Baltimore Aircoil Company equipment needs to be properly installed, operated and maintained.Note: There should be no "chirp" or "squeal" when the fan motor is started. DRIVE ALIGNMENT Proper drive alignment ensures maximum belt life. Alignment is checked for standard drives after correct belt tensioning by placing a straightedge across both sheaves as shown in the Figure below. When the drives are properly aligned the gap measured between straightedge and sheave does not exceed 0,5 mm per 100 mm of fan sheave diameter. 1. Motor Sheave 2. Fan Sheave 3. Points of Contact LOCKING COLLAR The excentric locking collar of the bearing at the drive end ensures that the inner bearing race is secured to the fan shaft. Locking collars can be set using the following procedure. (See Figure below) 1. Stop fan(s) and remove side access panel(s). 2. Loosen the set screw. 3. Using a drift pin centerpunch, tap the collar (in the hole provided) tangentially in the direction of rotation while holding the shaft. 4. Retighten the screw. 5. Install access panel(s) and start fan(s). 1. Locking Collar 2. Lubrication Fitting 3. Extended Lubrication Line ROTATION OF FAN(S) AND PUMP(S) Fans must rotate without obstruction and both fans and pumps must rotate in the correct direction, which is indicated by arrows on the equipment. Check proper functioning as follows: 1. Stop fan(s) and pump(s). 2. Turn the fan by hand to ensure rotation without obstruction. Remove obstruction, if present. 3. Start the pump(s) and check for the proper rotation as indicated by the arrow on the pump cover. If rotation is wrong, stop pump and correct electrical wiring. 4. Start the fan(s) and check for proper rotation as indicated by the arrow on the fan housing. If rotation is wrong stop fan(s) and correct fan motor wiring. Belt Profile Diameter (mm) Motor Sheave Deflection Force (kg) Min. Max. B 100 through 118 125 through 140 150 through 170 >180 1.5 1.5 2.0 2.5 2.0 2.5 2.5 3.0 Table 2: Belt Tension Forces Figure 4: Fan Belt Check and Adjustment Figure 5: Checking sheave alignment Figure 6: Locking Collar Assembly 8 MAINTENANCE PROCEDURES MOTOR VOLTAGE AND CURRENT Check the voltage and the current of all three legs of the motors. The current should not exceed the nameplate rating. After prolonged shutdown the motor insulation should be checked with a megger insulation tester prior to restarting. 1. Insulation resistance test – minimum value should be 1 Mega Ohm (1.000.000 Ohms). 2. Thermistors, if fitted, should be checked for continuity with a multi-meter but never megger-tested. 3. Ensure supply voltage and frequency correspond to the motor nameplate rating. 4. Ensure shaft turns freely. 5. Wire the motor in accordance with the wiring diagram as shown on the motor nameplate and/or in the motor terminal box. 6. Turn on unit and check amp draw does not exceed nameplate rating. Note: If motor is stored, it should be in a clean, dry place & have the shaft rotated occasionally. Storage areas should not be subject to vibration. ! Rapid on-off cycling can cause the fan motor to overheat. It is recommended that controls be set to allow a maximum of 6 on/ off cycles per hour. When two speed motors are used, the motor starter should include a 15 seconds time delay when switching from high to low speed. DRIVE TRAIN 1. Fan Sheave 2. Belt 3. Motor Sheave The DRIVE TRAIN consists of a specially designed belt, a fan sheave and a motor sheave. The high efficiency belt provides the premium quality necessary for evaporative cooling equipment service. Together these components provide a highly reliable system with low maintenance requirements. The DRIVE TRAIN should be inspected periodically to check the belt tension, condition of the sheaves and belt, and when necessary adjust the tension. The recommended service intervals are specified elsewhere. Initial Start-up: If the equipment was supplied in assembled

major sections, no servicing is required prior to initial unit start-up since the drive has been tensioned and aligned at the factory. If equipment was supplied completely knocked-down (KD) then check drive alignment & belt tensioning as per procedures outlined above. Seasonal Start-Up: Readjust the tension on the belt. Check condition of sheaves. Operation: After initial unit start-up or the installation of a new belt, the tension must be readjusted after the first 24 hours of operation. Thereafter the condition of the belt should be checked monthly and the tension adjusted as necessary, but at least once every 3 months. ! No service work should be performed on the drive train without first ensuring the fan and pump motors have been isolated, tagged and locked in the off position. UNUSUAL NOISE AND VIBRATIONS Unusual noise and/or vibration are the result of malfunctioning of mechanical components or operational problems (unwanted ice formation). If this occurs, a thoroughful inspection of the entire unit followed by immediate corrective action is needed. If required, consult your local BAC Balticare representative for