



# Baltimore Aircoil

# ECI/FCI Evaporative Condensers and Industrial Fluid Coolers

# Operating and Maintenance Instructions

Baltimore Aircoil Company FCI/ECI equipment has 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. This bulletin is published as a guide to establishing such a program.

Included in the bulletin are the recommended services for start-up, operation, and shutdown and the approximate frequency for each. *Note that the recommendations on frequency of service are minimum and where operating conditions are severe, the services should be performed more often.* For each required service, follow the procedures outlined under the "Maintenance Procedures" section of this bulletin.

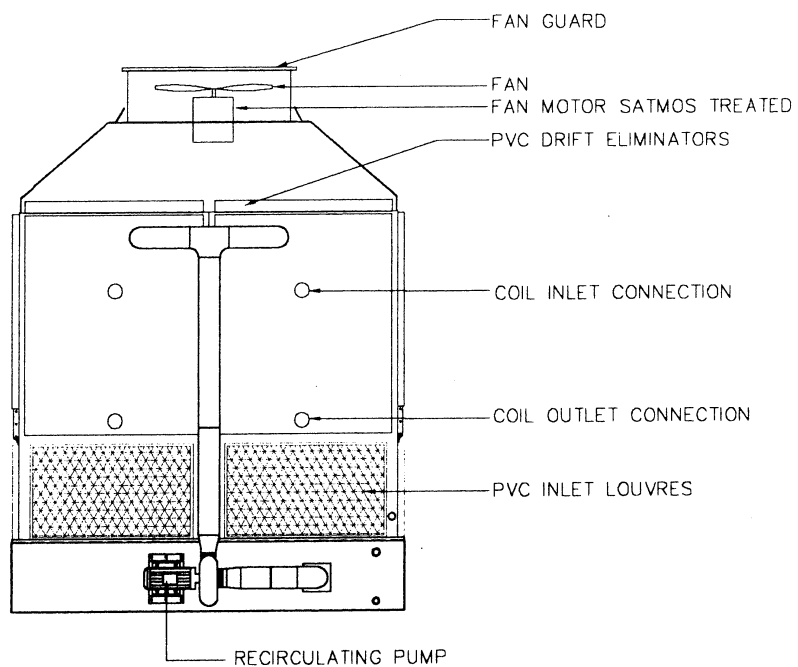
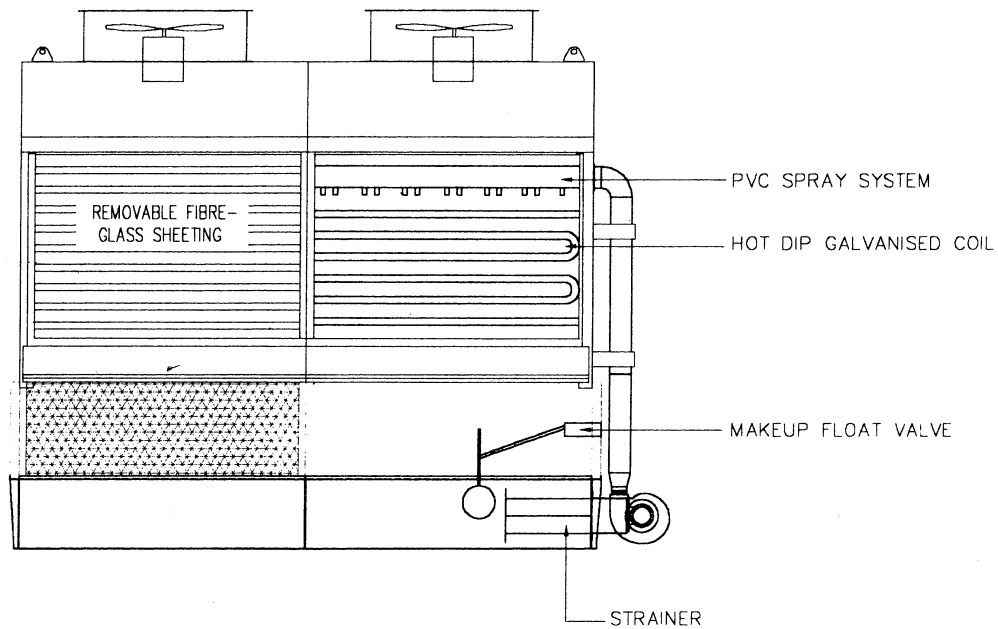
The FCI/ECI unit is illustrated in a cutaway form on page 2 with the major points of inspection and service identified. A copy of the unit certified drawing should also be available for reference.

