Bulletin 220-E Metric

evapco for LIFE

ATW

CLOSED CIRCUIT COOLER

ADVANCED TECHNOLOGY IN
INDUCED DRAFT, COUNTERFLOW COOLERS

EASY SOLUTIONS...BETTER CHOICES!

CERTIFIED EN ISO 9001

Mr. GoodTower®
evapco

CE PRESSURE EQUIPMENT DIRECTIVE 97/23/EC ASSESSED BY NOTIFIED BODY

EAC

ATW

Since its founding in 1976, EVAPCO, Inc. has become a world-wide leader in supplying quality cooling equipment for thousands of customers in both the commercial and industrial markets.

EVAPCO's success has been the result of a continual commitment to product improvement, quality workmanship and a dedication to providing unparalleled service.

Our emphasis on research and development has led to many product innovations – a hallmark of EVAPCO through the years.

The ongoing R & D Program enables EVAPCO to provide the most advanced products in the industry – technology for the future, available today.

EVAPCO products are manufactured on five continents around the world and distributed through hundreds of factory authorized sales representatives.

Design and Construction Features

The ATW line of evaporative coolers reflects EVAPCO's commitment to product development. Their advanced design provides owners with many operational and performance advantages.

These induced draft, counterflow coolers are designed for easy maintenance and long, trouble-free operation.

Easy to Service Motor Mount Design

- **All normal maintenance can be performed quickly from outside the unit**

- Designed for easy belt adjustment
- Extended lube lines for easy bearing lubrication
- If required, motor may swing to outside for easy removal

Water Saver Drift Eliminators

- New patented design reduces drift rate to < 0.001%
- Saves water and reduces water treatment cost
- Greater structural integrity vs. old style blade-type
- Recessed into casing for greater protection
- Drift rate certifications with Eurovent OM-14-2009

PVC Spray Distribution Header with ZM II™ Nozzles

- Large orifice nozzles prevent clogging (no moving parts)
- Nozzles are threaded into header at proper orientation
- Fixed position nozzles require zero maintenance
- Guaranteed for life

Totally Enclosed Pump Motors

- Help assure long, trouble-free operation

Stainless Steel Strainers

- Resists corrosion better than other materials

Z-725 Heavy Mill Hot-Dip Galvanized Steel Construction

(Stainless steel available as affordable option)

Advanced Design Smooth Flow Fans

- Totally Enclosed Fan Motors assures long life
- Power-Band Belts for Better Lateral Rigidity
- Advanced Design Aluminum Fan Blades
- Non-corroding Cast Aluminum Sheaves
- Heavy-Duty Fan Shaft Bearings with L-10 life of 75,000 - 135,000 hrs
- All Other Components Corrosion Resistant Materials

Low Sound Options available
Refer to page 11

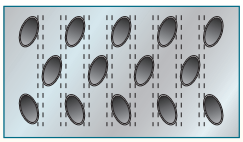
Super Low Sound Fan (optional)

- Extremely wide sloped fan blades for sound sensitive applications
- One piece molded heavy duty construction
- 9-15 dB(A) sound reduction

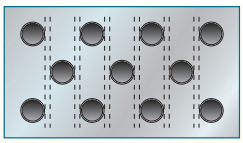
Patented Thermal-Pak® Coil Design Features EVAPCO's exclusive CROSSCOOL™

Features EVAPCO's exclusive ***CROSSCOOL***™ tube enhancement for greater internal heat transfer. All EVAPCO Closed Circuit Coolers utilize EVAPCO's patented Thermal-Pak® coil design which assures greater operating efficiency. The elliptical tube design allows for closer tube spacing, resulting in greater surface area per plan area than round-tube coil designs.
In addition, the Thermal-Pak® design has lower resistance to airflow and also permits greater water loading, making the Thermal-Pak® coil the most effective design available.

Thermal-Pak® Coil



Thermal-Pak® Coil by EVAPCO



Round Tube Coil by Others

IBC Compliant Design
Refer to page 17


evapco
Certificate of Compliance
AT, USS, UAT, UT Cooling Towers
eco-ATW/WE, ATW(B) and ESWA Closed Circuit Coolers
eco-ATC, ATC-E Evaporative Condensers
Are certified to meet or exceed the Seismic and Wind Load Provisions set forth in the applicable building codes for this project.
These products have been manufactured following all applicable quality assurance programs.
Applicable Building Codes: IBC 2012 ASCE-7 NFPA 5000
Referenced Report: VMA-43385
Approval Agency: VMC Seismic Consulting Group
EVAPCO...Specialists in Heat Transfer Products and Services.

Louver Access Door

- Hinged access panel with quick release mechanism
- Allows easy access to perform routine maintenance and inspection of the make-up assembly, strainer screen and basin
- Available on larger models

Easy Field Assembly

- A new field assembly seam design which ensures easier assembly and reduced potential for field seam leaks
- Self-guided channels guide the fan casing section into position improving the quality of the field seam
- Eliminates up to 66% of fasteners

"Clean Pan" Basin Design

- Access from all four sides
- Large open area simplifies maintenance
- Basin may be inspected with pumps running
- Sloped basin design prevents sediment buildup, biological film and standing water

WST Air Inlet Louvers (Water and Sight Tight)

- Easily removable for access
- Patented design keeps sunlight out–preventing biological growth
- Keeps water in while keeping dirt and debris out

U.S. Patent No. 7927196

EVAPCOAT Corrosion Protection System

EVAPCO, long known for using premium materials of construction, has developed the ultimate system for corrosion protection in galvanized steel construction – the EVAPCOAT Corrosion Protection System. Marrying corrosion free materials with heavy gauge mill hot-dip galvanized steel construction to provide the longest life product with the best value.

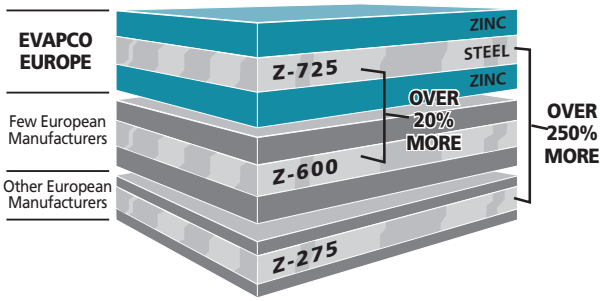
The Evapcoat Corrosion Protection System consist of:

• Z-725 Mill Hot-Dip Galvanized Steel Construction

Mill hot-dip galvanized steel has been successfully used for over 25 years for the protection of evaporative coolers against corrosion. There are various grades of mill galvanized steel each with differing amounts of zinc protection. EVAPCO has been a leader in the industry in developing heavier galvanizing, and was the first to standardize on Z-600 mill hot-dip galvanized steel. Now, EVAPCO is, once again, increasing the level of corrosion protection by being the first and only manufacturer in Europe to use Z-725 mill hot-dip galvanized steel.

