Crossflow Coil Products

Baltimore Aircoil Company

...because temperature matters

™

CXV Evaporative Condensers
FXV Closed Circuit Cooling Towers
HXV Closed Circuit Hybrid Cooling Towers

Baltimore Aircoil Company FXV Closed Circuit Cooling Towers, HXV Closed Circuit Hybrid Cooling Towers, and CXV Evaporative Condensers have been designed to give long, trouble-free service when properly installed, operated and maintained. To obtain optimum performance and maximum service life, it is important that a program of regular inspection and maintenance be developed and carried out by the end-users of these products. This manual is published as a guide to establishing such a program. Included in this manual are the recommended services for start-up, operation, shutdown, and the approximate frequency for each. Note that the recommended frequency of service in this manual is the minimum, and where operating conditions are severe, the services should be performed more frequently. For each required service, follow the procedures outlined under the “Maintenance Procedures” section of this manual. The FXV/CXV unit and the HXV unit are illustrated on pages N34 and N35 (see Figure 1A, 1B, and Figure 2), with the major points of inspection and service identified. In addition, a copy of the unit certified drawing should be available for reference. If you need additional information about operation or maintenance, contact your local BAC Representative whose name and phone number are on a label at the connection end of the unit.

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Baltimore Aircoil Company
General Maintenance Information

The services required to maintain an FXV Closed Circuit Cooling Tower, HXV Closed Circuit Hybrid Cooling Tower, or CXV Evaporative Condenser are primarily a function of the air and water quality at the installation site.

AIR: The most harmful atmospheric conditions are those with unusual quantities of industrial smoke, chemical fumes, salt or heavy dust. Such airborne impurities are carried into the cooling tower and absorbed by the recirculating water to form a corrosive solution.

WATER: The most harmful conditions develop as water evaporates from the unit, leaving behind the dissolved solids originally contained in the make-up water. These dissolved solids may be either alkaline or acidic and, as they are concentrated in the circulating water, can produce scaling or accelerated corrosion.

The extent of impurities in the air and water determines the frequency of most maintenance services and also governs the extent of water treatment which can vary from simple continuous bleed and biological control to a sophisticated treatment system (see "Water Treatment" section, page N46).
Figure 1B – Double-Side air inlet FXV/CXV

Figure 2 – HXV closed circuit hybrid cooling tower
Operation and Maintenance

Described below are the recommended services for start-up, operation, and shutdown as well as the approximate frequency for each. For each required service, follow the procedures outlined under the “Maintenance Procedures” section of this manual.

Table 1 – Recommended Maintenance Services (1) for FXV Closed Circuit Cooling Towers and CXV Evaporative Condensers

<table>
<thead>
<tr>
<th>Type of Service</th>
<th>Monthly</th>
<th>Quarterly</th>
<th>Start-up</th>
<th>Shutdown</th>
<th>Annually</th>
</tr>
</thead>
<tbody>
<tr>
<td>Inspect general condition</td>
<td>X</td>
<td>X</td>
<td>X</td>
<td>X</td>
<td>X</td>
</tr>
<tr>
<td>Inspect and clean as necessary</td>
<td>X</td>
<td>X</td>
<td>X</td>
<td>X</td>
<td>X</td>
</tr>
<tr>
<td>• Cold water basin/strainer</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>• Air inlet louvers</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Check and adjust water level in cold water basin</td>
<td>X</td>
<td>X</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Check operation of make-up valve</td>
<td>X</td>
<td>X</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Check bleed rate and adjust</td>
<td>X</td>
<td>X</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Check belt condition</td>
<td>X</td>
<td>X</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Check belt tension</td>
<td>X</td>
<td>X</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Lubricate fan shaft bearings</td>
<td>X</td>
<td>X</td>
<td>X</td>
<td>X</td>
<td>X</td>
</tr>
<tr>
<td>Lubricate motor base adjusting screw</td>
<td>X</td>
<td>X</td>
<td>X</td>
<td>X</td>
<td>X</td>
</tr>
<tr>
<td>Check drive alignment</td>
<td>X</td>
<td>X</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Clean outside of fan motor</td>
<td>X</td>
<td>X</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Clean debris from unit</td>
<td>X</td>
<td>X</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Inspect heat transfer sections</td>
<td>X</td>
<td>X</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Inspect spray nozzles</td>
<td>X</td>
<td>X</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Drain cold water basin</td>
<td>X</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Inspect protective finish</td>
<td>X</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Table 2 – Recommended Maintenance Services (1) for HXV Closed Circuit Hybrid Cooling Towers

<table>
<thead>
<tr>
<th>Type of Service</th>
<th>Summer Monthly</th>
<th>Period Quarterly</th>
<th>(with spray water) Start-up</th>
<th>Shutdown</th>
<th>Winter Monthly</th>
<th>Period Quarterly</th>
<th>(without spray water) Start-up</th>
<th>Shutdown</th>
</tr>
</thead>
<tbody>
<tr>
<td>Inspect general condition</td>
<td>X</td>
<td>X</td>
<td>X</td>
<td>X</td>
<td>X</td>
<td>X</td>
<td>X</td>
<td>X</td>
</tr>
<tr>
<td>Inspect &amp; clean as necessary</td>
<td>X</td>
<td>X</td>
<td>X</td>
<td>X</td>
<td>X</td>
<td>X</td>
<td>X</td>
<td>X</td>
</tr>
<tr>
<td>• Cold water basin/strainer</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>• Air inlet louvers</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>• High density finned coil bundle</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Check and adjust water level in cold water basin</td>
<td>X</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Check operation of make-up valve</td>
<td>X</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Check bleed rate and adjust</td>
<td>X</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Check belt condition</td>
<td>X</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Check belt tension</td>
<td>X</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Lubricate fan shaft bearings</td>
<td>X</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>X</td>
<td></td>
<td>X</td>
</tr>
<tr>
<td>Lubricate motor base adjusting screw</td>
<td>X</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>X</td>
<td></td>
<td>X</td>
</tr>
<tr>
<td>Check drive alignment</td>
<td>X</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>X</td>
<td></td>
<td>X</td>
</tr>
<tr>
<td>Clean outside of fan motor</td>
<td>X</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>X</td>
<td></td>
<td>X</td>
</tr>
<tr>
<td>Clean debris from unit</td>
<td>X</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>X</td>
<td></td>
<td>X</td>
</tr>
<tr>
<td>Inspect heat transfer sections</td>
<td>X</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>X</td>
<td></td>
<td>X</td>
</tr>
<tr>
<td>Inspect spray nozzles</td>
<td>X</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>X</td>
<td></td>
<td>X</td>
</tr>
<tr>
<td>Drain cold water basin</td>
<td>X</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>X</td>
<td></td>
<td>X</td>
</tr>
<tr>
<td>Inspect protective finish</td>
<td>X</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>X</td>
<td></td>
<td>X</td>
</tr>
</tbody>
</table>
Notes Table 1 and Table 2:

1. Recommended service intervals are for typical installations. Severe environmental conditions may dictate more frequent servicing.
2. When operating in ambient temperatures below freezing, the FXV/HXV/CXV unit should be inspected more frequently (see pages N43-N45).
3. Tension on new belts must be re-adjusted after the first 24 hours of operation and quarterly thereafter.

