **DO NOT** over tighten.
- 6.3.7 Open the Return and then Supply Isolation Valves. Allow air to bleed from the **CRF(s)** then close the Vent(s).

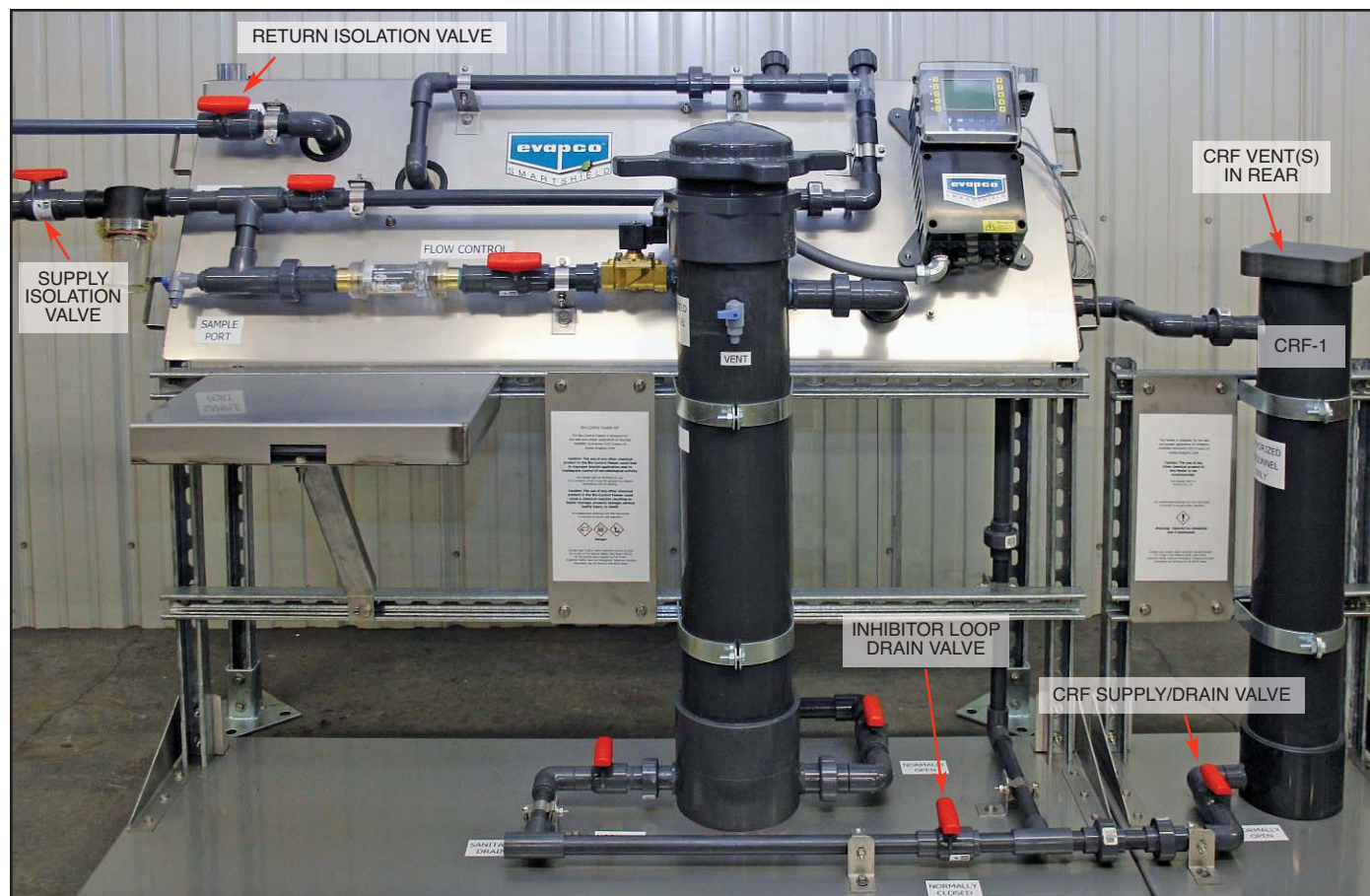


Figure 20 – Loading the CRF

#### 6.4 Replenishment Chemistry

**CRF** systems are designed to hold between 2-20 lbs. (1-10 kg) of CR inhibitor chemistry. Contact your EVAPCO Representative or Authorized Water Systems Service Provider for the amount of chemistry to be loaded for your system. **DO NOT** use any unapproved chemistry in the **CRF**. The chemistry is supplied in easy-to-handle mesh bags. Refer to the **CRF** label and the CR inhibitor Material Safety Data Sheet (MSDS) prior to use.