Z-725 designation means there is a minimum of 725 g of zinc per m^2 of surface area present on the steel. Z-725 is the heaviest level of galvanizing available for manufacturing evaporative coolers and has over 2.5 times more zinc protection than competitive designs using Z-275 steel. With Z-725 mill hot-dip galvanized steel construction, EVAPCO provides galvanized steel panels with corrosion protection that approaches the level of the hot-dip galvanized heat exchanger coils.

During fabrication, all panel edges are coated with a 95% pure zinc-rich compound for extended corrosion resistance.



• Type 304 Stainless Steel Strainers

Subjected to excessive wear and corrosion, the sump strainer is critical to the successful operation of the cooler. EVAPCO uses only stainless steel for this very important component.

• PVC Air Inlet Louvers

The innovative design uses corrosion free materials while effectively eliminating splash out and reducing the potential for algae formation inside the cooler.

• PVC Drift Eliminators

The final elements in the upper part of the cooler are moisture eliminators which strip the entrained water droplets from the leaving air stream.

EVAPCO eliminators are constructed entirely of inert, corrosion-free PVC. This PVC material has been specially treated to resist damaging ultraviolet light. The eliminators are assembled in easily handled sections to facilitate removal thereby exposing the upper portion of the unit and water distribution system for periodic inspection.

• PVC Water Distribution System, *ZM II*™ Spray Nozzle

The fixed position *ZM II*™ Spray Nozzles are mounted in corrosion-free PVC water distribution pipes. Together, these elements combine to provide unequaled coil coverage, scale prevention and make the industries best performing non-corrosive, maintenance-free water distribution system.

• Totally Enclosed Motors

EVAPCO uses totally enclosed motors for all fan and pump motors as standard. These superior motors help to assure longer equipment life without motor failures, which result in costly downtime.

• Alternate Materials of Construction

EVAPCO induced draft coolers have a modular design which allows for specific areas to be enhanced for increased corrosion protection. For particularly corrosive environments, EVAPCO coolers are available with Stainless Steel construction for the basin, casing and/or coil.

• Stainless Steel Welded Basin

The basin area of a cooler is often subjected to high concentrations of impurities and silt. In addition to the EVAPCOAT Corrosion Protection System, EVAPCO offers optional stainless steel construction for superior corrosion resistance. This option provides Type 304 or Type 316 stainless steel for the entire basin section - including the support columns and air inlet louver frames.

• Stainless Steel Coils

The heat exchanger coil is the heart of the evaporative cooler. For this critical component, EVAPCO offers the options of Type 304 or type 316 stainless steel construction.

NOTE: Closed Circuit Coolers should only be used on sealed, pressurized systems. Continual aeration of the water in an open system can cause corrosion inside the tubes of the cooler leading to premature failure.

DESIGN FEATURES

ATW

Axial Fan Drive System Direct Drive Units – 1.2 m Wide Models

ATW 9 to ATW 48

The T.E.F.C. motors are located on the outside of the unit on Models ATW 9-2C-2 through ATW 48-5G and are protected by a hinged, swing away cover.

External Motor Mount (with swing away cover)

Belt Drive Units – 2.4 m and 2,3 m Wide Models

ATW 64 to ATW 332

The fan motor and drive assembly on these units are designed to allow easy servicing of the motor and adjustment of the belt tension from the exterior of the unit. The T.E.F.C. fan motor is mounted on the outside of these models.

External Motor Mount (with optional ladder)

A large hinged access door with a "quick release" latch provide access to the fan section for maintenance.

NOTE: the sloped access ladder is available on all ATW 64 through ATW 866. Please check conformity with local legislation before application.

Belt Drive Units – 3 m & 3.6 m Wide Models

ATW 120 to ATW 362 - ATW 144 to ATW 866

Designed as the ideal replacement cooler, these models provide both cost effective and energy efficient alternatives to obsolete centrifugal fan designs. The 3 m wide plan areas are also well suited for new installations and provide more layout flexibility. The unique belt drive design features are detailed below.

Motor Base Assembly

The fan motor and drive assembly is designed to allow easy servicing of the motor and adjustment of the belt tension from the exterior of the unit. The T.E.A.O. fan motor is located inside the fan casing on a rugged heavy duty motor base. The innovative motor base also features a unique locking mechanism for a positive adjustment.

The motor base is designed to swing out through a very large 1.3 m^2 access opening. This allows for easy servicing of the motor.

Motor Access

Power- Band Drive Belt: The Power-Band is a solid-back, multigroove belt system that has high lateral rigidity. The belt is constructed of neoprene with polyester cords. The drive belt is designed for 150 percent of the motor nameplate kW for long life and durability.

Fan Shaft Bearings: The fan shaft bearings in ATW units are specially selected for long, trouble-free life. They are rated for an L-10 life of 75.000 to 135.000 hours and are the heaviest pillow block bearings available.

Aluminum Alloy Pulleys: Fan pulleys are constructed of corrosion free aluminum for long life. The aluminum also helps belts last longer.

ATW

DESIGN FEATURES

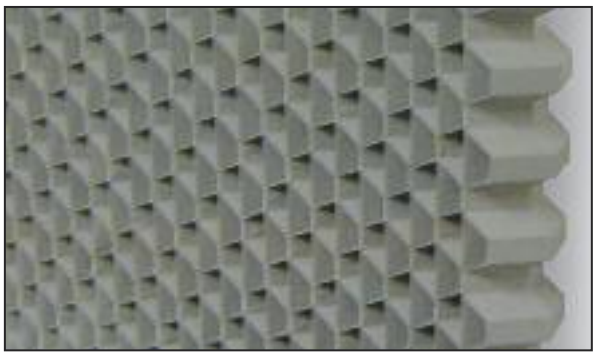
Water Management
High Efficient Water Saver Drift Eliminators

An extremely efficient drift eliminator system is standard on EVAPCO coolers. The patented system removes entrained water droplets from the air stream to limit the drift rate to less than 0.001% of the recirculating water rate. With a low drift rate, EVAPCO coolers save valuable water and water treatment chemicals. The drift eliminators are constructed of an inert polyvinyl chloride (PVC) plastic material which effectively eliminates corrosion of these vital components. They are assembled in sections to facilitate easy removal for inspection of the water distribution system.

Superior WST Air Inlet Louver and Screen Design

EVAPCO's patented WST Inlet Louvers keep water in and sunlight out of the basins of induced draft products. The unique non-planar design is made from light-weight PVC sections which easily fit together and have no loose hardware, enabling easy basin access.

Developed with computational fluid dynamics (CFD) software, the louver's air channels are optimized to maintain fluid dynamic and thermodynamic efficiency and block all line-of-sight paths into the basin eliminating splash-out; even when the fans are off. Additionally, algae growth is minimized by blocking all sunlight.