**WARNING:** Before performing any maintenance or inspection, make certain that all power has been disconnected and locked in the off position.

**CAUTION: STORAGE**
If the unit is to be stored for a period of time prior to installation, it is not recommended that any cover be placed over the unit. This can trap heat inside of the unit and cause damage to the fill section and other PVC components. Consult with your local BAC Representative for additional recommendations on long-term storage.

**SAFETY PRECAUTIONS**
Only qualified personnel may operate, maintain, and repair this equipment. All such personnel must be thoroughly familiar with the equipment, the associated system and controls, and procedures in this manual. Use proper care, procedure, and tools when handling, lifting, installing, operating, maintaining, and repairing this equipment to prevent personnel injury and/or property damage.

**CAUTION:** All electrical, mechanical, and rotating machinery are potential hazards, particularly for those not familiar with its design, construction and operation. Accordingly, use appropriate lockout procedures and adequate safeguards (including the use of protective enclosures where necessary) should be taken with this equipment both to safeguard the public (including minors) from injury and to prevent damage to the equipment, its associated system, and the premises.

**WARNING:** The top horizontal surface of the unit is not intended for use as a walking surface or working platform. If access to the top of the unit is desired, the purchaser/end-user is cautioned to use appropriate means complying with applicable safety standards of governmental authorities.

**CAUTION:** This equipment should never be operated without all fan screens, access panels, and access doors in place. For the protection of authorized service and maintenance personnel, install a lockable disconnect switch located within sight of the unit on each fan and pump motor associated with this equipment.

**WARNING:** Do no service work on or near the fans, motors, drives, or inside the unit without first disconnecting and locking out the fan and pump motors.

**WARNING:** When the fan speed of the unit is to be changed from the factory set speed, including changes achieved by the use of a variable fan speed device, steps must be taken to avoid operation at or near the fan's "critical speed" which could result in fan failure and possible personal injury or damage. Consult with your local BAC Representative on any such applications.

**WARNING:** The recirculating water system may contain chemicals or biological contaminants, including Legionella, which could be harmful if inhaled or ingested. Personnel exposed directly to the discharge airstream and the associated driftmists, generated during operation of the water distribution system and/or fans, or mists produced by high pressure water jets or compressed air (if used to clean components of the recirculating water system), must wear respiratory protection equipment approved for such use by governmental occupational safety and health authorities.

**FREEZE PROTECTION:** Mechanical and operational methods must be employed to protect these products against damage and/or reduced effectiveness due to possible freeze-up (see pages N43-N45).

**WARRANTIES:** Please refer to the Limitation of Warranties applicable to and in effect at the time of the sale/purchase of these products.
Operating Procedures

General
Inspect, clean and lubricate the unit on a regular basis during operation. The required services and recommended frequency for each are summarized in Table 1 and Table 2 on page N36 of this bulletin.

Initial and Seasonal Start-up
Before initial start-up or after a shutdown period, the FXV/HXV/CXV unit should be thoroughly inspected and cleaned.
1. If the unit sits on vibration isolators or isolation rails, refer to the manufacturer’s guidelines before loading/unloading weight from the unit.
2. Clean all debris, such as leaves and dirt, from inside the unit, the top of the finned coil bundle (for HXV only), and the air inlet louvers.
3. Drain the cold water basin (with basin suction strainers in place) and flush to remove accumulated dirt.
4. Remove the basin suction strainer, clean and reinstall.
5. Inspect spray nozzles and heat transfer section.
6. Turn the fan by hand to ensure rotation without obstruction.
7. Start the fan motor and check for proper fan rotation.
8. At seasonal start-ups, adjust the belt tension. This is typically not required at initial start-up since the factory has already applied proper tension.
9. Check float-operated make-up valve to ensure the valve is operating freely.
10. Before seasonal start-up, lubricate the fan shaft bearings. This is not required at initial start-up since the fan bearings have been lubricated at the factory prior to shipment.
   A. At initial start-up or before start-up when the basin is completely drained, fill the cold water basin with fresh water to the overflow level. For new installations, initiate a biocide water treatment program at this time (see “Water Treatment” section, page N46).
   B. At seasonal start-up and following a shutdown period of more than 3 days, resume the biocide treatment program or administer a shock treatment of appropriate biocides prior to operating the unit fans to eliminate accumulated biological contaminants (see “Biological Control” on page N47).
11. Set the float on the make-up valve to shut off the valve when the float is approximately 1/2” below the overflow level.***
12. Start the spray water pump and check for proper rotation as indicated by the arrow on the pump cover.***
   (Note: On remote sump applications, adjust system flow rate to design. The supply valve to the spray header should be opened slowly until the design pressure (1.0 psi at spray header connection) and spray water flow are reached. Pressure greater than 10.0 psi may cause damage to the distribution system).
13. Open the valve in the tower bleed line and adjust bleed to the recommended rate (see “Water Treatment” section on page N46).***
14. Thoroughly inspect cooling tower fans for the following items: (note: Before inspecting mechanical equipment components, the fan driver should always be turned off and starter or disconnect switch locked out and tagged to prevent personal injury).
   a) Fan bolts - Inspect all bolts on the fan hub bushing and those connecting fan blades to the hub. Insure all are installed (none missing), tight and show no signs of cracking or failure.
   b) Fan Blades - Visually inspect all fan blades. The clearance between the tips of the blades and the fan cowl should be between 1/2” and 1” and all blades should be at the same pitch. Inspect blades for any signs of cracking or failure.
   c) Blade Loose-ness - Twist each blade by hand to check for looseness. There should be no play or slippage whatsoever.
   d) Fan Rotation - Rotate fan by hand. It should rotate freely with no rough spots, binding, or other malfunctions that could cause vibration or fan motor overload. While rotating the fan, check the blade tracking. All blades should track within a 1” band at any single point around the cowl.
   e) Drain Holes - On hollow fan blades, check the drain hole in the end of the blade to be sure it is clear.
   f) Direction of Rotation - Jog the fan motor and observe the direction of fan rotation. It should rotate in the direction indicated by the arrow located on the fan cowl.
   g) Noise - Run the fan in the manual position for several minutes to check for any unusual noises or vibrations.
15. Check the voltage and current of all three legs of both the fan and pump motor wiring. The current must not exceed the nameplate rating. After prolonged shut downs, the motor insulation should be checked with a “megger” insulation tester before restarting the motor.
16. For the HXV unit, if the three-way valve and control components, the fan driver should always be turned off and starter or disconnect switch locked out and tagged to prevent personal injury.
   a) Fan bolts - Inspect all bolts on the fan hub bushing and those connecting fan blades to the hub. Insure all are installed (none missing), tight and show no signs of cracking or failure.
   b) Fan Blades - Visually inspect all fan blades. The clearance between the tips of the blades and the fan cowl should be between 1/2” and 1” and all blades should be at the same pitch. Inspect blades for any signs of cracking or failure.
   c) Blade Loose-ness - Twist each blade by hand to check for looseness. There should be no play or slippage whatsoever.
   d) Fan Rotation - Rotate fan by hand. It should rotate freely with no rough spots, binding, or other malfunctions that could cause vibration or fan motor overload. While rotating the fan, check the blade tracking. All blades should track within a 1” band at any single point around the cowl.
   e) Drain Holes - On hollow fan blades, check the drain hole in the end of the blade to be sure it is clear.
   f) Direction of Rotation - Jog the fan motor and observe the direction of fan rotation. It should rotate in the direction indicated by the arrow located on the fan cowl.
   g) Noise - Run the fan in the manual position for several minutes to check for any unusual noises or vibrations.
15. Check the voltage and current of all three legs of both the fan and pump motor wiring. The current must not exceed the nameplate rating. After prolonged shut downs, the motor insulation should be checked with a “megger” insulation tester before restarting the motor.
16. For the HXV unit, if the three-way valve and control logic are supplied by BAC, please refer to separate documentation supplied with this option.