#### 6.5 Periodic Testing

Periodic testing by an EVAPCO Representative or Authorized Water Systems Service Provider must be performed to verify that the system is operating as designed.

## 7.0 Bio-Control Feeder BCF-NX

The **BCF-NX** biocide feeder is engineered to feed non-oxidizing biocide over a 30-day period of operation.

### 7.1 BCF-NX Configuration

The **BCF-NX** feeder is equipped with isolation valves and a vent for draining. A 125 psi (860 kPa) pressure relief valve is located in the **BCF-NX** feed loop downstream of the feeder. The controller must be programmed to energize the feed solenoid two or three times per week. Biocide release from the feeder can be controlled by adjusting the feed duration and/or the flow rate through the feeder. See Figure 21.

### 7.2 BCF-NX Piping

The recirculating water flows into the **BCF-NX** feed loop from the supply through the 20 mesh strainer to the **BCF-NX** Flow Control Valve and Solenoid. When the controller's timer initiates feed, the **BCF-NX** Solenoid is energized allowing flow through the feeder and back to the recirculating water system. See Figure 21.

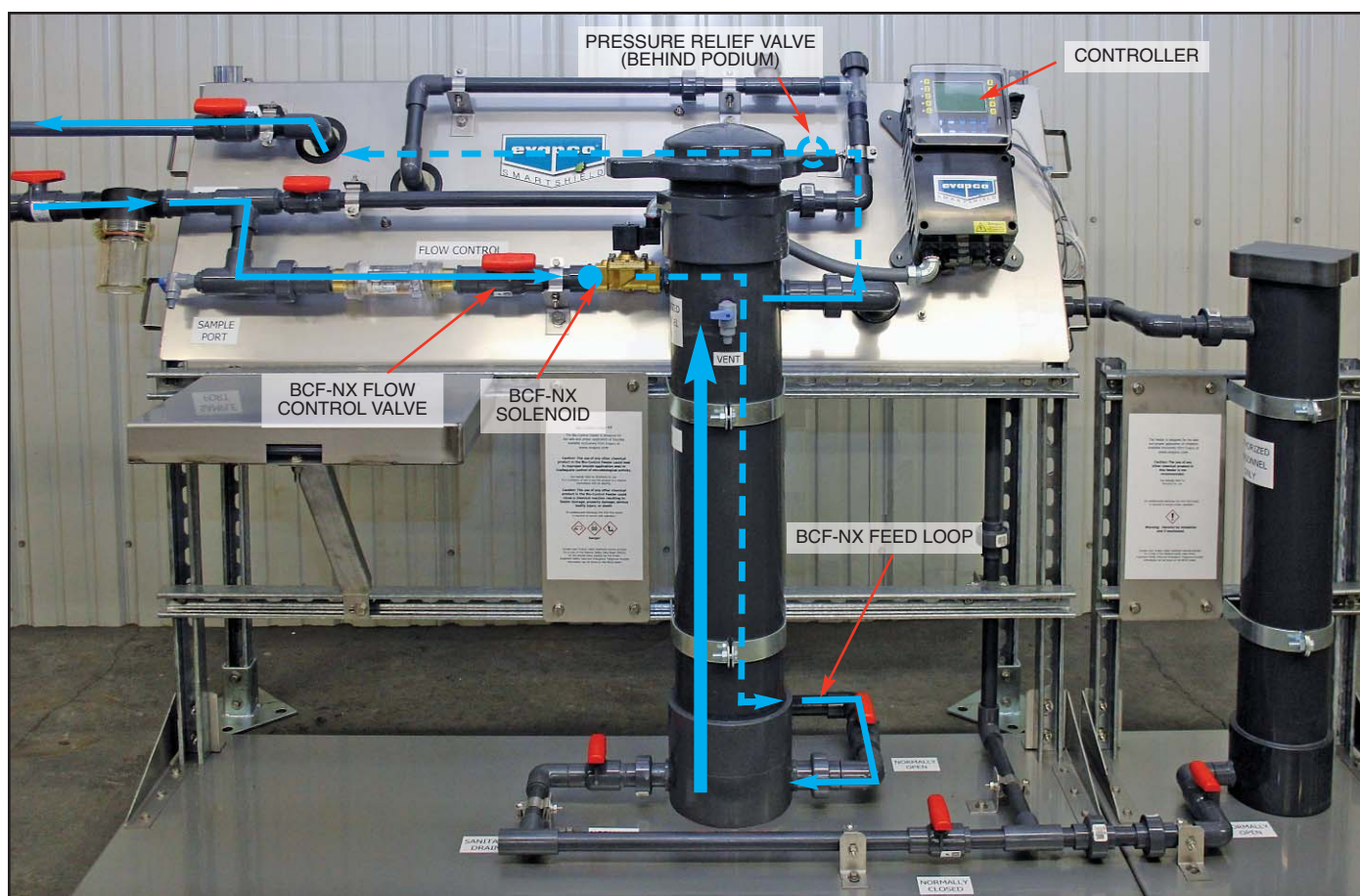


Figure 21 – BCF-NX Flow Path during Feed

### 7.3 Loading the BCF-NX

7.3.1 Read all posted labels and placards prior to opening this feeder. Contact your EVAPCO Representative or Authorized Water Systems Service Provider prior to opening feeder.