assistance. GENERAL CONDITION OF THE EQUIPMENT The inspection should focus on following areas: – damage of corrosion protection – signs of scale formation or corrosion – accumulation of dirt an debris – presence of biofilms If there is evidence of scale formation (more than 0.1 mm) or corrosion, water treatment regime must be checked and adjusted by the supplier. Any dirt and debris need be removed following the CLEANING PROCEDURE described in this manual (see page 12). If there is evidence of biofilms, the system, including piping, should be drained, flushed and cleaned of slimes and other organic contamination. Refill system with water and apply biocide shock treatment. Check pH value and functionality of ongoing biocide treatment. The RCT Cooling Towers are constructed of corrosion resistant materials. The wet deck surface is made of en inert synthetic material that requires no protection against rot, decay, rust or biological attack. Other materials used in construction of the equipment, that are listed below, should be inspected regularly. Stainless Steel Components Stainless steel components should be inspected for sighs of blemishes or corrosion and cleaned with stainless steel wool as necessary. If more extensive corrosion is prevalent, contact you local BAC-Balticare Representative. Fibreglass Re-Inforced Polyester (FRP) Components FRP components should be inspected for accumulation of dirt and cleaned with soap and water as necessary. Also FRP components should be inspected for any penetration of gelcoat or veil. Such penetrations should be repaired immediately. Figure 7: Drive Train Inspections and Corrective Actions MAINTENANCE PROCEDURES 9 HEAT TRANSFER SECTION The fill should be inspected and cleaned at least quarterly or more regularly if required by local authorities. The inspection procedure is as follows: 1. Shut off fan(s) and pump(s). 2. Remove the access panel. 3. Inspect the wet deck surface for – obstructions – damages – corrosion – fouling. Remove any obstructions from heat transfer section(s). Any damages or corroded areas need to be repaired. Call your local BAC Balticare representative for assistance. Minor fouling can usually be removed chemically or by temporary changes to the water treatment programme. Contact your water treatment supplier for advice. Major fouling requires cleaning and flushing according to the CLEANING PROCEDURES (See page 12). Regular checking of the total aerobic bacteria count (TAB) and maintaining it within acceptable levels are the key to prevent fouling. Note: When working on fill section or above fill section, fill bundle edges should be protected from damage by service personnel, tools or debris by placing a temporary cover of plywood, or other suitable material, over the top of the fill

bundles. DRIFT ELIMINATORS The inspection procedure is as follows : 1. With fan(s) and pump(s) running visually check for areas with excessive drift loss. 2. Shut off fan(s) and pump(s) and visually check eliminators for – obstructions – damages – cleanliness – proper fit 3. If any of the above problems have been observed, stop fan(s) and pump(s) and remove eliminators. 4. Clean eliminators from debris and foreign matter. Remove dirt and obstructions. Replace damaged or ineffective eliminators. 5. Install eliminators and ensure they fit tightly with no gaps. WATER DISTRIBUTION The inspection procedure is as follows : 1. Shut off the fan(s), but leave the pump(s) running. 2. Check and adjust spray pressure, if required. 3. Remove the eliminators. 4. Check to see if the nozzles are producing the spray pattern shown in figure(s) below 5. Clean water distribution from dirt and debris. Ensure spray branches and nozzles are in place and clean. Replace damaged or missing nozzles. 6. Install eliminators and ensure they fit tightly with no gaps. 7. Start fan(s) and pump(s). COMBINED INLET SHIELDS Combined inlet shields are installed at the air inlet side. These will prevent UV light from shining into the sump water and will eliminate the suction of large airborne impurities and debris. In addition, they will prevent water from splashing out of the air intake side of the unit during fan cycling. Figure 8: Removable Fill Figure 9: Removable Drift Eliminators Figure 10: Nozzle Spray Distribution Type Cooling Tower Figure 11: Removable Spray System 10 MAINTENANCE PROCEDURES Inspect regularly and remove foreign objects that might impair air passage. Replace broken and missing parts when necessary. Failure to replace broken shields will result in water loss due to splash out. You can remove the Combined Inlet Shields by simple loosening a single bolt on both ends of the air intake side. This allows simple removal of the combined inlet shields in small and easy to handle sections allowing full access to the sump section for maintenance. . Figure 12: Remove Combined Inlet Shields FAN SHAFT The fan shaft is fabricated from stainless steel. The exposed areas of the fan shaft are coated with a soft seal for added corrosion protection. It is recommended