Caution: Rapid on/off cycling of fan motors can cause the fan motors to overheat. Controls for motors should be set to allow a maximum of six on/off cycles per hour. If this unit is to be controlled with a variable frequency drive (VFD), refer to the “Variable Frequency Drives” section on page N42.
CAUTION: Rapid on/off cycling of spray pump motors can cause scaling of the prime surface coil bundle and the fill.

WARNING: Before performing any maintenance or inspection, make certain all electric power has been disconnected and locked in the off position.

After 24 Hours:
After 24 hours of operation under load, the following services should be performed.
1. Check the unit for any unusual noise or vibration.
2. Check the operating water level in the cold water basin. Adjust the make-up float valve if necessary.***
3. Readjust the belt tension.
4. Clean the basin suction strainer.***

Seasonal Shutdown
The following services should be performed whenever the FXV/HXV/CXV unit is shutdown for a prolonged period:
1. If the unit sits on vibration isolators or isolation rails, refer to the manufacturer’s guidelines before loading/unloading weight from the unit.
2. Clean all debris, such as leaves and dirt, from the inside of the unit, the top of the finned coil bundle (for HXV only), and the air-inlet louvers.
3. Drain the cold water basin with basin strainers in place and flush to remove accumulated dirt.
4. Remove the basin strainers, clean, and reinstall.
5. Lubricate the fan shaft bearings and motor base adjusting screw(s).
6. Close the shut off valve in the make-up water line (supplied by others) and drain all exposed make-up water piping.***
7. Inspect the integrity of the corrosion protection system on the steel portion of the unit.
8. Check the anti-freeze solution to ensure adequate coil freeze protection. Note that anti-freeze suppliers may offer free yearly glycol analysis.
9. Inspect the prime surface coil bundle and the high density finned coil bundle (HXV only), and clean or repair if required.
10. Inspect the integrity of the anti-skid tape on the internal walkway.

***Note: Actions not required for the HXV dry operation during winter period.

Maintenance Procedures
Cold Water Basin and Suction Strainers
The spray water collects in the cold water basin and passes through the strainer into the system. The operating water level is controlled by the make-up valve and should be maintained at the operating water level listed in Table 4 (measured from the inside basin bottom, near make-up float). The operating water level in the cold water basin will vary somewhat with the system thermal load (evaporation rate), the bleed rate employed, and the make-up water supply pressure. With reduced evaporation rate, the water level in the cold basin will increase unless the float is readjusted. The operating water level should be checked monthly and the float readjusted as necessary to maintain the recommended operating level.

The water level in the basin of the equipment designed for remote sump operation is a function of the spray water flow rate, water outlet connection size/location, and outlet piping size/configuration. The remote sump unit is supplied without a water make-up assembly and the basin operating level during remote sump operation is not adjustable.

Inspect the cold water basin regularly. Remove any trash or debris accumulating in the basin or on the strainer and, if necessary, adjust the float to maintain the design operating level. Quarterly, or more often if necessary, drain, clean and flush the entire cold water basin with fresh water. This will remove the silt and sediment normally collecting in the basin and under the fill during operation. If not removed periodically, this sediment can become corrosive and cause deterioration of the protection finish. After the basin has been flushed, the strainer should be removed, cleaned, and reinstalled or replaced before refilling the basin with fresh water.

For units that operate dry during the cold winter months, the cold water basin should be drained completely, with the drain left open to prevent collection of rainwater, snow, etc.

Make-Up Valve
A float operated water make-up assembly is furnished as standard equipment on all FXV/HXV/CXV units unless the unit has been ordered with the optional electric water level control package or for remote sump application. For the single-side air inlet FXV/HXV/CXV unit, the make-up valve is located inside the cold water basin within easy reach from the outside of the unit on the air inlet face (see Figure 3A). For the double-side air inlet FXV/CXV unit, the make-up valve is located inside the cold water basin and can be reached from inside the unit plenum (see Figure 3B). The standard make-up assembly (see Figure 4) consists of a bronze make-up valve connected to a float arm assembly and actuated by a large diameter polystyrene filled plastic float.
The float is mounted on an all-thread rod that is held in place by wing nuts. The operating water level in the cold water basin can be adjusted by repositioning the float and all-thread rod using the wing nuts provided.

The make-up assembly should be inspected monthly and adjusted as necessary. Inspect the valve annually for leakage and replace the valve seat if necessary. Maintain the make-up water supply pressure between 15 and 50 psig for proper operation.

To make the initial basin water level setting, adjust the wing nuts so that the make-up valve is completely closed when the water level in the cold water basin is 1/2" below the overflow connection. Under design thermal load and with average city water pressure (15 to 50 psig) at the valve, this setting should produce the operating water levels stated in Table 4. Note that if the thermal load is less than the design load at the time of unit start-up, the procedure may produce operating levels greater than those shown in Table 4. It may be necessary to re-adjust the float in order to attain the recommended operating level. The unit basin should be closely monitored and water level adjusted as necessary during the first 24 hours of operation.