7.3.2 It is important to flush dissolved biocide from the feeder back into the recirculating water prior to loading. With the system pump in operation, use the controller's 'H-ON' control feature to energize the **BCF-NX** Solenoid Relay. Flush the feeder for approximately 3 minutes then confirm the relay has returned to automatic operation ('OFF/ON').

**CAUTION:** Failure to flush feeder before opening may increase the potential for vapor release or other hazards.

- 7.3.3 Close the Supply and Return Isolation Valves on the **CRF** system. See Figure 22.
- 7.3.4 Open the **BCF-NX** Drain Valve and then the Vent to drain the feeder to sanitary drain. Note that it may not be necessary to completely drain the feeder for reloading. See Figure 22.
- 7.3.5 Once feeder is drained, close the **BCF-NX** Drain Valve and then open the feeder by rotating counter-clockwise to remove **BCF-NX** lid. Add the required amount of biocide to the feeder. **DO NOT** overload feeder.
- 7.3.6 Inspect the lid to ensure O-ring is present, lubricate as needed using non-petroleum based lubricant, and replace the lid. The lid should be secured hand tight. **DO NOT** use tools to tighten. **DO NOT** over tighten.
- 7.3.7 Open the Return and then Supply Isolation Valves. Use the controller to set the **BCF-NX** Solenoid Relay to 'H-ON'. Allow air to bleed from the feeder with the Vent open. Once air has bled, close the Vent. Ensure the flow meter is registering proper flow and confirm the **BCF-NX** Solenoid Relay is back in automatic operation ('OFF/ON').