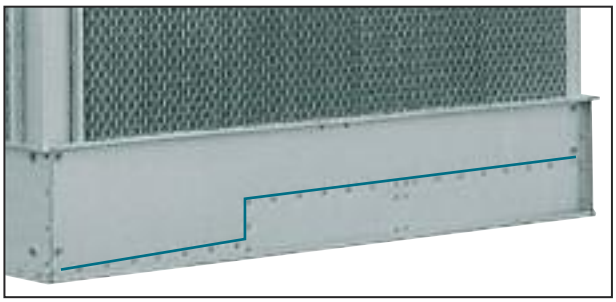


Inlet Louver Material

The combination of easy basin access, no splash-out and minimized algae growth saves the end user money on maintenance hours, water consumption and water treatment costs.

"Clean Pan" Basin Design

EVAPCO coolers features a completely sloped basin from the upper to lower pan section. This "Clean Pan" design allows the water to be completely drained from the basin. The cooler water will drain from the upper section to the depressed lower basin section where the dirt and debris can be easily flushed out through the drain. This design helps prevent buildup of sedimentary deposits, biological films and minimizes standing water.



Sloped Basin

ZM II™ Spray Nozzle Water Distribution System

Even and constant water distribution is paramount for reliable, scale-free evaporative cooling. EVAPCO's Zero Maintenance ZM II™ Spray Nozze, mounted in a PVC distribution pipe, remains clog-free under the toughest conditions to deliver approximately 4 l/s to every square meter of coil plan area.

The heavy-duty nylon ZM II™ Spray nozzles have a 33 mm diameter opening and a 38 mm splash plate clearance, enabling EVAPCO to use 75% fewer nozzles.

ZM II™ Nozzle

OPTIONAL EQUIPMENT

ATW

Two Speed Motors

Two speed fan motors can provide an excellent means of capacity control. In periods of lightened loads or reduced wet bulb temperatures, the fans can operate at low speed, which will provide about 60% of full speed capacity, yet consume only about 15% of the power compared with high speed. In addition to the energy savings, the sound levels of the units will be greatly reduced at low speed.

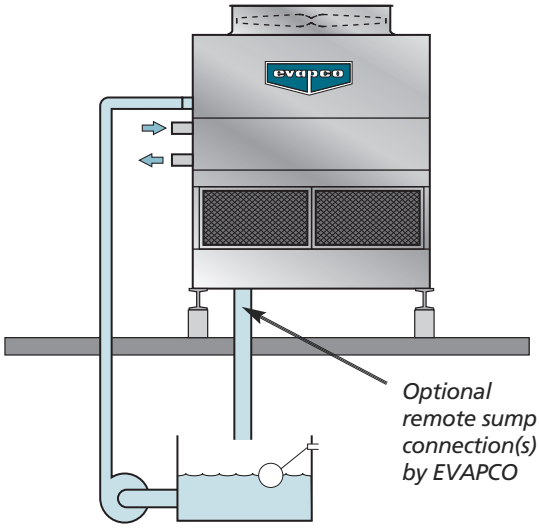
Inverter Duty Motors

Inverter Duty motors are available for cooler applications which utilize variable frequency drive systems for capacity control. Inverter Duty motors offer totally enclosed premium efficiency construction which is designed for variable frequency drive applications.

Note: Other special motor configurations are available to meet specific proper requirements. Contact your local EVAPCO sales representative for application assistance and motor availability.

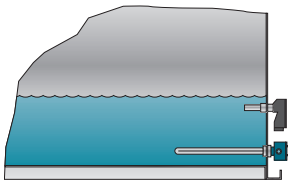
Remote Sump Configuration

For units operating in areas where temperatures may be very low, or where low temperatures may occur during periods when the unit is not operating, a sump located inside the building is the preferred means of ensuring that the basin water will not freeze. For these applications, the cooler will be supplied without the spray pump, suction strainers and all associated piping, but with an oversize bottom outlet.



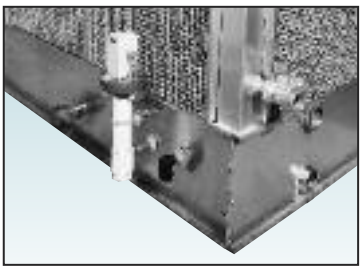
Basin Heater Package

If a remote sump configuration is not practical, electric basin heater packages are available to help prevent freeze-up of the basin water. The packages include electric heater elements and a combination with thermostat and low water cut-off. (Consult EVAPCO for heater size and application)



Electric Water Level Control

Evaporative coolers may be ordered with an electric water level control in lieu of the standard mechanical float and make-up assembly. This package provides accurate control of water levels and does not require field adjustment.



Multiple Circuit Coils

Coolers may be supplied with multiple circuit coils to match various system requirements such as split systems.

Self Supporting Service Platforms

Coolers are available with self-supporting service platforms that include access ladders which are designed for easy field installation. This option offers significant savings in comparison to field constructed, externally supported catwalks. The EVAPCO service platform option will be installed in front of the fan access doors.

Motor Davit

In the event that a fan and/or fan motor should need to be replaced, a motor davit is available from which a chain fall can be mounted to easily lower the motor/fan to the ground.

ATW Cooler with Optional Service Platform and Motor Davit

ATW

APPLICATION

Design
Evapco units are of heavy-duty construction and designed for long trouble-free operation. Proper equipment selection, installation and maintenance is, however, necessary to ensure full unit performance. Some of the major considerations in the application of a cooler are presented below. For additional information, please contact the factory.

Air Circulation
It is important that proper air circulation be provided. The best location is on an unobstructed roof top or on ground level away from walls and other barriers. Those closed circuit coolers located in wells, enclosures or adjacent to high walls must be properly located to avoid the problems associated with recirculation.
Recirculation raises the wet bulb temperature of the entering air causing the water temperature to rise above the design. For these cases, the discharge of the fan should be located at a height even with the adjacent wall, thereby reducing the chance of recirculation. For additional information, see the Evapco Equipment Layout Manual.
Good engineering practice dictates that the closed circuit cooler discharge air not be directed or located close to or in the vicinity of building air intakes.

Piping
Cooler piping should be designed and installed in accordance with generally accepted engineering practices. The piping layout should be symmetrical on multiple unit systems, and sized for a reasonably low water velocity and pressure drop. The standard closed circuit cooler is recommended only on a closed, pressurized system. The piping system should include an expansion tank to allow for fluid expansion and purging air from the system.
Note: Closed Circuit Coolers should never be used on an open system. Continual aeration of the water in an open system can cause corrosion inside the tubes of the cooler leading to premature failure.
The piping system should be designed to permit complete drainage of the heat exchanger coil. This will require a vacuum breaker or air vent to be installed at the high point and a drain valve installed at the low point of the piping system. Both must be adequately sized.
All piping should be securely anchored by properly designed hangers and supports. No external loads should be placed upon the cooler connections, nor should any of the pipe supports be anchored to the cooler framework.