### Table 4. Basin Operating Level

<table>
<thead>
<tr>
<th>Model</th>
<th>Make-up Valve Width (in)</th>
<th>Operating Valve Level (in)</th>
</tr>
</thead>
<tbody>
<tr>
<td>CXV-x to CXV-208</td>
<td>8.5W</td>
<td>9.5'</td>
</tr>
<tr>
<td>FXV-x xx</td>
<td>12W</td>
<td>7.5'</td>
</tr>
<tr>
<td>CXV-186 to CXV-1988</td>
<td>24W &amp; 28W</td>
<td>10.5'</td>
</tr>
</tbody>
</table>

As an option, an electric water level control package is available in lieu of the mechanical make-up assembly described above (either included with new units or as a field installed upgrade). The package consists of a probe-type liquid level control assembly and a slow closing solenoid valve. Stainless steel electrodes, factory set at predetermined lengths, extend from an electrode holder into the cold water basin. These electrodes should be periodically cleaned to prevent accumulations of scale, corrosion, sludge or biological growth from interfering with the electrical circuit. With the electric water level control package, the water level is maintained at the recommended operating level regardless of the system thermal load. Therefore, it is not necessary, nor is it recommended, that the operating level be adjusted.

During start-up of units equipped with the electric water level control package, the control should be bypassed in order to fill the unit 1/2" below the overflow connection. Operation at the recommended water level will ensure that the unit basin contains sufficient water volume to prevent air entrainment in the circulating pump during system start-up.

**WARNING:** Before performing any maintenance or inspection, make certain all electric power has been disconnected and locked in the off position.

### Fan Shaft Bearings

Each fan shaft is supported by two pillow block ball bearings. Each bearing is equipped with a lubrication fitting and a slinger/locking collar to keep out moisture. The fan shaft bearings should be lubricated only with a hand grease gun. Do not use high-pressure grease guns since they may rupture the bearing seals. The bearings should be lubricated as follows:

**Initial Start-up:** Lubrication is normally not required since the bearings have been lubricated at the factory. If, however, the equipment is stored at the jobsite for more than one year, purge the bearings with new grease before initial operation.

**Seasonal Start-up:** Purge bearings with new grease before start-up.

**Operation:** Purge bearings with new grease after every two thousand (2,000) hours of operation, or once every three months, whichever comes first.

**Seasonal Shutdown:** Purge bearings with new grease before any prolonged storage or downtown.

Lubricate the bearings only with one of the following water-resistant greases for ambient temperatures ranging from -65°F (-53.9°C) to +250°F (121.1°C):

- Amoco - Rycon Premium #3
- Mobil - SHC 32
- Texaco - Regal AFB 2
- Shell - Alavania 3
- Shell - Dolium "R"

The use of non-listed lubricants is not recommended and may void the unit warranty.
Fan Motor
The standard fan motor used on FXV/HXV/CXV is a TEAO (Totally Enclosed Air Over) motor. The motor has permanently lubricated ball bearings and special moisture protection on the bearings, shaft, and windings. The only servicing required during operation is to clean the outside surface of the motor at least quarterly to ensure proper motor cooling. Condensation drain openings, located at the lowest point of the housing, should be open and free of any debris (check after prolonged shutdowns). Also, the motor insulation should be checked with a “megger” insulation tester prior to restarting the motor.

Variable Frequency Drives
Motors: Applications employing variable frequency drives (VFDs) for fan motor control must use inverter duty electric motors built in compliance with NEMA Standard MG-1, Part 31, available as an option from BAC. The standard fan motors normally furnished with BAC products are not intended for this duty and will not be warranted if so applied.

WARNING: When the fan speed of the unit is to be changed from the factory set speed, including changes achieved by the use of a variable fan speed device, steps must be taken to avoid operation at or near the fan’s “critical speed” which could result in fan failure and possible personal injury or damage. Consult with your local BAC Representative on any such applications.

Adjustable Motor Base
The motor base adjusting screw (see Figure 6) should be greased quarterly using a good quality corrosion-inhibiting grease such as one of those recommended for lubricating the fan shaft bearings.

BALTIDRIVE® Power Train
The BALTIDRIVE® Power Train consists of a specially designed belt, heavy duty, corrosion resistant, aluminum fan and drive sheaves, and cooling tower duty bearings. The solid-backed, multi-groove, neoprene/polyester belt provides the premium quality necessary for evaporative cooling service. The aluminum sheaves extend the life of the belt by minimizing the possibility of corrosion. These components provide a highly reliable system with low maintenance requirements. The only servicing required on the BALTIDRIVE® Power Train is to periodically check the condition of the belt and, when necessary, adjust the tension. The recommended service intervals are specified below.

Initial Start-Up: No servicing is required prior to initial unit start-up since the drive has been tensioned and aligned at the factory.

Operation: After initial start-up or the installation of a new belt, the tension must be readjusted after the twenty-four (24) hours of operation. Thereafter, the condition of the belt should be checked monthly and the tension adjusted as necessary, but at least once quarterly.

Seasonal Start-Up: Readjust the tension on the belt.

To check the belt tension, place a straight edge along the belt from sheave to sheave as shown in Figure 7 or use a tape measure to measure belt deflection. Apply a moderate force by hand (approximately 40 lbs.) evenly across the width of the belt in the center of the span between the sheaves. If the belts deflect between 1/4” and 3/8” (as shown in Figure 7), the belt is adequately tensioned.

1. Loosen the lock nuts on the motor base adjusting screw (see Figure 6).
2. Turn the motor base adjusting screw clockwise to tension the belt, or counter-clockwise to relieve belt tension. During adjustment of belt tension, the drives should be rotated several times by hand to evenly distribute the tension throughout the belt.
3. When the belt is properly tensioned, retighten the locking nut on the motor base adjusting screw.

Note: There should be no “chirp” or “squeal” when the fan motor is started.
The drive alignment should be checked annually to ensure maximum belt life. This can be done by placing a straightedge across the drive and driven sheaves (as shown in Figure 8) and the optional ENERGY-MISER® Fan System drives (as shown in Figure 9). When the drive is properly aligned, the straightedge will contact all four points as indicated. No more than 1/16" deviation from four-point contact is recommended. If realignment is necessary, loosen the motor sheave and align it with the fan sheave. Allow approximately 1/4" for draw-up as the bushing screw is retightened.

Flow Control Package (For HXV Only)
If the Flow Control Package is supplied by BAC, refer to the specific HXV-Control Sequence Manual provided by BAC for this option.

Spray Nozzles and Heat Transfer Section
The spray nozzles and heat transfer section should be inspected and cleaned each quarter. The inspection procedure is as follows:

1. Check to see if the nozzles are producing the spray pattern shown in Figure 10.
2. Clean any nozzles that are clogged. If necessary, the nozzle and rubber grommet may be removed for cleaning. To remove, grasp the nozzle at the base (closest to the rubber grommet) and pull while twisting. Replace any damaged nozzles.
3. Inspect the coil and fill. Any corrosion, damage, or obstructions must be corrected.

During periods of low ambient temperature (well below design), these units may be able to run at reduced fan speeds. The fans should be cycled with the spray water pump running continuously. The coil may be used for seasonal dry operation, followed by seasonal wet operation, but NOT for frequent cycling of the spray pump. Frequent spray pump cycling may lead to excessive scale buildup and reduced wet and dry performance.

WARNING: Do not use steam or high pressure water to clean the cooling tower fill.

