COOLING TOWERS
(1 to 90 l/s)

INDUSTRIAL FLUID COOLERS
(1 to 65 l/s)

EVAPORATIVE CONDENSERS
(70 to1380 kW)

LOW PROFILE SERIES

Operating and Maintenance Instructions

Baltimore Aircoil Company Series VL 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 ar the recommended services for start-up, operation, and shutdown and the approximate frequency for each. Note that the recommendations on frequency of service are minimums 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 VCL, VFL and VTL models are illustrated in a cutaway form on pages 2 and 3 with the major points of inspection and service identified. A copy of the unit certified drawing should also be available for reference. If you do not have a copy of this drawing, or if you need additional information about operation or maintenance not covered in this bulletin, contact the local B.A.C. representative. The name and phone numer are on a label at the connection end of the unit.

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Baltimore Aircoil

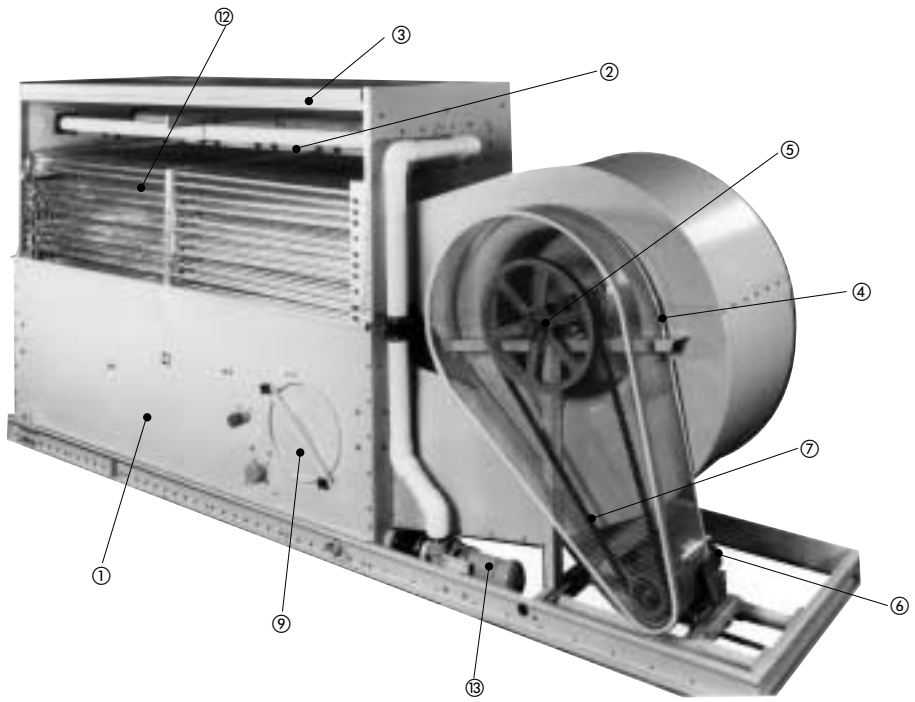
LOW PROFILE
SERIES
VL

CONSTRUCTION DETAILS

1. HEAVY DUTY CONSTRUCTION
- all major structural components are constructed of heavy gauge galvanized steel.
- double brake flanges maximize strength of panels.
- exterior of unit is finished with zinc-chromatized aluminum.

2. WATER DISTRIBUTION SYSTEM
- large diameter non-clog nozzles are oriented for optimum water distribution over the heat transfer surface.
- schedule 40 PVC spray branches.
- grommeted nozzles and branches allow quick removal for cleaning

3. ELIMINATORS
- constructed of U.V. resistant P.V.C.
- three distinct changes in air direction reduce drift losses to only .002% of design flow.
- assembled in easy to handle sections which can be easily removed for access to the spray branches and nozzles.



Model VCL Evaporative Condenser and Model VFL Fluid Cooler

4. HIGH EFFICIENCY AIR MOVING SYSTEM
- a close-coupled transition duct uniquely curved and flared maximizes efficiency
- forwardly curved centrifugal fan wheels are statically and dynamically balanced
- two-piece fan housings allow easy fan and shaft removal

5. FAN SHAFT AND BEARINGS
- no intermediate bearings
- supported on each end by heavy duty, grease packed, relubricable ball bearings with an L10 life of 40,000 hours

6. FAN MOTOR
- TEFC with IP55 protection
- located in protected area beneath the fan housing
- mounted on a motor base with single bolt adjustment
- easily accessible and located low to the ground

7. V-BELT DRIVE SYSTEM WITH DRIVE GUARD
- designed for not less than 150% of motor nameplate horsepower
- drive guard provides protection from moving parts