If you need additional information about operation or maintenance in this bulletin, contact the local B.A.C. Representative.

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# FCI Industrial Fluid Coolers / ECI Evaporative Condensers



# Warnings



## SAFETY

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

When servicing the interior of the unit, precautions must be taken to prevent the fan starting automatically. Before entering the tower or working near the fan, the power supply should be disconnected or locked off and warning signs placed.

The operation, maintenance and repair of this equipment should be undertaken only by personnel qualified to do so and familiar with the equipment, associated system and controls.

## FREEZE PROTECTION

These products must be protected against damage and or reduced effectiveness due to possible freeze-up by mechanical and operational methods. Please refer to Cold Weather Operation guidelines (page 7) or contact the local B.A.C. representative for recommended protection alternatives.

## WARRANTIES

Please refer to the B.A.C. Conditions of Sale and Limitation of Warranties applicable to and at the time of the sale/purchase of these products.

## INSTALLATION

It is essential that FCI/ECI units are correctly located and supported. Refer to FCI/ECI Rigging and Installation Bulletin for specific instructions regarding the correct installation of this equipment.

FCI/ECI units must be located to ensure an unrestricted supply of fresh air to the air inlets. Additionally each unit should be positioned to prevent the introduction of its discharge air into the ventilation system of any adjacent building.

## TEMPERATURE LIMITS

The standard eliminators can withstand a maximum inlet water temperature of 55°C. **This temperature should not be exceeded** even for short periods or major damage will be caused.

Alternative material options are available for higher operating temperatures.

# Operation and Maintenance

During operation, the unit should be inspected and cleaned on a regular basis. The required services and recommended frequency for each are summarized here below.

| Type of Service                            | Start-up | Monthly | Every 6 Months | Shutdown | Annually | Ref. Page |
|--|----------|---------|----------------|----------|----------|-----------|
| Inspect general condition of tower         | X        | X       |                |          |          | 4         |
| Clean debris from unit                     | X        | X       |                | X        |          | 4         |
| Clean and flush sump                       | X        |         | X              | X        |          | 4         |
| Clean sump strainer and inlet louvers      | X        | X       |                | X        |          | 5         |
| Check and adjust sump water level          | X        | X       |                |          |          | 5         |
| Inspect PVC drift eliminators and coil     | X        | X       |                |          |          | 5         |
| Inspect spray nozzles                      | X        | X       |                |          |          | 5         |
| Check and adjust bleed rate                | X        | X       |                |          |          | 7         |
| Check operation of make-up valve           | X        |         | X              |          |          | 5         |
| Check unit for unusual noise or vibrations | X        | X       |                |          |          | 4         |
| Check motor voltage and current            | X        |         | X              |          |          | 4         |
| Check fan for proper rotation              | X        |         |                |          |          | 4         |
| Drain sump and piping                      |          |         |                | X        |          | 6         |
| Inspect fibreglass panels                  |          |         |                |          | X        | 6         |

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



# Operation and Maintenance

## INITIAL AND SEASONAL START-UP

Before initial start-up or after a long shut down period, the unit should be thoroughly inspected and cleaned:

1. Clean any debris from air inlet louvers, fans, eliminators, coil and cold water basin.
2. Flush the cold water basin (with strainer in place) and drain to remove accumulated dirt.
3. Remove, clean and re-install strainer.
4. Turn the fan by hand to ensure rotation without obstruction.
5. Check float operated make-up valve to be sure it is operating freely.
6. Fill cold water basin with fresh water until level with the top of the strainer handle.
7. Set the float on the make-up valve to shut off the valve at the level recommended under "make-up valve" (page 5).
8. Inspect spray nozzles and coil.
9. Start the fans and pump and check for the proper rotation as indicated by the arrow on the fan cylinder and pump cover (clockwise when viewed from the top).
10. Check the voltage and current of all three supply phases to the fan and pump motors. The current (line amps) should not exceed the nameplate rating. After prolonged shutdowns, the motor insulation should be checked with a megger insulation tester prior to restarting the motor.
11. Open the bleed line valve and adjust to the recommended rate (see "Water Treatment", page 7).
12. Check that the water pressure matches the design figure given on the serial plate label. Nozzles are available in four sizes to accommodate different flow rates and supply pressures.