Corrosion Protection
FXV/HXV/CXV units are constructed of corrosion-resistant materials. The fill is made of an inert synthetic material - polyvinyl chloride (PVC), which is impervious to rot, decay, rust, or biological attack. Other materials used in construction of the equipment, which are listed below, should be inspected regularly.

Galvanized Steel Components
Galvanized steel components should be inspected for blemishes or corrosion on the galvanized steel. Affected areas should be thoroughly wire brushed and recoated with a cold galvanizing compound such as Zinc-Rich Compound (ZRC).

BALTIBOND® Corrosion Protection System Components
Galvanized steel components protected with the BALTIBOND® Corrosion Protection System may develop scratches, scrapes or blemishes. These can easily be touched up with a repair kit (BAC Part No. 16-133P).

Stainless Steel Components
Stainless steel components should be inspected for signs of blemishes or corrosion and cleaned with stainless steel wool as necessary.

Fiberglass Reinforced Polyester (FRP) Components
Double-side air inlet units are provided with FRP casing panels and air inlet louvers as standard. These components should be inspected for accumulation of dirt and cleaned with soap and water as necessary.

In the event that the corrosion damage is more extensive than simple scratches or minor blemishes, contact your local BAC Representative.

Winter Operation
Protection Against Cold Water Basin Freezing
If the unit is idle or operating at ambient temperatures below freezing with water in the cold water basin, the water needs to be protected from freezing. This can be accomplished with electric immersion heaters. A remote sump will eliminate the need for freeze protection in the unit. When a remote sump is not used, trace with electric heat tape and insulate all exposed make-up lines and water piping not draining at shutdown.

Leaving Fluid Temperature
When operating at ambient temperatures below freezing, the unit will normally produce leaving spray water and/or leaving process fluid temperatures below design. Low system temperatures tend to promote ice formation. When operating wet at below-freezing ambient temperatures, the leaving process fluid temperature of the FXV/HXV/CXV unit with liquid cooling circuits should be maintained at 50°F (45°F for an anti-freeze solution). The unit should be inspected frequently to detect any potential problems. Various methods of capacity control (fan cycling, VFD’s, etc.) may be used to maintain the leaving fluid temperature.
Capacity Control
Proper capacity control in the winter will optimize energy efficiency and minimize the potential for freeze-related problems. Several capacity control methods may be used:

1. **Unit Cycling:** During periods of cold weather, it is best to operate each unit with the highest load it can handle - rather than evenly dividing the total heat load across all cells. During prolonged periods, idle units may be bypassed and have their basins drained.

2. **Fan Cycling:** Reduce the heat rejection capacity of the unit by cycling fans on/off - **CAUTION:** Rapid on/off cycling of fan motors can cause the fan motor to overheat. Set controls to allow a maximum of six (6) on/off cycles per hour. Cycling the fans off periodically to prevent ice formation or to melt ice accumulating on the air inlet louvers may be necessary.

3. **Multi-Speed Motors:** If the unit is equipped with two-speed fan motors, operation at low speed may be sufficient to prevent icing - **Note:** When two-speed motors are used, the motor starter should include a fifteen-second time delay when switching from high to low speed.

4. **Variable Frequency Drives:** The most precise method of capacity control is accomplished by using VFDs to control fan motor speed - **WARNING:** When the fan speed of a unit is to be changed from the factory speed, including the use of a VFD device, steps must be taken to avoid operating at or near “critical speeds”. Consult with your local BAC Representative on any application utilizing variable speed control to determine whether any critical speeds may be encountered and if any modifications may be required. Additionally, inverter duty motors are required on installations that are to be controlled by VFDs (see Variable Frequency Drives, page N42).

Under severe conditions, when fan cycling is insufficient to prevent icing, it may be necessary to operate the fan(s) in reverse to remove any ice accumulation by forcing warm air out the inlet louvers. **CAUTION:** **DO NOT** operate the fans in reverse any longer than is necessary since extended reverse operation may cause the ice to form on the fan blades, fan stack, or eliminators and damage the unit. Because of this possibility, units using reverse fan operation for ice removal should be equipped with a vibration-cut-out switch. The duration of reverse operation must be limited to a maximum of thirty minutes. A time delay of approximately forty seconds between forward and reverse direction should be incorporated into the motor controls.

**HXV Closed Circuit Hybrid Cooling Tower**
To optimize water and energy savings, the HXV Closed Circuit Hybrid Cooling Tower operates in three different modes (also see “HXV Operation Modes & Seasonal Periods”). In each mode, capacity is controlled by a combination of fan motor and 3-way valve modulation. In the dry/wet mode the spray pump and fan motor(s) are in operation and the complete process fluid flow passes through the finned coil bundle. The flow through the wetted prime surface coil bundle is gradually controlled (using the three-way valve arrangement) to maintain a constant process return temperature. In the adiabatic mode, the spray pump and fan motor(s) are in operation and the complete process fluid flow passes through the finned coil bundle, though it bypasses the wetted prime surface coil. The HXV unit remains in this operating mode until the process return temperature is low enough to switch over to dry mode.

In the dry mode the fan motor(s) can be operated at variable speeds. For units with more than (1) fan motor, the speed of the different motors should be equal at all times for the most efficient unit operation.

**WARNING:** When the fan speed of an HXV Closed Circuit Hybrid Cooling Tower is to be changed from the factory speed, including the use of a Variable Frequency Drive (VFD) device, steps must be taken to avoid operating at or near “critical speeds”. Consult with your BAC Representative on any application utilizing variable speed control to determine whether any critical speeds may be encountered and if any modifications may be required. Additionally, inverter duty motors are required on installations that are to be controlled by VFDs (See “Variable Frequency Drives” section, page N42). The spray pump is not in operation and the complete process fluid flows through both the finned and the wetted prime surface coil bundles.

Consult with your local BAC Representative for specific operating sequences with VFD’s, two-speed motors, etc.

**CAUTION:** Rapid on/off cycling of fan motors can cause the fan motor to overheat. Set controls to allow a maximum of six (6) on/off cycles per hour. If the unit has two-speed motors, the motor starter should include a minimum fifteen-second time delay when switching from high to low speed.

**CAUTION:** Frequent on/off cycling of the spray pump may lead excessive scale build-up and reduce wet and dry performance. During winter months, when the HXV unit stays in the dry mode, the water from the basin should be drained. When the basin is drained, any electric basin heaters, should be disconnected and locked in the off position.
Water Treatment
Corrosion and Scale Control

Although general recommendations regarding the quality of water circulated through BAC evaporative cooling equipment are made below, it is always the responsibility of the end-user to contract a competent water treatment specialist to design an application-specific treatment program for a given system. This program should consider (as a minimum) setting and adjustment of the bleed rate, passivation of galvanized steel surfaces, chemical treatment, and biological control. **Biological control cannot be ignored.** Uncontrolled growth of algae, slimes, and other microorganisms may contribute to the growth of potentially harmful microorganisms, including Legionella, in the recirculating water system. Furthermore, the program should consider all components of the system (piping, chiller, heat exchanger, etc.), not just the cooling tower.