Recirculating Water System
The surest way to protect the recirculating water system from freezing is with a remote sump. The remote sump should be located inside the building and below the unit. When a remote sump arrangement is selected, the spray pump is provided by others and installed at the remote sump. All water in the closed circuit cooler basin should drain to the remote sump when the spray pump cycles off. Refer to page 7 for concept illustration.
Other freeze protection methods are available when a remote sump is not feasible. Electric pan heaters, steam or hot water coils can be used to keep the pan water from freezing when the unit cycles off. Water lines to and from the unit, spray pump and related piping should be heat traced and insulated up to the overflow level in order to protect from freezing.
The unit should not be operated dry (fans on, pump off) unless the basin is completely drained and the unit has been designed for dry operation. Consult the factory when dry operation is a requirement.

Freeze Protection
If the units are installed in a cold climate and operated year-round, freeze protection must be provided for the heat exchanger coil in the unit as well as for the recirculating water system.

Minimum Flows		
MODELS		l/s
ATW	9, 16	1,64*
ATW	24, 36, 48	2,34*
ATW	64, 72, 84, 96, 112, 142, 166	10,1
ATW	120, 180	11,9
ATW	241, 360	23,8
ATW	192, 224, 284, 332,	20,2
ATW	166W, 192W, 224W	
ATW	144, 168, 216	14,7
ATW	242, 362	23,8
ATW	286, 334, 430	29,3
ATW	290, 338, 434	
ATW	578, 672, 866	58,6

* serial flow

Heat Exchanger Coil
The simplest and most foolproof method of protecting the heat exchanger coil from freeze-up is to use a glycol solution. If this is not possible, an auxiliary heat load must be maintained on the coil at all times so that the water temperature does not drop below 10°C when the cooler is shut down. Also, a minimum recommended flow rate must be maintained. Refer to Heat Loss Data Table on page 35 for heat loss data.

Water Treatment
In some cases the make-up water will be so high in mineral content that a normal bleed-off will not prevent scaling. In this case, water treatment will be required and a reputable water treatment company familiar with the local water conditions should be consulted.
Units constructed of galvanized steel operating with circulating water having a pH of 8,3 or higher will require periodic passivation of the galvanized steel to prevent the formation of “white rust”.
Any chemical water treatment used must be compatible with the galvanized construction of the unit. If acid is used for treatment, it should be accurately metered and the concentration properly controlled. The pH of the water should be maintained between 7 and 8,8. Batch chemical feeding is not recommended because it does not afford the proper degree of control. If acid cleaning is required, extreme caution must be exercised and only inhibited acids recommended for use with galvanized construction should be used.

Control of Biological Contamination
Water quality should be checked regularly for biological contamination. If biological contamination is detected, a more aggressive water treatment and mechanical cleaning program is required. The water treatment program should be performed in accordance with local legislation and in conjunction with a qualified water treatment company.
It is important that all internal surfaces be kept clean of accumulated dirt or sludge. In addition, the drift eliminators should be kept in good operating condition to minimize water from exiting the evaporative cooling unit in the discharge air. To minimize the risk of biological contamination, at initial start up or after an extended shut down, it is recommended that the cooler be properly treated. Clean all debris such as leaves and dirt from the unit. Completely fill the basin to the overflow level with fresh water. Initiate a biocide water treatment or shock treatment program prior to operating the unit. It is preferable that all such procedures be conducted or supervised by a water treatment specialist.

APPLICATION

ATW

FM Approval


Certificate of Compliance

COOLING TOWERS

Evapco Models ICT, AT, UT, USS, REP, UAT, LSTA, LSTB, LSTE, PMTA, PMTQ, ATW, ATWB, ATC-E, LSWB, LSCB, PMCB, PMCE, LSWE, LSC-E, PMWQ

FM (Factory Mutual) Global is a mutual insurance company, which evaluates hazards and recommends improvements to property to reduce risks if a disaster like fire occurs.

EVAPCO's ATW closed circuit cooler can be executed to meet the FM approval standard.

To be in compliance with this standard the closed circuit coolers are improved with the following modifications:

- Water distribution system constructed of galvanized or stainless steel instead of PVC. Nozzles remain ABS plastic.
- Special full scale tested and approved PVC louver and eliminator material.
- Internal partition walls between cells and louver screens to avoid fire propagation.
- Air inlet louvers are provided with 1" x 1" hot dipped galvanized or stainless steel screens in front of the PVC air inlet material.
- Units with louvers more than 4' tall are provided with galvanized or stainless steel fire-walls which extend out from the unit 12" and are attached to the vertical supports between adjoining cells.
- Increased thickness of steel construction panels to improve fire resistance.
- Aluminum axial fans on single cell units, SLSF only on multi cell units for redundancy.

Technical Support Services

EVAPCO's evap*Select*™ Equipment Selection Program

Evap*Select*™ is a Web based computer selection program which allows the design engineer to choose EVAPCO models and optimize unit selections.
The program allows the engineer to evaluate the equipment's thermal performance, space, energy requirements and water consumption. Once the model is selected and optional equipment features are inserted, the engineer may output a complete specification **AND** a unit drawing from this program.

The software is designed to provide the user with maximum flexibility in analyzing the various selection parameters while in a friendly and familiar Windows format.

The **Evap*Select*™** software is available to all consulting engineering offices and design-build contractors.
The programs are distributed through the local EVAPCO sales representative or the EVAPCO offices.

EVAPCO's Website

Log on to EVAPCO's new and improved website **http://www.evapco.eu** for expanded product information.
Product literature, Rigging and Maintenance Instructions are all accessible online from your computer.
The **Evap*Select*™** Equipment Selection Software program may be accessed using Microsoft Internet Explorer after contacting your local EVAPCO sales representative.
Users may make Requests for Quotation through the website or by e-mailing EVAPCO at this address:

evapco.europe@evapco.eu

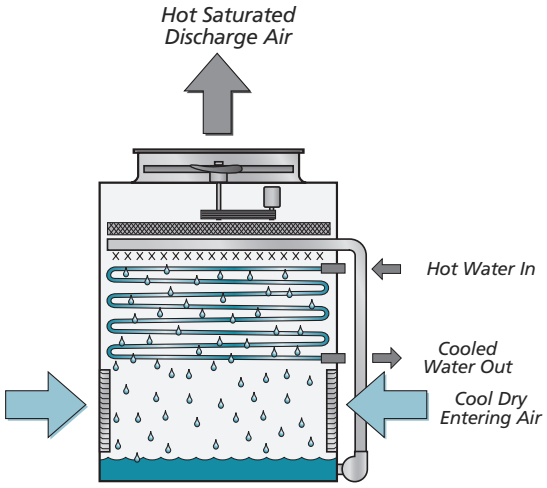
With the Evap*Select*™ program, equipment selections, written specifications, unit drawing files and EVAPCO on-line information are readily available from the comfort of your own office!