8. STRAINER ASSEMBLY
- light-weight, large area lift-out strainer screens
- stationary anti-vortexing assembly

9. CIRCULAR ACCESS DOORS
- easy access to float valve and strainer

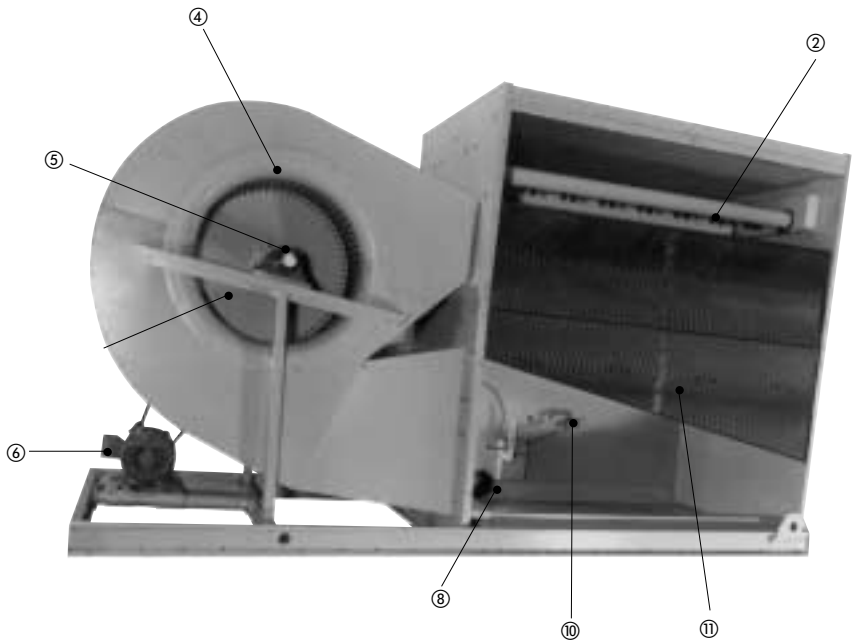
10. WATER MAKE-UP VALVE
- actuated by a large diameter, unsinkable, polystyrene-filled plastic float ball constrained for operational stability

11. BACount WET DECK SURFACE
- durable polyvinyl chloride (PVC) construction
- sloping design which maximizes capacity while minimizing height
- efficient heat transfer surface minimizes power requirements
- flame spread rating of 5 per ASTM standard E84-77a
- optional chlorinated polyvinyl chloride (CPVC) heat transfer surface available for high temperature applications

12. HEAT TRANSFER SYSTEM
- prime surface steel coil
- encased in steel framework and hot-dip galvanized
- designed for low fluid pressure drop
- sloping tubes for free drainage

13. CLOSE COUPLED CENTRIFUGAL PUMP
- completely piped from the suction strainer to the water distribution system (on coil products only)

Model VTL
Cooling Tower



GENERAL INFORMATION

Evaporative Fluid Coolers

Evaporative Fluid Coolers are designed for operating conditions specified below. The operator must ensure that during operation of the equipment these conditions are not exceeded.

Fluid Compatibility : Fluids circulated through the coil(s) of Evaporative Fluid Coolers must be compatible with the coil construction material, i.e.

- black steel for standard coils hot dip galvanized after construction
- stainless steel AISI 304L or AISI 316L (options)
- galvanized steel for cleanable coil option

Design pressure : max. 10 bar

Maximum inlet temperature of fluid : 82 °C

Minimum outlet temperature of fluid : 10°C

Evaporative Condensers

Evaporative Condensers are designed for operating conditions specified below. The operator must ensure that during operation of the equipment these conditions are not exceeded.

Acceptable Refrigerants : R-717, Halocarbon Refrigerants and HFC`s

Coil design pressure : 22 bar max. (Note that high pressure coils with a design pressure of 28 bar are available upon request.)

Maximum temperature of superheated vapour : 120 °C

Minimum temperature of refrigerant in coil(s) : - 20°C

SPRAY PRESSURE

Max. pressure at the inlet of the spray water distribution system is not to exceed 14 kPa. Standard spray water pumps supplied and installed by B.A.C. do not exceed this pressure limit and require no extra installation of pressure gauges. For pumps supplied by others (remote sump) it is recommended to install a pressure gauge at the inlet of the water distribution system.

CONNECTING PIPING

All refrigerant piping external to the evaporative condenser(s) must be supported separately from the equipment. In case the evaporative condenser(s) are installed in vibration rails or springs, the piping must contain compensators to eliminate vibrations carried through the refrigerant piping.

PURGE REQUIREMENTS

The installer of this equipment must ensure proper system purging of air, prior to operation of the installation. Air entrained in the system can obstruct the proper drainage of liquid refrigerant, reduce condensing capacity and result in higher operating pressures than design. To verify absence of non condensibles in the system, follow the instructions of the B.A.C. Evaporative Condenser Manual E115.