In order to control scaling and corrosion, a combination of chemical treatment and bleed-off should be used to maintain the given properties of water within the limits shown below. In rare cases where chemical treatment is not required to control scale and corrosion, more conservative limits are recommended. Similarly, certain limits may be exceeded when under the guidance of a water treatment specialist. As make-up water properties, materials of construction, and environmental conditions will vary on a case-by-case basis, treatment programs will also vary and should always be administered by a water treatment specialist.

Recirculated Water Quality Guidelines for Chemically Treated Water

<table>
<thead>
<tr>
<th>Property of Water</th>
<th>Recommended Level</th>
</tr>
</thead>
<tbody>
<tr>
<td>pH</td>
<td>6.5 to 8.5*</td>
</tr>
<tr>
<td>Hardness as CaCO₃</td>
<td>50 to 750 ppm²</td>
</tr>
<tr>
<td>Alkalinity as CaCO₃</td>
<td>500 ppm maximum³</td>
</tr>
<tr>
<td>Trial Dissolved Solids</td>
<td>1500 ppm maximum</td>
</tr>
<tr>
<td>Conductivity</td>
<td>2400 micromhos³</td>
</tr>
<tr>
<td>Chlorides</td>
<td>200 ppm maximum as CI</td>
</tr>
<tr>
<td>Sulfates</td>
<td>410 ppm maximum as NaCl</td>
</tr>
<tr>
<td>Silica</td>
<td>250 ppm maximum</td>
</tr>
</tbody>
</table>

1. Galvanized steel units require passivation in order to prevent white rust. To passivate the galvanized steel, the pH must be maintained between 7 and 8.2 for 4 to 8 weeks or until the new zinc surfaces turn dull gray in color. After passivation, the pH can be maintained at higher levels. Repassivation may be necessary if white deposits appear on galvanized steel surfaces. Stainless steel units and units protected by the BALTIBOND® Corrosion Protection System do not require passivation. Consult your water treatment specialist for specific recommendations regarding passivation (or repassivation) of galvanized steel surfaces.

2. Hardness and alkalinity limits may be exceeded under certain circumstances. Consult your water treatment specialist for recommendations.

3. The conversion factor used to determine conductivity is 0.625 (TDS = 0.625 * Conductivity).

Bleed Rate

In evaporative cooling equipment, cooling is accomplished by the evaporation of a small portion of the recirculating spray water as it flows through the equipment. As this water evaporates, the impurities originally present remain in the recirculating water. The concentration of the dissolved solids increases over time and can reach unacceptable levels. In addition, airborne impurities are often introduced into the recirculating water. If these impurities and contaminants are not effectively controlled, they can cause scaling, corrosion, and sludge accumulations that reduce heat transfer efficiency and increase system operating costs, potentially shortening the useful life of the equipment.

The degree to which dissolved solids and other impurities build up in the recirculating water may be defined as the cycles of concentration. Specifically, cycles of concentration is the ratio of the concentration of a dissolved solid (for example - chlorides, sulfates, etc.) in the recirculating water to the concentration of the same material in the make-up water. For optimal heat transfer efficiency and maximum equipment life, the cycles of concentration should be controlled to maintain the quality of the recirculating water within the guidelines given above. In order to control the cycles of concentration such that the above guidelines are maintained, it will be necessary to “bleed” or “blow down” a small amount of recirculating water from the system. This “bleed” water is replenished with fresh make-up water, thereby limiting the build-up of impurities.

Typically, the bleed is accomplished automatically through a solenoid valve controlled by a conductivity meter. The conductivity meter set point is the water conductivity at the desired cycles of concentration and should be determined by a competent water treatment expert. (Note: The solenoid valve and conductivity meter must be supplied by others.) Alternatively, a bleed line with a valve can be used to continuously bleed from the system. In this arrangement, the rate of bleed can be adjusted using the valve in the bleed line and measured by filling a container of known volume while noting the time period. **The bleed rate and water quality should be periodically checked to ensure that adequate control of the water quality is being maintained.**
The following example illustrates a bleed rate calculation.

**Given:**
- Closed Circuit Cooling Tower
- Process Fluid Flow Rate = 800 GPM
- Range = 10°F
- Maximum Allowable Chloride Concentration = 250 ppm
- Concentration of Chlorides in Make-Up Water = 45 ppm

**Find:** Bleed Rate

**Solution:**

\[ B = \frac{E}{N-1} \]

Where:
- \( B \) = Bleed Rate (GPM)
- \( E \) = Evaporation Rate (GPM) = \( Q \) (GPM) \times R (°F) \times .001
- \( Q \) = Process Fluid Flow Rate (GPM)
- \( R \) = Range = Entering – Leaving Fluid Temperature (°F)
- \( N \) = Number of Cycles of Concentration = \( CR/CM \)
- \( CR \) = Concentration in Recirculating Water
- \( CM \) = Concentration in Make-Up Water

So in this case,

\[ E = 800 \times 10 \times 0.001 = 8 \text{ GPM} \]
\[ N = \frac{250}{45} = 5.56 \]
\[ B = \frac{8}{5.56 - 1} = 1.75 \text{ GPM} \]

This example focuses on a single parameter (chloride concentration) of water only. The bleed rate required for a system (when evaluating more than one parameter) is the highest bleed rate required to keep all parameters within recommended limits.

The evaporation rate (E) can be determined by any one of the following methods:

1. The evaporation rate is approximately 2 GPM per 1 million BTUH of heat rejection.
2. The evaporation rate is approximately 3 GPM per 100 tons of refrigeration.
3. Evaporation Rate = \( Q \) (GPM) \times R (°F) \times .001 (as shown in the example above)

---

**Chemical Treatment**

Follow all applicable laws and regulations while handling and disposing chemicals.

Chemical treatment programs must meet the following requirements:

1. The chemicals must be compatible with the unit materials of construction as well as other materials used in the system (pipe, heat exchanger, etc.)
2. Chemical scale and corrosion inhibitors, and particularly acid (if used) should be introduced into the circulating water through automatic feeders at a point in the system where total mixing and dilution can occur before reaching the evaporative cooling equipment. Stainless steel and galvanized steel materials coated with the BALTIBOND® Corrosion Protection System are less sensitive to the addition of acid than galvanized steel materials. Regardless of the unit materials of construction, the preferred injection point for chemical scale and corrosion inhibitors is on the discharge side of the recirculating spray water pump(s). These chemicals should never be batch fed directly into the cold water basin or water distribution system, as such practice can cause severe damage to directly contacted areas.
3. When chlorine is added to the system, free residual shall not exceed 1 ppm. Exceeding this limit may accelerate corrosion.