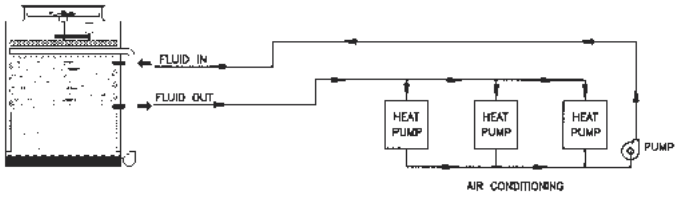
ATW

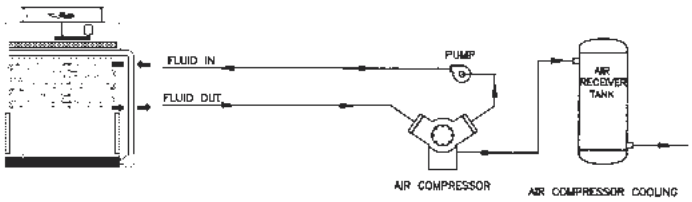
APPLICATION

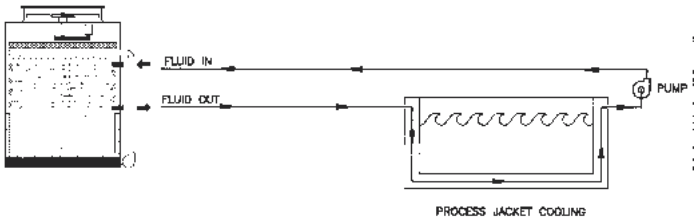
Principle of Operation

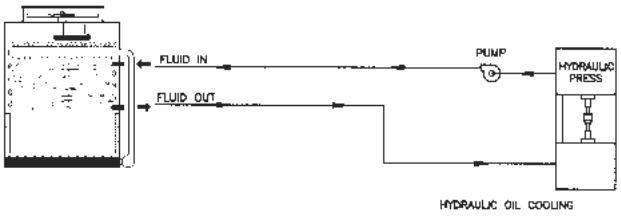
The process fluid is circulated through the coil of the closed circuit cooler. Heat from the process fluid is dissipated through the coil tubes to the water cascading downward over the tubes. Simultaneously, air is drawn in through the air inlet louvers at the base of the cooler and travels upward over the coil opposite the water flow. A small portion of the water is evaporated which removes the heat. The warm moist air is drawn to the top of the closed circuit cooler by the fan and is discharged to the atmosphere. The remaining water falls to the sump at the bottom of the cooler where it is recirculated by the pump up through the water distribution system and back down over the coils.











Air Conditioning
- Unitary Heat Pump Systems
- Computer Room Cooling
- Refrigeration Supplement

Manufacturing
- Air Compressors
- Plastic Mold Machines
- Transformers
- Engines

Steel Mills & Foundries
- Quench Tanks
- Rolling Mills
- Induction Furnaces
- Continuous Casters

Industrial Fluids
- Hydraulic Oils
- Plating Solutions
- Quench Oils

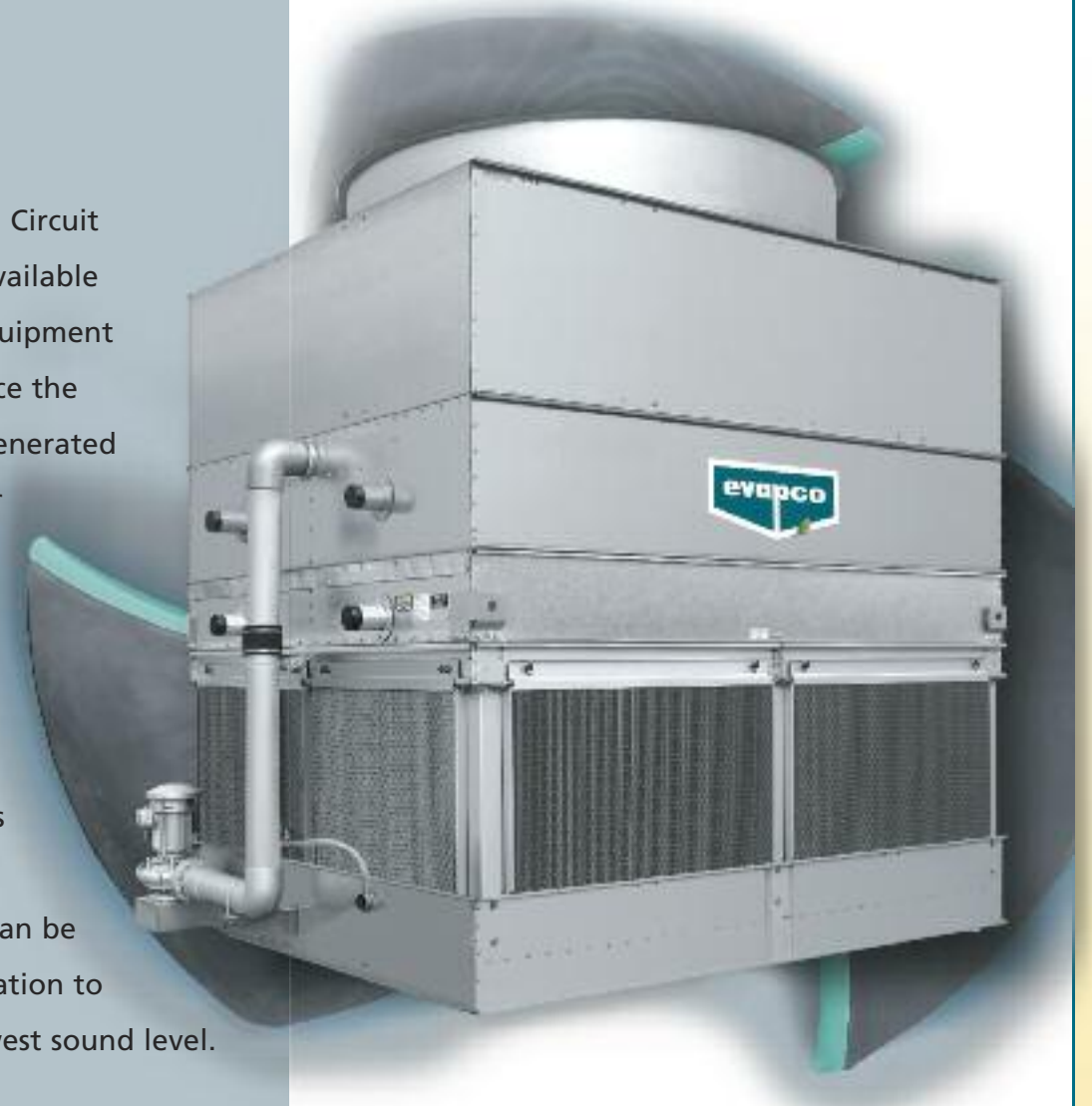
APPLICATIONS

ATW

Ultra Quiet Closed Circuit Coolers

The ATW Closed Circuit Cooler is now available with four (4) equipment options to reduce the overall sound generated from the side or top of the ATW Closed Circuit Cooler.