REFRIGERANT CONNECTIONS ON SITE

All connections in the external refrigerant pipework (installed by others) must be leak free and tested accordingly.

SAFETY PRECAUTIONS *All electrical, mechanical, and rotating machinery constitute a potential hazard, particularly for those not familiar with its design, construction, and operation. Accordingly, adequate safeguards (including 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.*

Depending upon site conditions, it also may be necessary to install ladders, safety cages, stairways, access platforms, and handrails and toeboards for the safety and convenience of authorized service and maintenance personnel.

At no time should this equipment be operated without all fan screens, access panels, and access doors in place.

The operation, maintenance, and repair of this equipment should be undertaken only by personnel qualified to do so. All such personnel should be thoroughly familiar with the equipment, the associated system and controls, and the procedures set forth in this manual. 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.

For the protection of authorized service and maintenance personnel, each fan and pump motor associated with this equipment should be installed with a lockable disconnect switch located within sight of the cooling tower, evaporative condenser, or fluid cooler. No service work should be performed on or near the fans, motors, and drives or inside the unit without first ensuring the fan and pump motors have been disconnected and locked out.

The recirculating water system may contain chemicals or biological contaminants, including Legionella, which could be harmful if inhaled or ingested. Accordingly, personnel who may be exposed directly to the discharge airstream and the associated drift, mists generated during operation of the water distribution system and/or fans, or mists produced by high pressure water jets or compressed air should these be used to clean portions or components of the recirculating water system, must wear respiratory protection equipment approved for such use by the local occupational safety and health authorities.

Warranties *Please refer to the Limitation of Warranties applicable to and in affect at the time of the sale/purchase of these products.*

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 the Cold Weather Operation guidelines (page 11) or contact the local B.A.C. representative for recommended protection alternatives.*

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 inlet air screens, fans, eliminators, heat transfer sections and cold water basin.
2. Flush the cold water sump (with sump strainers in place) and drain to remove accumulated dirt.
3. Remove, clean and replace sump strainers.
4. Turn the fan by hand to ensure rotation without obstruction.
5. Check the locking collar on each fan bearing assembly and tighten as required.
6. Check and, if necessary, adjust the fan belt tension.
7. Prior to seasonal start-up, lubricate the fan shaft and motor bearings. The ball bearings are factory lubricated, but should be relubricated if the unit has been sitting on site for more than a year before start-up.
8. Check float operated make-up valve to be sure it is operating freely.
9. Fill cold water sump with fresh water to the overflow level.

   a) At initial start-up or before restart-up where the sump was completely drained : the initial biocide treatment should be applied at this time (see Water Treatment Section).

   b) Following a shut-down period, where the sump was not completely drained : it is recommended that an initial shock treatment of appropriate biocides be administered at restart-up to eliminate accumulated biological contaminants.
10. Set the float on the make-up valve to shut off the valve when the float is approximately 13 mm below the overflow level.
11. On VFL Industrial Fluid Coolers and VCL Evaporative Condensers, start the pump and check for the proper rotation as indicated by the arrow on the pump cover. On installations where the unit pump was not furnished by the factory, a globe valve should be installed in the pump discharge line and the pump flow rate adjusted to correct water flow.
12. Inspect spray nozzles and heat transfer section.
13. Start the fan and check for the proper rotation as indicated by the arrow on the fan housing.
14. Check the voltage and current of all three legs of the fan and pump motors. The current 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. **To prevent motor overload, do not operate fan motor without design water flow over unit.**
15. Open the bleed line valve (must be furnished by others on cooling towers) and adjust bleed to the recommended rate (See "Water Treatment").

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 sump. Adjust if necessary.
3. Readjust the fan belt tension.
4. Inspect spray nozzles and heat transfer section.

OPERATION

During operation, the unit should be inspected, cleaned, and lubricated on a regular basis. The required services and recommended frequency for each are summarized in Table 1 on page 4 of this bulletin.

SEASONAL SHUTDOWN

The following services should be performed when the unit is to be shutdown for a prolonged period :

1. Drain the cold water sump and all piping (including spray pump) that will be exposed to freezing temperatures.
2. Clean and flush the cold water sump with the sump strainers in place. Leave the drain open so rain and melting snow will drain from the unit.
3. Clean the sump strainers and re-install.
4. Lubricate the fan-shaft and motor bearings, motor base and motor base adjusting screw.
5. Close shut-off valve in water make-up line and drain all exposed make-up piping.
6. Inspect the protective finish on the unit. Clean and refinish as required.
7. For VFL coolers only, follow the coil freeze protection guidelines explained on page 11.