## 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 for water leaks from casing flanges, pipework connections and all fasteners.
3. Check the operating water level in the cold water basin and adjust if necessary.
4. Inspect spray nozzles and water distribution system.
5. Re-adjust fan belt tension. (Belt drive units only).

## SEASONAL SHUTDOWN

The following services should be performed when the unit is to be shut down for a longer period of time:

1. Drain the cold water basin and all piping that will be exposed to freezing temperatures.
2. Clean and flush the cold water basin with the strainer in place. Leave the drain open so rain and melting snow will drain from the unit.
3. Clean the strainer and re-install.
4. Close shut off valves in water make-up line and drain all exposed make-up piping.
5. Inspect the protective finish on the unit. Clean and repair as required (see page 6).
6. Re-lubricate the fan shaft bearings and motor base adjusting screw.

# Maintenance Procedures



During service procedures care must be taken to protect the equipment. In particular the PVC eliminators are vulnerable to damage if stood on directly.

## MOTOR AND FAN

Should it be required to remove this assembly for the purpose of repair or replacement of motor or fan, the following procedure should be followed.

### DIRECT DRIVE UNITS

#### Removal of Fan

1. Remove bolts from fan hold-down plate and remove plate.
2. Re-insert the center bolt into the motor shaft so that the bolt head protrudes  $\pm 15$  mm above the face of the fan hub.
3. Place hold down plate on top of the bolt head, line up holes between the fan hub and hold down plate.
4. Insert hold down bolts and turn evenly until fan is released from motor shaft.
5. Remove fan.

#### Removal of Motor

1. Insert an eye bolt in the end of motor shaft and support the motor.
2. Remove bolts securing motor base to support structure.
3. Lift motor out of position.

## PVC DRIFT ELIMINATORS

Made from UV resistant PVC the eliminators are light weight and are easily removed through the access panels. They should be cleaned regularly using a hose or high pressure cleaner. Water temperatures should not exceed 50°C.

Observe position and orientation if removing eliminators from the tower. Top side of eliminator is marked.

## SPRAY NOZZLES

Large orifice, clog-resistant, ABS plastic spray nozzles ensure an optimum water distribution pattern over the coil surface. In order to maintain high efficiency, nozzles should be inspected and cleaned regularly. The nozzles are designed for quick, twist-lock removal to facilitate cleaning.

Nozzles are either the 360° type or 'D' type. When fitting 'D' type nozzles, care must be taken that the orientation is correct to give a spray pattern as indicated in figure 1.

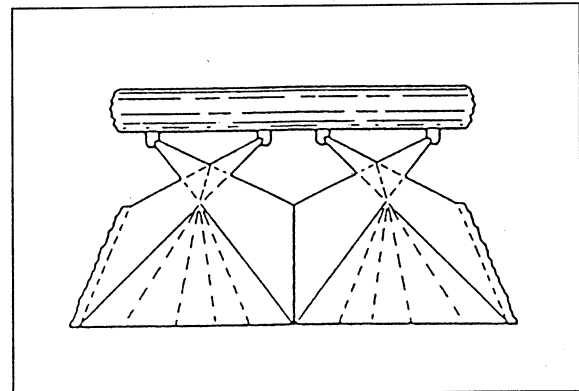


Figure 1 - Nozzle Spray Distribution

## COIL

Inspect coil. Any obstructions must be removed. Any corrosion or damage repaired.

## AIR INLET LOUVERS

Easily removable air inlet louvers are made from PVC material of honeycomb design. The PVC sections are contained in a lightweight 304 SST frame. Therefore maintenance requirements are minimal and consist of regular cleaning with hose or medium pressure cleaner. Observe front/top label when refitting.

## MAKE-UP VALVE

A float operated water make-up is furnished as standard equipment on all units unless the unit has been ordered with an electric water level control or for remote sump application. The float controlling the valve is mounted on a threaded rod, held in place by wing nuts to facilitate adjustment of the operating water level.

To make the initial setting, adjust the wing nuts so that the make-up valve is completely closed when the water level in the cold water basin is  $\pm 30$  mm above the handle of the anti-vortex strainer. Continue to fill the basin by pressing the float balls down until the water level is 15 mm below the overflow level. This is to allow the system piping to be filled after the pump has been switched on, while still maintaining an adequate operating level.

The operating water level should be checked monthly, with the circulating pump running, and the float adjusted as necessary to maintain the recommended level. (See Table 1). The valve itself should be inspected every six months for leakage and the valve seat replaced if necessary.