Each option provides various levels of sound reduction and can be used in combination to provide the lowest sound level.



Ultra Quiet operation for induced draft counterflow Closed Circuit Coolers

SOUND

ATW

ADVANCED TECHNOLOGY LOW SOUND SOLUTIONS

Super Low Sound Solution for Sound Sensitive Applications

Family of Super Low Sound Fans

The Super Low Sound Fan

Reduced Sound Levels versus Model ATW Standard Fan

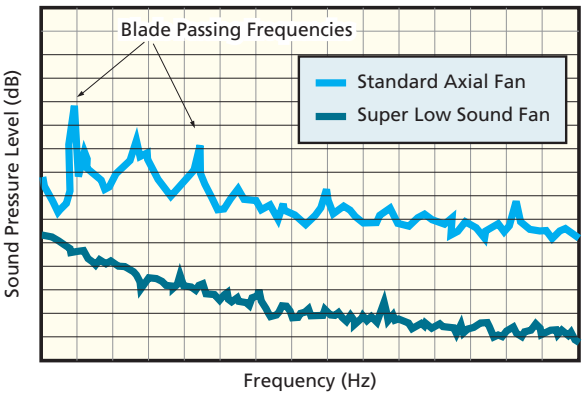
EVAPCO's Super Low Sound Fan on the **ATW** Closed Circuit Coolers utilizes an extremely wide chord blade design applied for sound sensitive applications where the lowest sound levels are desired. The fan is one piece molded heavy duty FRP construction utilizing a forward swept blade design. The Super Low Sound Fan reduces sound levels 9 to 15 dB(A) compared to the Model ATW standard fan.

Improved Sound Quality versus Model ATW Standard Fan

The SUPER Low Sound Fan on the **ATW** Closed Circuit Cooler reduces sound levels 9-15 dB(A) and eliminates audible blade passing frequencies indicative of straight bladed axial type fans.

Refer to the Narrow Band Spectrum graph which shows how straight bladed axial fans produce blade passing frequencies – the same phenomena that produce the signature pulsating helicopter noise.

The blade passing frequencies are audible spikes in sound pressure levels, but are not apparent in the octave band sound spectrum.



Narrow Band Spectrum Analysis

*The Super Low Sound Fan on the **ATW** Closed Circuit Cooler reduces sound levels and betters the sound quality!*

NOTE: These low sound options may impact the overall installed dimensions of the ATW Closed Circuit Cooler selected.

ADVANCED TECHNOLOGY LOW SOUND SOLUTIONS

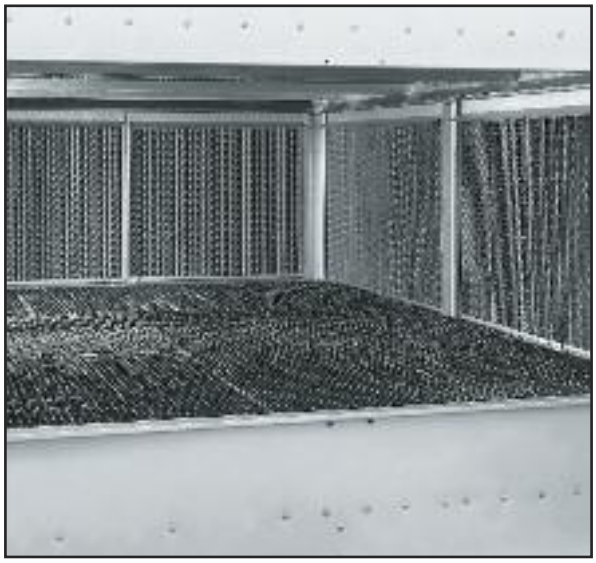
ATW

Additional Solutions for Sound Sensitive Applications

Low Sound Fan *4 – 7 dB(A) Reduction!*

The Low Sound Fan offered by EVAPCO is a wide chord blade design for sound sensitive applications where low sound levels are desired. The Low Sound Fan shall utilize a unique soft-connect blade-to-hub design that is compatible with Variable Speed Drives.

The Low Sound Fan is capable of reducing the unit sound pressure levels 4 dB(A) to 7 dB(A), depending upon specific unit selection and measurement location. The fans are high efficiency axial propeller type and are available on 2.4 m wide and larger ATW Closed Circuit Coolers.



Water Silencer

Reduces Water Noise in the Cold Water Basin up to 7 dB(A)!

The water silencer option is available for all induced draft models and is located in the falling water area of the cold water basin. The water silencer will reduce the high frequency noise associated with the falling water and is capable of reducing overall sound levels **4 dB(A) to 7 dB(A)** measured at 1.5 m from the side or end of the unit. The water silencers reduce overall sound levels **9 dB(A) to 12 dB(A)** (depending on water loading and louver height) measured 1.5 m from the side or end of the unit when water is circulated with fans off.

The water silencers are constructed of lightweight PVC sections and can be easily removed for access to the basin area. *The water silencer will have no impact on unit thermal performance.*

The Water Silencer is available on ALL ATW Closed Circuit Coolers.

Consult EVAPCO's **Evap*Select*™** selection software for unit sound levels. If a detailed analysis or full octave band data sheet is required for your application, please consult your EVAPCO Sales Representative.

Background in Sound Basics

Sound

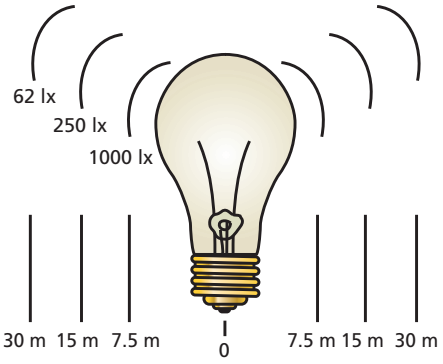
Sound is the alteration in pressure, stress, particle displacement and particle velocity, which is propagated in an elastic material. Audible sound is the sensation produced at the ear by very small pressure fluctuations in the air.

Sound Pressure

Sound pressure is the *intensity* of sound. Sound pressure, L_p in decibels is the ratio of measured pressure, P in the air to a reference sound pressure, $P_o = 2 \times 10^{-5}$ Pascal following the following formula:

L_p (dB) = 10 $\log_{10}$ ($\triangle P^2 / \triangle P_o^2$)

The most important point to understand about sound pressure level is that **sound pressure level is what is actually being measured when sound data is recorded.** Microphones that measure sound are pressure sensitive devices that are calibrated to convert the sound pressure waves into decibels.



"SOUND PRESSURE"

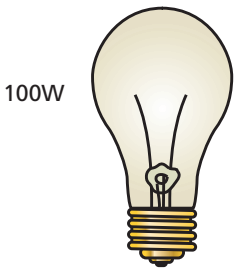
Similar to the intensity coming from a light bulb which gets dimmer as one gets further and further away, sound pressure decreases in decibels as your ear gets further from the sound source.