TABLE 1. Recommended Maintenance Services for Series VL Equipment

TYPE SERVICE	Start-Up	Monthly	Every Six Months	Shutdown	Annually	Ref. Page
Inspect General Condition of Unit	X	X				5
Clean Debris from Unit	X	X		X		5
Clean and Flush Sump	X	X		X		6
Clean Sump Strainer	X	X		X		6
Check and Adjust Sump Water Level	X	X				6
Inspect Heat Transfer Section	X	X				9
Inspect Spray Nozzles	X	X				9
Check and Adjust Fan Belt Tension	X	X				7
Check and Adjust Bleed Rate	X	X				10
Check Operation of Make-Up Valve	X	X				6
Check Unit for Unusual Noise or Vibration	X	X				5
Check Fan Bearing Locking Collars	X		X			7
Check Motor Voltage and Current	X		X			5
Lubricate Fan Shaft Bearings	X		X	X		7
Fan Motor Bearings	X					7
Lubricate Motor Base Adjusting Screw	X		X	X		8
Check Fan for Rotation Without Obstruction	X					5
Check Fan and Pump Motor for Proper Rotation	X					5
Drain Sump and Piping				X		5
Inspect Protective Finish					X	9
Inspect Eliminators	X		X	X		2

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

MAINTENANCE PROCEDURES

COLD WATER SUMP
The cold water sump should be inspected regularly. Any trash or debris which may have accumulated in the sump or on the strainers should be removed. Each month, the entire cold water sump should be drained, cleaned, and flushed with fresh water to remove the silt and sediment which normally collects in the sump during operation. If not removed periodically, this sediment can become corrosive and cause deterioration of the protective sinish. When flushing the sump, the strainers should be left in place to prevent the sediment from re-entering the system. After the sump has been flushed, the strainers should be removed, cleaned, and replaced before refilling the sump with fresh water.

Note : *Do not use acid to clean the strainers.*

MAKE-UP VALVE ASSEMBLY
A float-operated mechanical make-up valve assembly (see Figure 1) is furnished as standard on all units unless the equipment has been ordered with an electrical water level control or for remote sump application. It is located inside the unit sump within easy reach from the access door at the connection end.
The make-up assembly 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 to an all-threaded rod which is held in place by wing nuts. They allow easy adjustment of the operating water level.
The make-up assembly should be inspected monthly and adjusted as necessary. The valve itself should be inspected annually for leakage and the valve seat replaced if necessary.

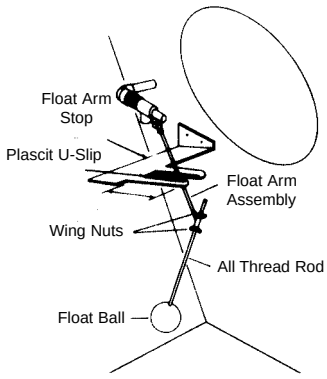


Figure 1 – Water Make-Up Valve Assembly

SUMP OPERATING LEVEL
Tabulated below are the recommended sump water operating heights for Low Profile Series VL when the circulating water is pumped directly from the cold water sump. The operation at the recommended water level will ensure that the unit sump contains sufficient water volume to prevent air entrainment in the circulating pump during system start-up and provide excess sump volume to accept the quantity of water suspended in the unit and in external system components, including piping and heat exchangers, which could drain to the unit when the circulating pump is shut down.

TABLE 2. Operating Water Level

MODEL NO.	OPERATING HEIGHT (measured) from pan bottom) (mm)
VTL	140
VCL	140
VFL	140

To make the INITIAL sump water level setting, adjust the wing nuts so that the make-up valve is completely closed when the water level is 13 mm below the overflow connection. Under design thermal load and with average city water pressure (1 to 3.5 bar) at the valve, this setting should produce operating water levels stated in Table 2 and Figure 2.
The operating water level in the cold water sump will fluctuate with the system thermal load (evaporation rate), the bleed rate and make-up supply water pressure. It may be necessary to re-adjust the float in order to attain the recommended operating height. The unit sump should be closely monitored and water level adjusted as necessary during the first 24 hours of operation.

During normal operation the cold water sump will contain water even if the unit is designed for remote sump operation. In these cases the water level in the pan will depend on the circulating water flow rate, outlet connection size, quantity and location, and drain piping size and configuration. The sump operating level during remote sump operation is not adjustable

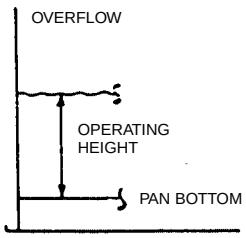


Figure 2 – Operating Water Level

ELECTRIC WATER LEVEL CONTROL
As an option, an electric water level control package is available. The package consists of an electrical level switch and a solenoid valve. The water level is maintained at the recommended operating level regardless of the system thermal load; therefore it is not necessary that the operating level be adjusted.

OPERATION AND MAINTENANCE

(continued)

FAN SHAFT BEARINGS

The fan shaft is supported at each end by ball bearings (See Figure 3), each equipped with a lubrication fitting and locking collar.
Extended grease lines are fitted on all Low Profile Series VL units.