The standard low pressure float valve is designed to operate with water supply pressure below 200kPa. Consult your local B.A.C. representative if this value is exceeded or if very low pressures result in insufficient water supply.



# Maintenance Procedures

**TABLE 1 - OPERATING WATER LEVEL**

| <b>MODEL No.</b>                                   | <b>OPERATING HEIGHT<br/>(measured from pan bottom)</b> |
|--|--|
| FCI - 8, 18, 27, 36<br>ECI - 10 through 135        | 250mm<br>250mm   |
| FCI - 50<br>ECI - 150 through 185                  | 320mm<br>320mm   |
| FCI - 70, 105, 140, 210<br>ECI - N205 through N800 | 300mm<br>300mm   |
| FCI - 120, 180, 240, 360<br>ECI - 320 through 1360 | 300mm<br>300mm   |

## **COLD WATER BASIN AND STRAINER**

The cold water basin should be inspected regularly. Any dirt or debris which may have accumulated in the basin or on the strainer should be removed.

Approximately every six months (or more frequently if circumstances warrant) the entire cold water basin should be drained, cleaned and flushed with fresh water to remove the silt and sediment which normally collects in the basin during operation. If not removed periodically, this sediment can become corrosive and cause deterioration of the fibreglass finish. When flushing the basin, the strainer should be left in place to prevent particles from re-entering the system. After the sump has been flushed, the strainer should be removed, cleaned and replaced before refilling the basin with fresh water. The strainer can be removed by pulling the handle up and away from the outlet connection.

## **CORROSION PROTECTION**

The FCI/ECI range of units is constructed entirely from corrosion resistant materials.

The heat transfer coil section is Hot Dipped Galvanised after fabrication. Other sheetmetal parts are manufactured from Mill Galvanised Steel and are painted with Zinc Chromatised Aluminium (ZCA). Galvanised parts can also be finished in Balticote A for superior corrosion protection.

The side panels of the casing are Fibre Reinforced Plastic and are easily removable for inspection of the coil surface.

These units should be inspected annually. Inspect the complete unit for any damage to the protective paint coating and galvanising. Affected areas should be thoroughly wire brushed and recoated with ZRC (Zinc Rich Compound).

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# Water Treatment

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## CHEMICAL TREATMENT

To control the increasing concentration of dissolved solids as a result of the evaporation of recirculated water, a water treatment program is required. In many cases a simple bleed-off is adequate for control of scale and corrosion but biological contamination can only be controlled through the use of biocides. The chemicals must be compatible with galvanised steel as well as all other materials used in the system.

**Consult a competent water treatment supplier.**

Batch feeding of chemicals is not recommended and water quality should be maintained within the guidelines as set out below:

|                        |               |
|------------------------|---------------|
| ph                     | 7.0 to 9.0    |
| Hardness as CaCo3      | 30 to 500 ppm |
| Alkalinity as CaCo3    | 500 ppm max.  |
| Total dissolved solids | 1000 ppm max. |
| Chlorides              | 125 ppm max.  |
| Sulphates              | 125 ppm max.  |

## BLEED OFF (BLOW DOWN)

FCI/ECI units are fitted with a bleed line. The recommended bleed-off rate is equal to the water evaporation rate. This is directly related to the capacity.

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# Cold Weather Operation

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## PROTECTION AGAINST BASIN WATER FREEZING

When the unit is shut down and exposed to sub-freezing ambient temperatures the basin water may freeze. A remote sump located in a heated indoor area is a desirable method of freeze protection.

Alternatively, basin heaters (electric immersion heaters) can be used to maintain the basin water temperature at a minimum of 4°C. In addition to protecting the cold water basin, all exposed water piping including pump piping below the overflow level and make-up water lines should be traced with electrical heater tape and insulated.

## ICE ACCUMULATION

When operating tower at sub-freezing ambient temperatures the unit should be inspected frequently so ensure that ice build up does not occur on the fan, cylinder or air inlet louvers.

For more detailed advice on cold weather operation consult your B.A.C. representative.

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# Factory Authorized Parts

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Baltimore Aircoil maintains a stock of replacement parts at each of its several manufacturing facilities. These parts are designed and built specifically for B.A.C.'s customers of:

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

All factory authorized parts are guaranteed for one full year, and their use will ensure continued maximum performance from your Baltimore Aircoil 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 Baltimore Aircoil Representative. Be sure to include the unit serial number when ordering any parts.

For critical installations it is recommended that spares of essential components, subject to breakdown, be stocked on site (i.e. motors, fans, bearings and belts).