**HXV Blowdown**

Note that the HXV has been designed to minimize water usage. Therefore the use of an automated blowdown system is highly recommended, to maximize water savings and reduce sewage charges.

**Biological Control**

Bleed-off with or without chemical treatment for scale and corrosion control is not adequate for control of biological contamination. The growth of algae, slimes, and other microorganisms, if unchecked, will reduce system efficiency and may contribute to the growth of potentially harmful microorganisms, including Legionella, in the recirculating water system. **All water treatment programs for evaporative cooling equipment must employ some form of biological control to control Legionella and other biological contaminants. A competent water treatment specialist should be contacted for specific recommendations.**

Accordingly, a biocide treatment program specifically designed to address biological control should be initiated when the system is first filled with water and administered on a regular basis thereafter in accordance with the supplier’s instructions. Solid or granular biocides should be introduced through a chemical "pot" feeder installed in parallel with the system circulating pump(s). Dilute liquid biocides may be added directly to the basin. If ozone water treatment is used, ozone concentrations should not exceed 0.1 - 0.5 ppm in order to ensure maximum equipment life.
Start-Up Following a Shut-Down Period

To minimize risk from biological contamination following a shutdown period, it is recommended that the entire system (evaporative cooling equipment, system piping, heat exchangers, etc.) be drained when the system is to be shut down for more than three days. To resume operation of a drained system, clean all debris, such as leaves and dirt from the unit and refill the system with fresh water. While operating the recirculating spray pump(s) and prior to operating the unit fan(s), execute one of the following two alternative biocide treatment programs:

1. Resume treatment with the biocide that had been used prior to shutdown. Maintain the maximum recommended biocide residual (for the specific biocide) for a sufficient period of time (residual and time will vary with the biocide) as recommended by the water treatment supplier to bring the system under good biological control. Only after this treatment period is completed should the unit fan(s) be started.

2. Check the pH of the circulating water and, if necessary, adjust it to 7.0 to 7.6. Then treat the system with sodium hypochlorite to maintain a level of 4 to 5 mg/l (ppm) free chlorine (as Cl₂) over a six (6) hour period. Test kits that can be used to measure the free residual of chlorine are commercially available. Only after this treatment period is completed should the unit fan(s) be started.

Coil Cleaning

Both the inside and outside of the heat exchanger coil may require occasional cleaning. The chemicals used must be compatible with the materials being treated (for example - standard coil: outside of the coil is galvanized steel; inside of the coil is black carbon steel). For finned coils, the coil cleaning must be careful not to damage the fins (outside of the coils) and the coils themselves. For specific recommendations on coil cleaning, consult a qualified consultant.

Weld Byproduct Cleaning (CXV)

The installation and manufacturing processes commonly used for field assembly of steel-piped systems may leave weld byproducts inside coils and connecting piping (especially in refrigeration systems). It is common practice to install filters and/or strainers that remove contaminants during initial system operation. Shortly after system startup, the filters and/or strainers should be cleaned or replaced.

Summary

For specific recommendations on treatment for scale, corrosion and biological control, consult a qualified water treatment consultant.

In addition to the issues addressed above, some routine maintenance is also required to keep evaporative cooling equipment in its optimal condition. Refer to the maintenance procedures addressed in this bulletin for more information.

Factory Authorized Parts

Baltimore Aircoil Company maintains a stock of replacement parts at each of its several manufacturing facilities. Many BAC Representatives also have their local stocks of BAC replacement parts. These parts are designed and built specifically for BAC units and assure BAC’s customers of:

- Guaranteed performance
- Immediate availability
- Original equipment quality
- Local assistance with service problems

All factory-authorized parts are guaranteed for one (1) full year, and their use will ensure continued maximum performance from your BAC equipment. Shipment of parts is normally made within three (3) days after receipt of an order. In emergency situations, shipment can usually be made within 24 hours. To order factory authorized parts, contact your local BAC Representative. You can determine your local BAC Representative by the label next to the unit nameplate, by calling 1-(800)-896-8497, or via the Internet at www.BaltimoreAircoil.com. Be sure to include the unit serial number when ordering any parts.

To facilitate servicing the FXV Closed Circuit Cooling Tower/ HXV Closed Circuit Hybrid Cooling Tower/CXV Evaporative Condenser, it is suggested that one of each of the following spare parts be carried on hand:

- Make-Up Float Ball – Large diameter, foam filled plastic float for make-up valve.
- Valve Seat for Make-up Valve – Elastomer seat for positive shut off.
- Set of Fan Shaft Bearings – Grease-lubricated ball bearings with special moisture proof seals and integral slinger rings designed specifically for evaporative cooler applications.
- Spray Nozzle and Grommet Kit – 360° large diameter plastic metering nozzles engineered to give optimum water distribution.

In addition, your local BAC Representative usually stocks common wear items for immediate delivery, and is available to inspect your unit to ensure it is in proper operating condition.

Please record your unit’s model number and serial number (as they appear on the unit nameplate) on the front and back cover. This will help ensure the quickest, most accurate response to your inquiries.
Rigging and Assembly Instructions
CXV Evaporative Condensers
FXV Closed Circuit Cooling Towers

Thoroughly review the rigging and assembly instructions in this bulletin with all personnel prior to an actual rigging operation. Make sure all necessary equipment is available before starting.

Be sure to have a copy of the certified drawing available for reference.
Before rigging any unit, verify the weight of each section from the certified drawings. Some accessories add additional weight as shown on the respective accessory drawing. If you do not have a copy of this drawing, or if you need additional information about this unit, contact the local BAC Representative whose name and telephone number are on a label adjacent to the access door. The model number and serial number of the unit are also located in this area.

Shipping
CXV and FXV units are factory-assembled to ensure uniform quality and minimize field assembly. Some models ship in four sections per cell (one lower and three upper: each coil section ships separately) to ease rigging and minimize freight costs. All other models ship in two sections per cell (upper and lower) due to shipping height restrictions. Table 1 identifies the number of sections required for each unit.

Check Unit Before Rigging
When the unit is delivered to the jobsite, check it thoroughly to ensure all required items have been received and are free of any shipping damage before signing the bill of lading. The following parts should be inspected:

- Sheaves and Belts
- Bearings
- Bearing Supports
- Fan Motor[s]
- Fan[s] and Fan Shaft[s]
- Fill
- Cooling or Condensing Coil[s]
- Removable Drift Eliminators
- Interior/Exterior Surfaces
- Louvers
- Float Valve Assembly[s]
- Strainer[s]
- Spray Water Pump[s]
- Water Distribution System
- Intake Hood Assembly (if applicable)
- Miscellaneous Items

All bolts, nuts, washers, and sealer tape required to assemble sections or component parts are furnished by BAC and are shipped with the unit. A checklist inside the envelope attached to the side of the unit marked "Contractor’s Installation Information" indicates what miscellaneous parts are included with the shipment and where they are packed.