LUBRIFICATION

Under normal operating conditions, the bearings should be greased every 2.000 operating hours or at least every six months. The bearings should also be greased at seasonal start-up and shut-down. Lubricate the bearings only with one of the following water resistant inhibited greases which are good for ambient temperatures ranging from – 54°C to 120°C.

Exxon	–Beacon #325
Shell	–Aeroshell #7
Mobil	–Mobilgrease #28
Chevron	–SRI #3
American	–Rycon Premium #3
Keystone	–84 EP Light

The bearings should be lubricated only with a hand grease gun. Do not use high pressure grease guns since they may rupture the extended grease lines or bearing seals. When lubricating, purge and the old grease from the bearing by gradually adding grease until a bead of new grease appears at the seal.

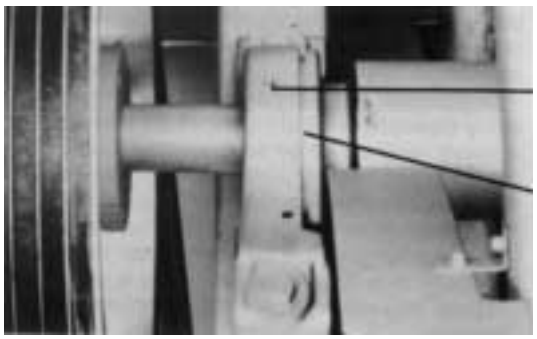


Figure 3 – Ball Bearing

LOCKING COLLARS

Each eccentric locking collar should be checked every six months to ensure that the inner bearing race is secured to the fan shaft. The locking collar can be set using the following procedure (See Figure 4) :

1. Loosen the set screw.
2. Using a drift pin or centerpunch, tap the collar (in the hole provided) tangentially in the direction of rotation while holding the shaft.
3. Retighten the set screw.

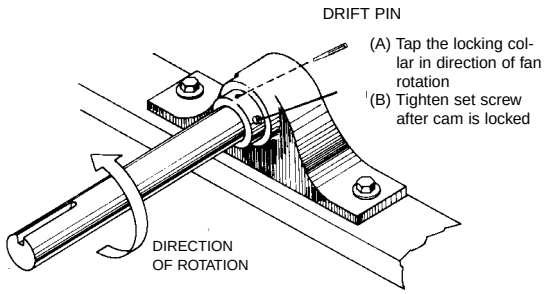


Figure 4 – Locking Collar Assembly

FAN MOTOR BEARINGS

All motors have the bearings correctly charged with grease. Motors up to frame size D180 do not have external lubricators. Motors as from size D200 have lubricators and need lubrication as per motor supplier instructions.
Installation and Maintenance Instructions (in English) for the motors are located in the motor therminal box when the equipment ships from the factory.

OPERATION AND MAINTENANCE

(continued)

ADJUSTABLE MOTOR BASE

The motor base slides and adjusting screw (See Figure 5) should be coated twice a year using a good quality corrosion inhibiting grease, such as one of those recommended for lubrificating the fan shaft bearings.

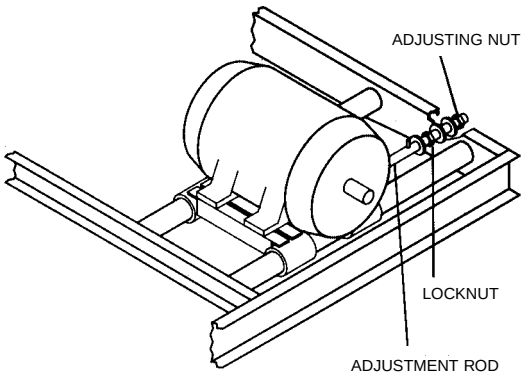


Figure 5 – Adjustable Motor Base

FAN DRIVES

The fan **BELT TENSION** should be checked, if necessary adjusted, every month. The position of the fan motor can be changed to achieve this by rotating the motor base adjusting screw which extends through the bottom frame angle.

Remark : Rotate the fan sheave half a turn to evenly distribute the tension in the belt before measuring.

The belt tension is correct if following conditions are both met :

a) the deflection amounts 10 mm/m free belt length (see figure 6)
   f.e. the deflection is 8 mm for a free belt length of 0,8 m.
   the deflection is 12 mm for a free belt length of 1,2 m.

b) the deflection force required is between the min. & max. values given in the table herewith for the belt type & sheave size concerned.