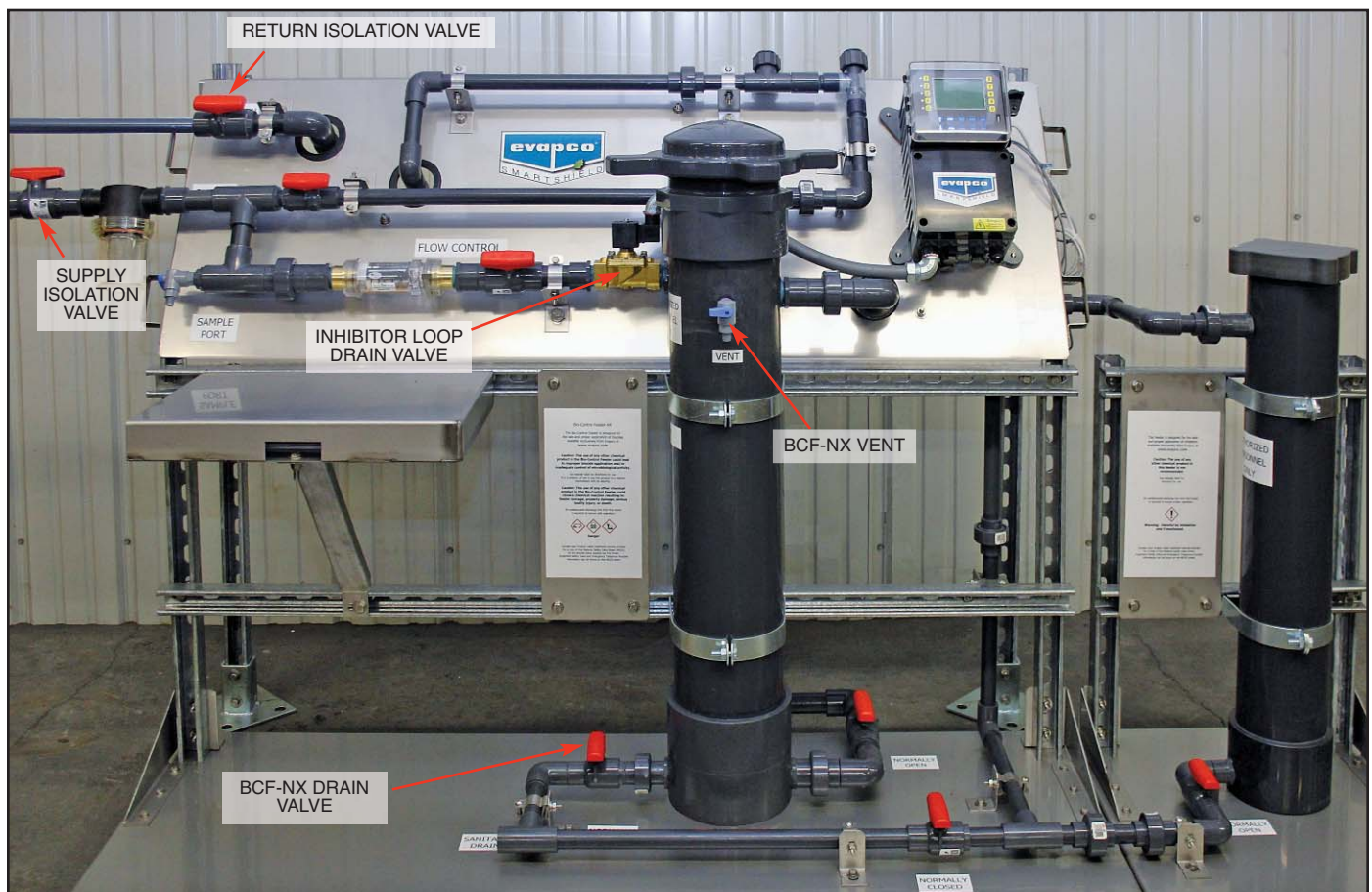


Figure 22 – Loading the **BCF-NX**

#### 7.4 Replenishment Chemistry

The **BCF-NX** can hold up to 20 lbs. (10 kg) of non-oxidizing biocide. Contact your EVAPCO Representative or Authorized Water Systems Service Provider for the type and amount of chemistry to be loaded into your system. Refer to the **BCF-NX** label and the biocide Material Safety Data Sheet (MSDS) prior to use. **CAUTION:** The use of any other chemical product in the **BCF-NX** could cause a chemical reaction resulting in feeder damage, property damage, serious bodily injury, or death.

#### 7.5 Periodic Testing

Periodic testing by an EVAPCO Representative or Authorized Water Systems Service Provider must be performed to verify that the system is operating as designed and to adjust the feed timer duration and chemistry amount based on changes in system load, ambient conditions, make-up water quality, or other local conditions.