Sound Power

Sound Power is the *energy* of sound. Sound power, L_w in decibels is the ratio of the calculated sound power, W to a reference power, W_o=1 picowatt, according to the following formula:

L_w (dB) = 10 $\log_{10}$ (W/W_o)

The most important point to remember about **sound power level is that sound power level is not a measured value, but is calculated based on the measured sound pressure.**



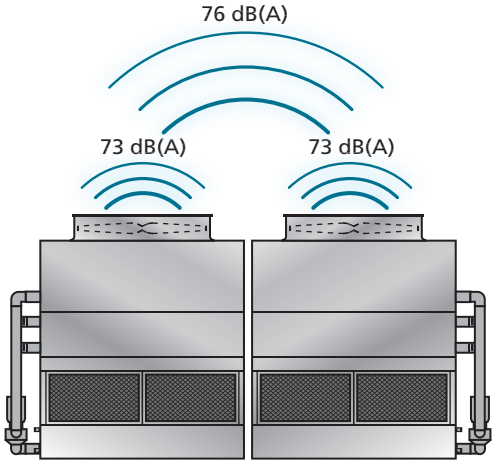
"SOUND POWER"

Similar to the wattage of a light bulb that does not change the farther one is away from the light bulb, sound power does not vary with distance.

Adding Multiple Sound Sources

Since the decibel is a logarithmic function, the numbers are not added linearly. Therefore, two 73 dB sound sources added together do not equal 146 dB. The resultant sound would actually be 76 dB. The following table shows how to add decibels from two sound sources.

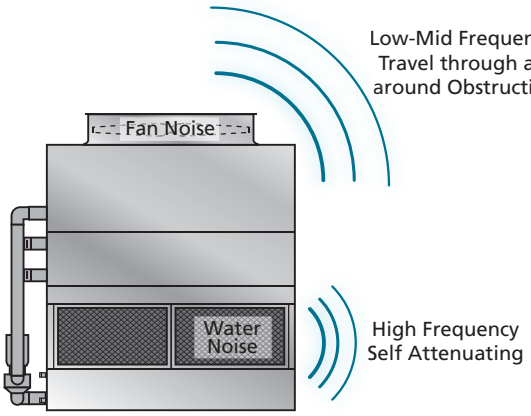
Difference in dB Level	Add to the higher dB Level
0 to 1	3
2 to 3	2
4 to 8	1
9 or greater	0



SOUND

Sound Science and Closed Circuit Coolers

Sound Frequency



Fan Noise

- Low / Mid frequencies that travel long distances, through walls, and around obstructions.
- Very difficult to attenuate. Reduce fan noise by using Low Sound Fans.
- Dominates what is measured and heard at the Closed Circuit Cooler and at the sound sensitive location.

Water Noise

- High frequencies that attenuate naturally with distance. Attenuated easily by walls, trees or other obstructions.
- Totally masked and drowned out by fan noise at a short distance away from the Closed Circuit Cooler.

Sound Pressure – The A-Weighted Scale

The A-weighted scale, dB(A) is a means to translate what a sound meter microphone measures to how the human ear perceives the sound.

dB(A) Formula and Conversions:

$$dB(A) = 10 \log_{10} \sum_{f=63}^{f=8000} 10^{((dB+Cf)/10)}$$

where: C_f = correction factor per band
dB = measured sound pressure
let: $Z_f = (dB + Cf)/10$

Band	Center Freq. (Hz)	Frequency Range (Hz)	Sample Data (dB)	Cf (dB)	Z_f
1	63	44-88	68	-26.2	4.18
2	125	89-175	76	-16.1	5.99
3	250	176-350	77	-8.6	6.84
4	500	351-700	73	-3.2	6.98
5	1000	701-1400	70	0	7.00
6	2000	1401-2800	68	+1.2	6.92
7	4000	2801-5600	71	+1.0	7.20
8	8000	5601-11200	73	-1.1	7.19

Typical Sound Pressure Levels of Well Known Noises:

Jet Airplane, 45 meters away	140 dB(A)
Painful	130 dB(A)
Very Uncomfortable	120 dB(A)
Circular Saw	110 dB(A)
Nightclub	100 dB(A)
Semi Truck	90 dB(A)
Sidewalk of a Busy Road	80 dB(A)
Household Vacuum, 1 meter away	70 dB(A)
Normal Conversation	60 dB(A)
Inside Average Home	50 dB(A)
Quiet Library	40 dB(A)
Bedroom at Night	30 dB(A)

Notable Facts about Sound:

- +/- 1 dB(A) is inaudible to the human ear
- Decreasing a noise source by 10 dB(A) sounds half as loud to the human ear

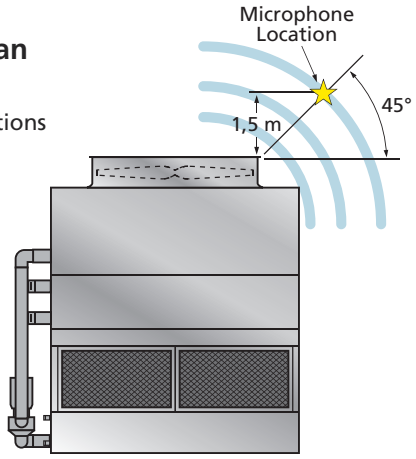
Example calculation of the dB(A) formula using the Sample Data above.

$dB(A) = 10 \log_{10} \sum 10^{(Z1)} + 10^{(Z2)} + 10^{(Z3)} + 10^{(Z4)} + 10^{(Z5)} + 10^{(Z6)} + 10^{(Z7)} + 10^{(Z8)}$
$= 10 \log_{10} (67114245.2) = 78.3$ dB(A)

Sound Verifications

Specify sound pressure in dB(A) measured 1,5 m above the fan discharge during full speed operation.

- All manufacturers can meet a performance specification with Low Sound Options
- Fan noise is what matters. 1,5 m above the fan is where it matters.



Measurement Location

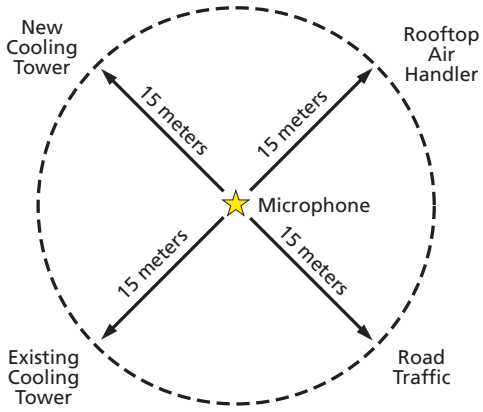
Per Cooling Technology Institute Standard ATC-128

Sound Microphone location 1,5 m above the closed circuit cooler fan cowl edge at a 45° angle.