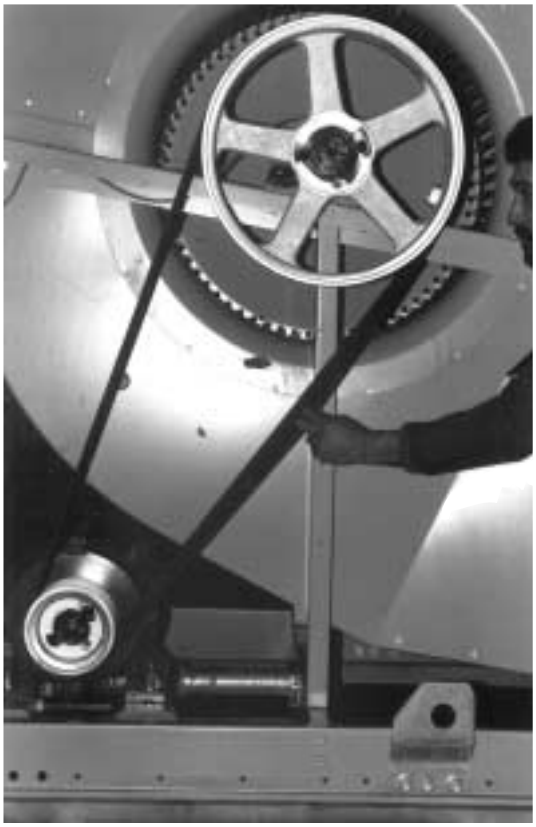


Figure 6 – Fan Belt Adjustment

TABLE : BELT TENSION FORCES

BELT PROFILE	DIAMETER (mm) MOTOR SHEAVE	DEFLECTION FORCE (kg) min.	max.
XPA	80 through 125	1.5	2.5
	132 through 200	2.0	3.0
	> 200	2.5	3.5
SPA	100 through 125	1.5	2.0
	132 through 212	2.0	2.5
	> 212	2.0	3.0

New belts have to be retensioned after 24 hours operation.

The **DRIVE ALIGNMENT** should be checked annually to ensure maximum belt life. This is done by placing a straightedge across both sheaves as shown in Figure 7.

When the drives are properly aligned the gap measured between straightedge and sheave does not exceed 0,5 mm per 100 mm of sheave diameter.

Ex. : motor sheave has ø 150 mm and fan sheave has ø 500 m
Max. gap on motorsheave 1,5 x 0,5 = 0,75 mm
Max. gap on fan sheave 5 x 0,5 = 2,5 mm

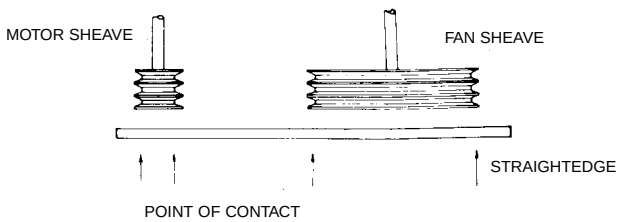


Figure 7 – Checking Sheave Alignment

OPERATION AND MAINTENANCE

(continued)

SPRAY NOZZLES AND HEAT TRANSFER SECTION

The spray nozzles and heat transfer section should be inspected and cleaned each month.
The inspection procedure is as follows :

1. Shut off the fan, but leave the pump running.
2. Remove the eliminators.
3. Check to see if the nozzles are producing the spray pattern shown in Figure 8a for cooling tower or 8b for industrial fluid coolers and evaporative condensers.
4. Clean any nozzles which are clogged. If necessary, the nozzle and rubber grommet may be removed for cleaning.
5. Inspect the coil or wet deck surface. Any corrosion, damage, or obstructions must be corrected.
6. Some VCL and VFL units are provided with an extended surface coil. During the winter season, when the ambient temperature is well below design, units with this coil can operate with the spray pump off. The coil is designed for seasonal dry operation followed by seasonal wet operation, and *not* for frequent cycling of the spray pump.
   Frequent spray pump cycling may lead to excessive scale buildup.

Note : *Do not use steam or high pressure water to clean cooling tower wet deck surface other than steel.*

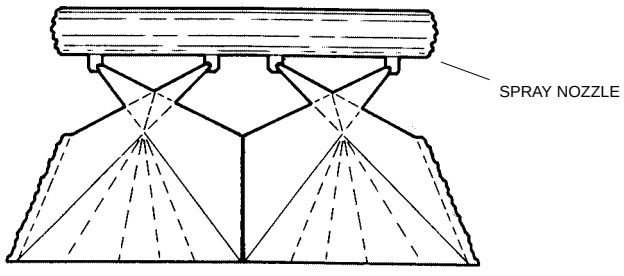


Figure 8a – Nozzle Spray Distribution (Cooling Towers)

CORROSION PROTECTION

All Low Profile Series VL Units are constructed entirely of corrosion resistant materials. The wet deck surface of the VTL is made of an inert synthetic material which requires no protection against rot, decay, rust of biological attack. The coils of the VCL and VFL are hot-dip galvanized after fabrication. The balance of the construction is of hot-dip galvanized steel with either Baltimore Aircoils BALTIPLUS Protection finish or the BALTIBOND Corrosion Protection System.