## 8.0 Bio-Control Feeder BCF-OX

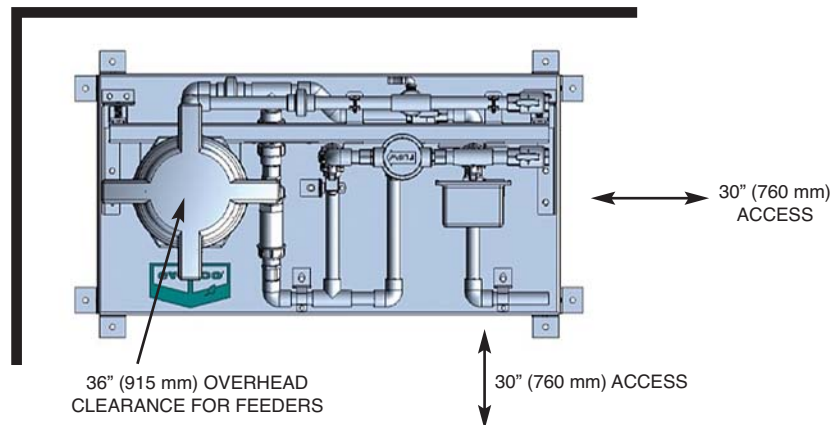
The **BCF-OX** oxidizing biocide feeder is engineered to provide semi-continuous timed feed of oxidizing biocide over a 30-day period of operation. There are two **BCF-OX-D** models to accommodate varying system sizes and demand.

### 8.1 Installation

The **BCF-OX** module is installed in conjunction with the **CRF** system in a mechanical room, as described in Section 3.0. Before installation, consider the location of the recirculating water's supply and return taps in the system piping headers. Each header tap should include an isolation valve at the header and be installed on the side of the pipe (see Figure 13). Also consider sanitary drain location. Drain piping should provide for gravity flow. The **BCF-OX** module may be located against a wall or in a corner on the floor of the mechanical room. Allow sufficient space for supply, return, and drain piping. Allow a minimum of 30" (760 mm) unobstructed space in front and to one side of the skid for routine servicing. Allow a minimum of 36" (915 mm) unobstructed space above feeders for routine servicing. See Figures 23 and 24. General installation piping arrangements are shown in Section 3.2. For special installations not covered in this manual, please consult your EVAPCO Representative or Authorized Water Systems Service Provider. General **BCF-OX** installation requirements are listed below.

<b>BCF-OX Model</b>	<b>LENGTH, in (mm)</b>	<b>WIDTH, in (mm)</b>	<b>HEIGHT, in (mm)</b>	<b>MINIMUM PIPING CONNECTION SIZES, in (mm)</b>
OX-D15	40 (1020)	21 (535)	42 (1070)	¾ (25 mm)
OX-D40	40 (1020)	21 (535)	45 (1154)	1 (32 mm)

**Figure 23 – BCF-OX Module Dimensions**



**Figure 24 – Top View of Skid with Required Access**

- 8.1.1 Pipe supply water to the **BCF-OX** from the high pressure (pump discharge) side of the system, upstream of metering valves and process heat exchangers. **BCF-OX** supply piping shall be ¾" (25 mm) or 1" (32 mm) schedule 80 (PN16) PVC. Use the minimum piping size for your **BCF-OX** model shown in Figure 23.
- 8.1.2 Pipe return water from the **BCF-OX** to the low pressure (pump suction) side of the system pump or to the remote sump. **BCF-OX** return piping shall be ¾" (25 mm) or 1" (32 mm) schedule 80 (PN16) PVC. See Figure 23.
- 8.1.3 Each header tap shall include an isolation valve at the header (supplied by others) and be installed on the side of the pipe (see Figure 13).
- 8.1.4 The desired operating pressure differential is 15 psi (100 kPa). If the operating pressure differential is less than 12 psi (80 kPa), or you have any questions, consult your EVAPCO Representative or Authorized Water Systems Service Provider.