that the coating be inspected for continuity quarterly or at least every 6 months. Any signs of surface corrosion must be treated. This involves: 1. Removal of the protective coating with a suitable cleaning medium 2. The removal of any surface corrosion with emery cloth 3. The re-coating of the shaft with soft seal. AXIAL FAN Due to its size and speed, the axial fan has great potential for injury and destruction if damaged. Inspect closely, and as required, replace damaged or deteriorating fan blades. Inspection should include the fan, fan cylinder and fan guard, and these should be inspected for – Fan blade tip clearance – Pitch angle – Bolt torque – Excessive vibration – Deterioration of fan assembly Correct or adjust if necessary. Note: Before any disassembly, fan blades and hub should be match marked to ensure proper blade pitch angle when reassembled. ! 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 isolated, tagged and locked in the off position. FAN MOTOR The standard fan motor for this line of units is a TEFC (Totally Enclosed Fan Cooled) motor. The motor with frame size smaller or equal than 200L 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. After prolonged shutdowns, the motor insulation should be checked with a "megger" insulation tester before restarting the motor.(Contact your local BAC Balticare representative for advice.) Whenever two speed motors are

used for capacity control, a time delay of at least 15 seconds is required when switching form high to low speed. Sudden switch over might damage the drive system or the motor. Note: When operating with VFD drives above nominal frequency be aware of the potential risk for motor overload or mechanical damages. Note: It is recommended to provide sinus filters on the VFD to prevent bearing damage on fan motors. ! Please refer to fan motor nameplate data when programming a VFD. The purpose of a Low Level Cut out Switch is to protect the pump from running dry in case of make-up failure or extreme water loss. The status of the alarm can be checked prior to pump start-up, but should not be considered during the first minute after start-up, since activation of the pump can cause a water level drop, that might trigger the alarm. Normal make-up will stabilize the water level after a short period of time. About Cold Weather Operation Protection Against Sump Water Freezing Capacity Control 6 MAINTENANCE PROCEDURES COLD WATER BASIN AND BASIN STRAINERS The cold water basin should be inspected regularly. Any debris which may have accumulated in the basin or on the strainers should be removed. Quarterly, or more often if necessary, 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 and under the wet deck surface during operation. When flushing the basin, the strainers should be left in place to prevent the sediment from re-entering the unit system. After the basin has been flushed, the strainers should be removed, cleaned, and replaced before refilling the basin with fresh water. ! DO NOT USE ACID TO CLEAN THE STRAINERS Remote Basin The water level in the basin of equipment designed for remote basin operation is a function of the circulating water flow rate; water outlet connection size, quantity and location, and outlet piping size and configuration. The remote basin unit is supplied without a water make-up assembly or a strainer and the basin operating level during remote basin operation is not adjustable. OPERATING LEVEL AND MAKE-UP As the water circulating through the tower is cooled, it collects in the cold water basin and passes through the strainers into the system. The operating water level is controlled by the make-up valve and should be maintained at an operating water level of 140 mm below ledge on which louvres rest. Because the typical winter load is less than the summer load, the winter evaporation rate is frequently less than the summer evaporation rate. With this reduced evaporation rate in winter, the water level in the cold water basin will increase unless the float is readjusted. The operating water level should be checked monthly and float readjusted as necessary to maintain the recommended operating level. A float operated water make-up assembly is furnished as standard equipment on cooling towers. It is located inside the unit within easy reach from the access door. The float is mounted on an all-thread rod which 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. The valve itself should be inspected annually for leakage and the valve seat replaced if necessary. The make-up water supply pressure should be maintained between 100 and 450 kPa for proper operation of the valve. To make the initial basin water level setting, fill the sump with water until 2 cm above the operating level. Adjust the wing nuts of the float ball so that the make-up valve is completely closed. Under normal load conditions this setting should produce the correct operating level. At low load conditions the operating level will rise and needs to be adjusted. The unit basin should be