BALTIPLUS Protection

Once a year the steel components should be thoroughly inspected. If there are any signs of blemishes or corrosion, the affected area only should be thoroughly wire brushed and recoated. The recommended procedure is to use a base coat of ZRC (Zinc Rich Compound). The externals of the tower can be touched up with Zinc Aluminum, if necessary. Both the ZRC and Zinc Aluminum are available from your local B.A.C. Representative.

BALTIBOND CORROSION PROTECTION SYSTEM

The BALTIBOND Corrosion Protection System is provided as an option on the entire unit. Scratches and scrapes can be touched up with a two-component repair kit (B.A.C. part no. RK 1057). In the unlikely event that damage is more extensive than simple scratches or dents, contact your local B.A.C. representative.

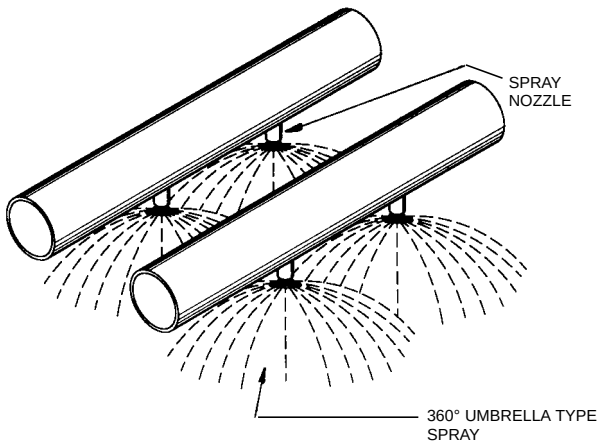


Figure 8b – Nozzle Spray Distribution (Coil Products)

Note : *BALTIBOND, BACOUNT and BALTIGUARD are trademarks of Baltimore Aircoil Company, which may be registered or pending in the U.S.A. and certain other nations.*

WATER TREATMENT

Evaporative cooling is accomplished by the evaporation of a portion of water being recirculated. As water evaporates, the dissolved solids originally present in the water remain in the system. The concentration of disolved solids increases rapidly and can reach unacceptable levels. In addition, airborne impurities and biological contaminants are often introduced into the recirculating water.
If impurities and contaminants are not effectively controlled, they can cause scaling, corrosion, sludge or biological fouling. The Circulated Water Quality Guidelines are to be respected.
Accordingly, a water treatment program should be employed to control all potential contaminants.
While in many cases simple bleed-off may be adequate for control of corrosion, it is insufficient to control biological contamination and this subject must be adressed in any treatment program.

Circulated Water Quality Guidelines

	BALTIBOND Corrosion Protection System	**BALTIPLUS Protection**
pH	6.5 à 9.0	7.0 à 9.0
Hardness as $CaCO_3$	30 à 500 ppm	30 à 500 ppm
Alkalinity as $CaCO_3$	500 ppm max.	500 ppm max.
Total Dissolved Solids	1200 ppm max.	1000 ppm max.
Chlorides	250 ppm max.	125 ppm max.
Sulfates	250 ppm max.	125 ppm max.

BLEED OFF

To prevent an excessive build-up of impurities in the circulating water, it is recommended that a small amount of water be "bled" from the unit at a rate which is being determined by the water analysis of the make-up water and the water quality guidelines (if water analysis is not available, it is suggested to bleed at least a quantity equal to the amount of water being evaporated i.e. a rate that will maintain approximately two cycles of concentration in the circulating water). In many localities, this constant bleed and replacement with fresh water will keep the concentration of impurities in the system at an acceptable level.
The evaporation rate can be determined by one of the following :

1. The evaporation rate is approximately 1,8 l per 1000 kcam of heat rejection.
2. The evaporation rate is approximately 1,8 l per 4200 kJ.
3. Evaporate rate = Water Flow Rate (l/s) x Range (°C) x 0,0018

Example : At a flow rate of 10 l/s and a cooling range of 10°C the evaporation rate is 0,18 l/s (10 l/s x 10°C x 0,0018 = 0,18 l/s)

Note : *For VFL, the flow rate is the flow through the coil.*

The rate of bleed-off can be adjusted with the valve and measured by filling a gallon container while noting the time period. The bleed-off rate should be checked periodically to ensure that proper water quality is being maintained

Note : *The bleed line must be furnished by others on all cooling tower models VTL.*

CHEMICAL TREATMENT

If the condition of the water is such that constant bleed-off will not control scale or corrosion, chemical treatment may be necessary. If a water treatment program is used it must meet the following requirements :