- 8.1.5 Pipe the 3/4" (25 mm) or 1" (32 mm) **BCF-OX** drain/bleed connection to sanitary drain using hard pipe, providing for gravity flow. Use the minimum piping size for your **BCF-OX** model shown in Figure 23.
- 8.1.6 Connect the pressure relief valve to the sanitary drain noted above. Pressure relief valve is fixed at 125 psi (860 kPa).
- 8.1.7 **CRF** and **BCF-OX** systems require separate return piping to the low pressure side (pump suction) of the evaporative cooling system. See Section 3.2.
- 8.1.8 Field wire the **BCF-OX** Solenoid (18 GA) and the blow down valve (18 GA) to the conductivity controller located on the **CRF** system. Refer to wiring diagrams provided in submittal or controller IO&M for details.

## 8.2 BCF-OX Startup

Contact your EVAPCO Representative or Authorized Water Systems Service Provider at least three business days prior to adding water to the evaporative cooling system for startup.

- 8.2.1 Open Supply and Return Isolation Valves. See Figure 25. The flow control valves should **NOT** be used to isolate piping.
- 8.2.2 Using the controller keypad, manually energize the **BCF-OX** Solenoid Relay ('H-ON'). Adjust flow to specified rate using the **BCF-OX** Flow Control Valve and reading the rate from the Flow Meter. Contact your Authorized Water Systems Service Provider if additional information is needed. Ensure the **BCF-OX** Solenoid Relay is back in automatic operation ('OFF/ON').
- 8.2.3 Using the controller keypad, manually energize the Blow Down Motorized Ball Valve Relay ('H-ON'); use the Blow Down Flow Control Valve to throttle the bleed rate. Ensure the Blow Down Motorized Ball Valve Relay is back in automatic operation ('OFF/ON').