closely monitored and water level adjusted as necessary during the first 24 hours of operation. 1. Float Ball 2. All Threaded rod 3. Wing Nuts 4. Float Arm Assembly 5. Float Valve BLOW DOWN In case of a continuous blow down with a metering valve in the bleed line, ensure that the valve is unobstructed and that blow down water can drain freely. Measure the blow down flow rate by recording the time needed to fill a given volume. For automatic blow down using conductivity control, ensure that the conductivity probe is clean and that the blow down solenoid valve is operational. Unless you have a specific adjustment procedure, your water treatment company should check and adjust set points. Under no circumstances should sump heaters operate at other times as they could potentially heat the water to temperature levels, which are favourable to bacteriological growth. Ensure every six months the heater thermostat is properly set and clean. Also ensure that control and safety devices, such as low level cut out switches, are operational, clean and properly incorporated into the control circuit. ! SUMP HEATERS CAN BE HOT. BELT TENSIONING Belt tensioning can be checked as follows: 1. 2. Rotate the fan sheave half a turn to evenly distribute the tension in the belt before measuring. 3. Check belt tension by verifying both following conditions: the deflection amounts 10 mm/m free belt length (see figure below) the deflection force required is between the minimum and maximum values given in the table below.Figure 15: Ball Bearing Shell Alvania grease RL3 –20?C to +120?C Texaco Multifak Premium 3 –30?C to +140?C Kluber Isoflex LDS Special A –50?C to +120?C Mobil Mobilith SHC 100 –40?C to +175?C Total Fina Elf Multis 3 –20?C to +120?C Table 3: Grease Products Figure 16: Ball Bearing Figure 17: Adjustable Motor Base 12 MAINTENANCE PROCEDURES MECHANICAL CLEANING Keeping your evaporative cooling equipment (and the associated system) clean will maintain its efficiency and help to prevent uncontrolled bacteriological growth.For the cooling system, scale, corrosion and biological control must be established and initiated when the system is first filled with water and administered on a regular basis thereafter in accordance with recognized Codes of Practice, (such as EUROVENT 9 – 5/6, ACOP HSC L8, Guide des bonnes pratiques, Legionella et tours aerorefrigerantes, etc.).To facilitate servicing of the equipment, it is suggested that the following parts be carried on hand : – Make–up float ball (if applicable) – Valve seal for water make–up valve – Fan shaft bearings – Spray nozzles and grommets – Spray distribution branch grommets – Set of belts Insist on factory authorised parts to avoid loss of efficiency or an operational risk, which may occur if non–authorised parts are used.On a quarterly or six monthly basis check: – electric connections – motor protection devices – check amp draw – motor bearings for noise/overheating – motor holding bolts – external surface of motor for corrosion If the motor is equipped with space heaters, these must be activated when the motor is idle in order to prevent condensation inside the motor.Cleaning Procedures COMPREHENSIVE MAINTENANCE 13 In order to ensure maximum efficiency and minimum downtime of your evaporative cooling system, it is recommended to establish and execute a programme of preventive maintenance.Temperature increase due to sun radiation could deform the fill or eliminators AUTHORIZED PERSONNEL The operation, maintenance and repair of this equipment should be undertaken only by personnel authorized and qualified to do so. All such personnel should be thoroughly familiar with the equipment, the associated systems and controls and the procedures set forth in this and other relevant manuals.Depending upon site conditions it also may be necessary to install items such as

bottom screens, ladders, safety cages, stairways, access platforms, handrails and toe boards for the safety and convenience of the authorized service and maintenance personnel.Accordingly a treatment programme specifically designed to address biological control should be initiated when the system is first filled with water and administered on a regular base thereafter in accordance with any regulations (national, regional) that may exist or in accordance with accepted codes of good practice, such as EUROVENT 9–5/6, VDMA Detailsheet 24649 etc.Consult your water treatment specialist for specific recommendation About Water Care Pultruded Composite pH 6.5 to 9.5 pH during initial passivation Not Applicable Total hardness as (CaCO3) 750 mg/l Total alkalinity as (CaCO3) 600 mg/l max.The preventive maintenance programme must not only avoid that excessive downtime occurs under unforeseen and unwanted conditions, but must also ensure that factory authorized replacement parts are used, which are designed to fit and for their purpose carry the full factory warranty.Passivation is the formation of a protective, passive, oxide layer on galvanized steel surfaces.Motor Sheave 4.!2.2.1.2.3.!!1.1.2.3.4.5.6.7.8.9.