WARNING: Before an actual lift is undertaken, ensure that no water, snow, ice or debris has collected in the basin or elsewhere in the unit. Such accumulations will add substantially to the equipment’s lifting weight.

WARNING: For safety, in the event of extended lifts or where hazards exist, the lifting devices should be used in conjunction with safety slings placed under the unit.

Anchoring
Seven eighths (7/8) inch diameter holes are provided in the bottom flange of the lower section for bolting the unit to the support beams. Refer to the suggested support location drawing included in the submittal for location of the mounting holes. The unit must be level for proper operation. Anchor bolts must be provided by others.

Safety: Adequate precautions, appropriate for the installation and location of these products, should be taken to safeguard the public from possible injury and protect the equipment and premises from damage.

WARNING: Operation, maintenance, and repair of this equipment must be undertaken only by personnel qualified to do so. Proper care, procedures, and tools must be used in handling, lifting, installing, operating, maintaining, and repairing this equipment to prevent personal injury and/or property damage.

Location: All evaporative cooling equipment must be located to ensure an adequate supply of fresh air to the fans. When units are located adjacent to walls or in enclosures, care must be taken to ensure the warm, saturated, discharge air is not deflected and short-circuited back to the air intakes.

Each unit should be located and positioned to prevent the introduction of discharge air into the ventilation system of any building. For detailed recommendations on CXV and FXV layout, please consult your local BAC Representative.
Rigging

Refer to Table 1 and Figures 1, 2 and 3 for each section’s required minimum spreader bar length (W1) and recommended minimum vertical dimension “H” from the base of each section to the spreader bar. To assemble sections, refer to the appropriate section of this bulletin for further details.

Note: All units must be rigged one section at a time.

### Table 1

<table>
<thead>
<tr>
<th>Model Number</th>
<th>Section</th>
<th>H</th>
<th>W1</th>
<th>W2</th>
</tr>
</thead>
<tbody>
<tr>
<td>FXV - 42x</td>
<td>Upper</td>
<td>14'</td>
<td>8' 6&quot;</td>
<td>3' 6&quot;</td>
</tr>
<tr>
<td></td>
<td>Lower</td>
<td>7'</td>
<td>8' 6&quot;</td>
<td></td>
</tr>
<tr>
<td>FXV - 43x</td>
<td>Upper</td>
<td>18'</td>
<td>8' 6&quot;</td>
<td>3' 6&quot;</td>
</tr>
<tr>
<td></td>
<td>Lower</td>
<td>9'</td>
<td>8' 6&quot;</td>
<td></td>
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<tr>
<td>FXV - 44x</td>
<td>Upper</td>
<td>18'</td>
<td>11' 10&quot;</td>
<td>3' 6&quot;</td>
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<tr>
<td></td>
<td>Lower</td>
<td>11'</td>
<td>11' 10&quot;</td>
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<tr>
<td>FXV - 64x</td>
<td>Upper</td>
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<td>11' 10&quot;</td>
<td>4' 6&quot;</td>
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<td></td>
<td>Lower</td>
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<td>11' 10&quot;</td>
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<tr>
<td>FXV - 66x</td>
<td>Upper</td>
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<td>11' 10&quot;</td>
<td>4' 6&quot;</td>
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<tr>
<td></td>
<td>Lower</td>
<td>18'</td>
<td>11' 10&quot;</td>
<td></td>
</tr>
<tr>
<td>FXV - 288 - xxx</td>
<td>Plenum</td>
<td>18'</td>
<td>11' 11'</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Lower</td>
<td>20'</td>
<td>11' 11'</td>
<td></td>
</tr>
<tr>
<td></td>
<td>(2) Coil</td>
<td>14'</td>
<td>11' 11'</td>
<td></td>
</tr>
<tr>
<td>FXV - 384 - xxx</td>
<td>Plenum</td>
<td>20'</td>
<td>13' 11&quot;</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Lower</td>
<td>20'</td>
<td>13' 11&quot;</td>
<td></td>
</tr>
<tr>
<td></td>
<td>(2) Coil</td>
<td>14'</td>
<td>13' 11&quot;</td>
<td></td>
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</tbody>
</table>

**Note:** The “H” dimension represents the distance from the base of each section to the spreader bar attachment point. The “W1” dimension represents the minimum distance between the spreader bar attachment points.
Section Assembly of Two-Piece Cells

To assemble a two-piece cell:

- Position the lower section on the unit supports and bolt in place.
- Wipe moisture and dirt from the perimeter flange.
- Install sealer tape [BAC part number - 554000P] supplied with the unit, as illustrated in Figure 4, on the mating flanges of the lower section in a continuous line. At each corner, allow 1” overlap.
- Using drift pins, as shown in Figure 5, in the bolt holes provided, guide the top section onto the bottom section starting with bolt hole at one corner and following down the flange.
- Screw in place using the self-tapping screws or bolts, supplied with the unit, to ensure leak-free operation. (Figure 6)
To assemble a four-piece cells:

- Position the lower section on the unit supports and bolt in place.
- Wipe moisture and dirt from the perimeter flange and plenum step shown in Figure 8.
- Apply foam seal tape (BAC part number – 270175P) at each corner and across the plenum step as shown in Figure 9. See Figures 10 & 11 for critical sealing areas. Allow 1” overlap of tape at these locations.
- Apply foam tape around the entire perimeter of the lower section. Align the tape on the perimeter flange as shown in Figure 7. See Figures 10 & 11 for critical sealing areas. Allow 1” overlap of tape at these locations.
• Lift and set the plenum module. Center the plenum module transversely and longitudinally. The rigging guides (shown in Figure 12) will engage when the plenum module is within 2” of the lower casing section. Bolt the plenum module in place at the four (4) internal bracket locations. See Figure 6 for typical bolting detail.
• Before rigging the coil modules, wipe the moisture and dirt from the corner columns and apply “D” seals (BAC part number – 271665P) at two (2) locations on each coil module as shown in Figure 14.

• Lift the coil module and verify that it is level. Adjust lifting devices as necessary to level the coil module before attempting to set. The coil connection of the coil module weighs more and will affect the balance. Tolerances are given in Figures 17 & 18.
Failure to level the coil module for rigging will prevent proper engagement of rigging guides.

**NOTE:** Failure to level the coil module for rigging will prevent proper engagement of rigging guides.

- To engage the rigging guides, the coil module must be positioned between 2 3/4” and 3 3/4” above the lower section as it is moved towards the plenum module. Once the coil module rigging guides have engaged the plenum module corner columns, lower the coil into final position.

- Bolt the coil module to the lower section along the louver face flange. See Figure 6 for typical bolting details.
Optional Accessories and Equipment

All optional accessories such as ladders, safety cages, platforms and handrail packages should be installed as shown on the appropriate reference drawing in the submittal package from Baltimore Aircoil Company. Any applicable reference drawings are included with the unit in the envelope attached to the side of the unit marked “Contractor’s Installation Information.”