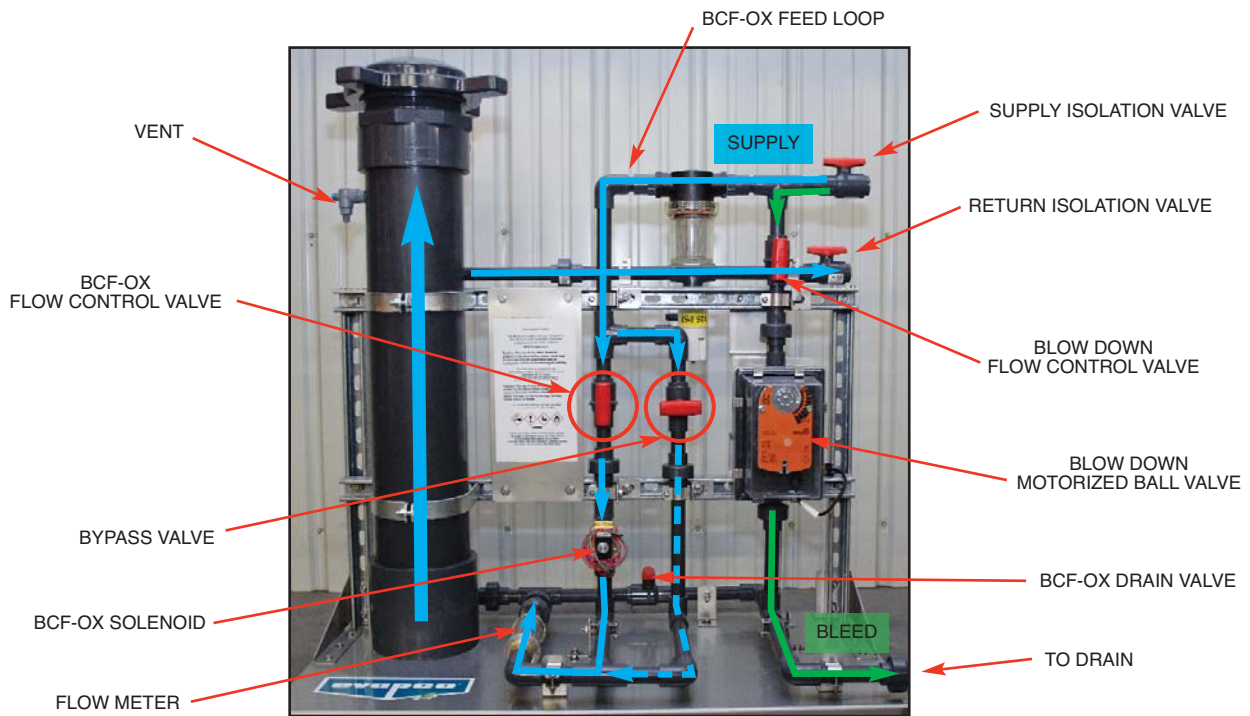


Figure 25 – BCF-OX Flow Path during Feed or Bleed

- 8.2.4 See 'Loading the **BCF-OX**' Section 8.5 for details on replenishment chemistry loading.

## 8.3 BCF-OX Configuration

The **BCF-OX** module is equipped with isolation valves and a vent for draining. A 125 psi (860 kPa) pressure relief valve is located in the **BCF-OX** feed loop downstream of the feeder. The controller must be programmed to energize the feed solenoid per EVAPCO's site specific recommendations. Biocide release from the feeder can be controlled by adjusting the feed duration and/or the flow rate through the feeder. The **BCF-OX** module is also equipped with a motorized ball valve for system bleed. See Figure 25.

## 8.4 BCF-OX Piping

The recirculating water from the high pressure side (pump discharge) flows into the **BCF-OX** feed loop (indicated by blue arrows in Figure 25) from the supply through the 20 mesh strainer, and then to the **BCF-OX** Flow Control Valve and Solenoid. When the controller's timer initiates feed, the **BCF-OX** Solenoid is energized allowing flow through the feeder and back to the low pressure side (pump suction) of the recirculating water system. The Bypass Valve remains closed. When the system's conductivity exceeds the programmed set point, the controller initiates bleed. During system bleed, flow is diverted through the Blow Down Motorized Ball Valve and to drain (indicated by green arrows in Figure 25). Bleed flow is set using the Blow Down Flow Control Valve. See Figure 25.

## 8.5 Loading the **BCF-OX**

- 8.5.1 Read all posted labels and placards prior to opening this feeder. Contact your EVAPCO Representative or Authorized Water Systems Service Provider prior to opening feeder.
- 8.5.2 It is important to flush dissolved biocide from the feeder back into the recirculating water prior to loading. Use the controller's 'H-ON' control feature to energize the **BCF-OX** Solenoid Relay. Flush the feeder for approximately 3 minutes then ensure the relay is back in automatic operation ('OFF/ON'). **CAUTION:** Failure to flush feeder before opening may increase potential for vapor release or other hazards.
- 8.5.3 Close the Supply and Return Isolation Valves on the **BCF-OX** module. See Figure 26.
- 8.5.4 Open the **BCF-OX** Drain Valve and then the Vent to drain the feeder to sanitary drain. Note that it may not be necessary to completely drain the feeder for reloading.
- 8.5.5 Once feeder is drained, close the **BCF-OX** Drain Valve and then open the feeder by rotating counter-clockwise to remove **BCF-OX** lid. Add the required amount of biocide to the feeder. **DO NOT** overload feeder.
- 8.5.6 Inspect the lid to ensure O-ring is present, lubricate as needed using non-petroleum based lubricant, and replace the lid. The lid should be secured hand tight. **DO NOT** use tools to tighten. **DO NOT** over tighten.
- 8.5.7 Open the Return and then Supply Isolation Valves. Use the controller to set the **BCF-OX** Solenoid Relay into 'H-ON'. Allow air to bleed from the feeder with the Vent open. Once air has bled, close the Vent. Ensure the flow meter is registering proper flow and confirm the **BCF-OX** Relay is back in automatic operation ('OFF/ON').



**Figure 26 – Loading the **BCF-OX****

## 8.6 Replenishment Chemistry

The **BCF-OX-D** is available in two different sizes. The D15 can hold up to 15 lbs. (7 kg) and the D40 can hold up to 40 lbs. (20 kg) of oxidizing chemistry. Contact your EVAPCO Representative or Authorized Water Systems Provider for the type and amount of chemistry to be loaded into your system. Refer to the **BCF-OX** label and the biocide Material Safety Data Sheet (MSDS) prior to use. **CAUTION:** The use of any other chemical product in the **BCF-OX** could cause a chemical reaction resulting in feeder damage, property damage, serious bodily injury, or death.