1. The chemicals must be compatible with galvanized (zinc coated) steel. Water treatment chemicals which are compatible with galvanized steel are also satisfactory for the Zinc Chromatized Aluminum finish.
2. Chemicals should be fed into the recirculated water, but not into the cold water sump, on a continuous metered basis to avoid localized high concentrations which may cause corrosion. These chemicals are normally fed into the pump discharge line. Batch feeding of chemicals does not afford adequate control of water quality and is not recommended.
3. *Acid water treatment is not recommended for units furnished with Zinc Aluminum finish. Series VL Low Profile Units provided with the BALTIBOND Corrosion Protection System on the entire unit (designated with an "R" suffix on the nameplate, VTL-272-PR) may be used on systems with acid water treatment as long as requirement 2 and the water quality guidelines are maintained.*

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 micro-organisms, if unchecked, will reduce system efficiency and may contribute to the growth of potentially harmful micro-organisms, including Legionella, in the recirculating water system.

Accordingly, a 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 suppliers instructions.

ATTENTION :

For specific recommendations on treatment for scale, corrosion, or biological control, consult a competent water treatment supplier.

COLD WEATHER OPERATION

Low Profile Series VL equipment can be operated in subfreezing ambient conditions provided the proper measures are taken :

1. Protection against pan water freezing when the unit is idle.
2. Capacity control to prevent ice formation in heat transfer sections during operation.
3. Protection against coil freezing (VFL Industrial Fluid Coolers).

Cold weather applications should be reviewed with the B.A.C. representative in your area to ensure that the unit selection, location, control, and accessories are adequate to ensure reliable operation. Listed below are general guidelines which should be followed to minimize the possibility of freeze-up.

PROTECTION AGAINST PAN WATER FREEZING

When the unit is shutdown and exposed to subfreezing ambient temperatures, the pan water may freeze. A remote sump located in a heated indoor area is a desirable method of freeze protection. Alternatively, pan heaters (electric immersion heaters, steam coil, or hot water coil) can be used to maintain the pan water at a minimum temperature 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.

CAPACITY CONTROL

It is necessary to prevent the recirculating water from approaching freezing conditions when the unit is operating under load.
At times the unit is provided with the BALTIGUARD Fan System for Capacity Control. A full size fan motor and drive are installed at one end of the fan shaft and a lower horsepower motor (sized at approximately one-third the horsepower of a standard motor, with drives designed for approximately 2/3 of design fan speed) is installed at the opposite end. This allows the fans to operate at 2/3 speed at lower ambient conditions. Please note that capacity control dampers allow the unit to operate longer and with closer control than the BALTIGUARD Fan System and/or fan cycling. Units with two-speed motor or the BALTIGUARD Fan System should have a 15 second time delay during switch down from high to low speed to avoid overloads on the low speed windings or motor.

PROTECTION AGAINST COIL FREEZING (VFL ONLY)

Evaporative Fluid Cooler coil(s) must be protected from damage by freezing of the fluid inside the coil(s) when exposed to subfreezing conditions. Freeze protection can be obtained by the use of ethylene or propylene glycol or other anti-freeze solutions in appropriate concentrations. In such cases refer to the appropriate selection method in the technical bulletins D385.
When an antifreeze solution is not possible, the system must be operated to meet both of the following conditions :

1. Maintain the minimum recommended flow through the unit at all times.

VFL Minimum Flow Requirements

MODEL	MINIMUM FLOW (l/s)
VFL 24X-48X	4,1
VFL 72X-96X	7,9

2. Maintain the heat load on the circulating fluid so that the temperature of the fluid leaving the coil will not fall below 10°C.

If the process load is extremely light or shut off, it may be necessary to apply an auxiliary heat load circulating fluid at 10°C when freezing conditions exist.*

Draining the coil is not recommended as a normal method of freeze protection. Frequent draining promotes corrosion inside the coil tubes. However, draining is acceptable as an emergency method of freeze protection if the coil is not protected by an antifreeze solution. The local B.A.C. representative should be consulted for guidelines on the installation of an emergency coil drain system.

**** For evaporative chilling applications only, the leaving fluid temperature can be maintained as low as 8°C. Consult the local B.A.C. representative for necessary precautions.***

FACTORY AUTHORIZED PARTS

Baltimore Aircoil maintains a stock of replacement parts at each of its manufacturing facilities. Shipment of these parts is normally within four days after receipt of an order. In emergency situations, shipment can usually be made within twenty-four hours. To order factory authorized parts, contact your local Baltimore Aircoil representative. Be sure to include the unit serial number when ordering any parts.

To facilitate servicing the unit, it is suggested that the followint parts be carried on hand :

– Make-Up Float Ball
– Valve Seat for Make-Up Valve
– Fan Shaft Bearings
– Fan Wheel
– Fan Belts
– Spray nozzles and Grommets
– Spray distribution Branch Grommet
– Access Door Gasket
– Spray Pump (for VCL & VFL)

Baltimore Aircoil

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