## 8.7 Periodic Testing

Periodic testing by an EVAPCO Representative or Authorized Water Systems Service Provider must be performed to verify that the system is operating as designed and to adjust the feed timer duration or flow and chemistry amount based on changes in system load, ambient conditions, make-up water quality, or other local conditions.

# 9.0 Maintenance

Scheduled routine maintenance can help ensure that the Smart Shield® system operates at maximum efficiency and achieves a long service life. Maintaining a service agreement with an EVAPCO Representative or Authorized Water Systems Service Provider can help ensure that your system is properly monitored and serviced at regular intervals.

Some of the routine maintenance items that should be performed on the Smart Shield® are shown below in Figure 27.

Smart Shield® Component	Action Interval
Supply Strainer	Inspect weekly - clean as needed
BCF-OX Supply Strainer	Inspect weekly - clean as needed
Blow Down Valve	Confirm proper operation monthly
Flow Switch	Inspect monthly - clean as needed
Conductivity Probe	Clean monthly - calibrate as needed*
Chemistry Feeder Baskets	Inspect monthly - clean as needed
O-Rings	Inspect monthly - lubricate as needed**
Flow Meters	Confirm proper operation monthly

\*For specific calibration instructions, see controller IO&M.

\*\*Use only silicone based lubricant. DO NOT use any petroleum based product.

**Figure 27 – Routine Maintenance Items**

# 10.0 Dry Lay-up and Shutdown

Proper lay-up and shutdown procedures should be utilized for all evaporative cooling equipment.

## 10.1 Dry Lay-up

EVAPCO's Smart Shield® for cooling towers and remote sump applications is designed to be located indoors, eliminating freeze concerns and the need for winterization. During periods of dry lay-up, no chemistry should be left in any feeders prior to the system being drained. Chemistry levels in all of the feeders should be managed in the months prior to dry lay-up to ensure minimal residual chemistry remains in the feeders during lay-up. While minimizing the chemistry level in all feeders is important, it is especially critically for the **BCF-NX**. The feed frequency and/or flow rate to the feeder can be increased to ensure no chemistry is left in the **BCF-NX** during dry lay-up.



### 10.2 Shutdown

Intermittent operation and/or stagnant water can cause operational problems. Circulation of the system water through the Smart Shield® several times per week is recommended for evaporative cooling equipment which is shut-down for short periods of time. If the evaporative cooling system is to be off-line for more than a few weeks, or circulation of the system water through the Smart Shield® every three days is not practical, the system should be drained and dry lay-up instructions should be followed (see Section 10.1).

## 11.0 Pre-cleaning and Passivation

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All new evaporative cooling equipment and associated piping should be pre-cleaned and flushed for removal of grease, oil, dirt, debris and other suspended solids. Consult your evaporative cooling equipment's Instruction, Operation and Maintenance (IO&M) Manual for additional information regarding initial start-up and pre-cleaning.

All evaporative cooling equipment utilizing 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 (IO&M) Manual for additional information regarding passivation.

A site-specific pre-cleaning and/or passivation plan is not included with a Smart Shield® system. 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 to provide a pre-cleaning and/or passivation plan along with associated plan costs.

## 12.0 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, consult your local regulatory group and 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 Inhibitor Feeder (CRF, FMF or MRF), Bio-Control Feeder(s), 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 LESS STARTUP AND MONITORING FEES. 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 PRE-APPROVE IN WRITING. EVAPCO IS ONLY RESPONSIBLE FOR COSTS THAT PERTAIN TO REPAIR OR REPLACEMENT OF EQUIPMENT SUPPLIED BY EVAPCO (i.e., EVAPCO IS NOT RESPONSIBLE FOR REPLACEMENT OR MODIFICATION OF PIPING, OR "IN AND OUT" COSTS SUCH AS THIRD PARTY LABOR OR OTHER EQUIPMENT FEES).

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