This position assures accurate sound measurements by eliminating a source of uncertainty by taking the microphone out of the high velocity fan discharge air.

Easy Verification

At 1,5 m from the Closed Circuit Cooler, a sound meter records only closed circuit cooler noise. Interested parties can easily verify the actual noise coming from the closed circuit cooler against the specified sound data with good certainty.



If sound were specified at 15 meters or some greater distance from the sound sensitive location, there is increased uncertainty in the measured data due to other possible sound sources within the 15 meters radius of the sound microphone.

Sound Quality

Sound coming from the top of the closed circuit cooler is comprised of low- and mid-frequency fan noise. Low- and mid-frequency fan "rumble" is very difficult to attenuate. Fan rumble travels through everything and around everything and what is audible at any sound sensitive location.

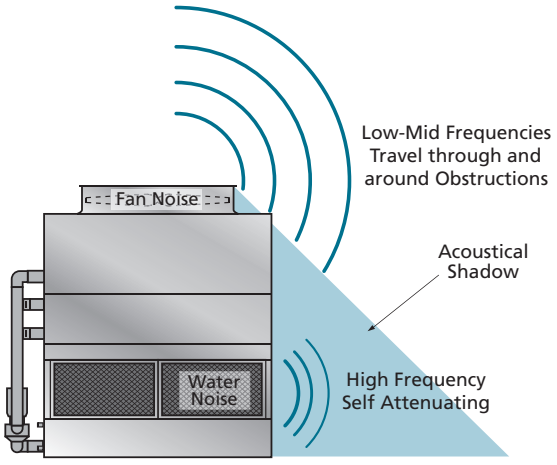
Sound coming from the sides of the Closed Circuit Cooler is comprised of high frequency water noise, is much less objectionable than fan noise and attenuates naturally with distance.

Acoustical Shadow*

"Subjective reactions to the overall noise generated by Closed Circuit Coolers indicate that as one walks away from a tower intake, a point is reached where the water noise is masked by the fan noise. The point coincides with the point at which one emerges from the acoustical shadow of the Closed Circuit Cooler structure, which shields intake water noise from discharge fan noise."

*Seelbach & Oran, "What To Do About Cooling Tower Noise", Industrial Acoustics Company.

Sound measured at the side of a Closed Circuit Cooler is inside the acoustical shadow of the noise emitted from the top. Outside the acoustical shadow, the low- and mid-frequency fan noise completely masks the high frequency water noise.



Specify fan noise because it matters! Specify fan noise where it matters!

SOUND

ATW

We Stand Tall Through it All!

Wind, Rain, Earthquake and Hurricane

The International Building Code (IBC) is a comprehensive set of regulations addressing the structural design and installation requirements for building systems – including HVAC and industrial refrigeration equipment.

With the advent of the IBC, EVAPCO is proud to introduce the new and improved line of ATW Closed Circuit Coolers with IBC 2012 compliance standard.

EVAPCO Closed Circuit Coolers... designed to withstand seismic or wind load forces.

ATW

IBC COMPLIANCE

In its continuing commitment to be the leaders in evaporative cooling equipment design and services, EVAPCO ATW Closed Circuit Coolers are now ***Independently Certified*** to withstand Seismic and Wind Loads in accordance with IBC 2012.

What is IBC?

International Building Code

The International Building Code (IBC) is a comprehensive set of regulations addressing both the structural design and the installation requirements for building systems – including HVAC and industrial refrigeration equipment. Compared to previous building codes that considered only the building structure and component anchorage, the requirements contained within the IBC address anchorage, structural integrity, and the operational capability of a component following either a seismic or wind load event. **Simply stated, the IBC code provisions require that evaporative cooling equipment, and all other components permanently installed on a structure, must be designed to meet the same seismic or wind load forces as the building to which they are attached.**

How Does IBC 2012 Apply to Closed Circuit Coolers?

Based on site design factors, calculations are made to determine the equivalent seismic "g force" and wind load (kilo-Newton per square meter, kN/m²) on the unit. The closed circuit cooler must be designed to withstand the greater of either the seismic or wind load.

The New ATW is offered with a choice of TWO structural design packages:

- **Standard Structural Design** – For projects with ≤1.0g seismic or 6,94 kN/m² wind loads
- **Upgraded Structural Design** – Required for projects with >1.0 g seismic or 6,94 kN/m² wind loads

All locations with design criteria resulting in a seismic design force of up to 1.0g or a wind load of 6,94 kN/m² or below will be provided with the standard ATW structural design. An upgraded structural design is available for installations with design criteria resulting in "g forces" greater than 1.0g. The highest "g force" location in North America is 5.12g. The highest wind load shown on the maps is 273 km/h, which is approximately equal to 6,94 kN/m² velocity pressure. **Therefore, the upgraded structural design package option for the New ATW is designed for 5.12 g and 6,94 kN/m² making it applicable to most building locations worldwide.**

Design Implementation

EVAPCO applies the seismic design and wind load information provided for the project to determine the equipment design necessary to meet IBC requirements. This process ensures that the mechanical equipment and its components are compliant per the provisions of the IBC as given in the plans and specifications for the project.

Independent Certification

Although the IBC references and is based on the structural building code ASCE 7, many chapters and paragraphs of ASCE 7 are superceded by the IBC, independent certification and methods of analysis are such paragraphs. Per the most recent edition of the code, the EVAPCO compliance process included an exhaustive analysis by an independent approval agency. As required by the International Building Code, EVAPCO supplies a certificate of compliance as part of its submittal documents. The certificate of compliance demonstrates that the equipment has been independently tested and analyzed in accordance with the IBC seismic and wind load requirements. Evapco has worked closely with the independent approval agency, The VMC Group, to complete the independent equipment testing and analysis.

If the seismic "g force" or wind load psf requirements for the project site are known, EVAPCO's online equipment selection software **Evap*Select*™**, will allow you to choose the required structural design package – either standard construction or upgraded construction.

For further questions regarding IBC compliance, please contact your local EVAPCO Representative.


evapco

Certificate of Compliance

AT, USS, UAT, UT Cooling Towers
eco-ATW/WE, ATW(B) and ESWA Closed Circuit Coolers
eco-ATC, ATC-E Evaporative Condensers

Are certified to meet or exceed the Seismic and Wind Load Provisions set forth in the applicable building codes for this project.

These products have been manufactured following all applicable quality assurance programs.

Applicable Building Codes:
IBC 2012
ASCE-7
NFPA 5000

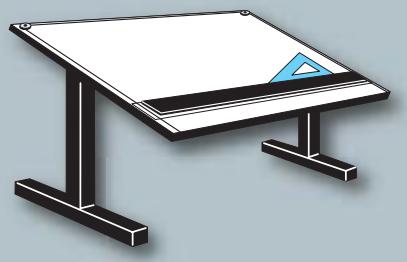
Referenced Report:
VMA-43387

Approval Agency:
VMC Seismic Consulting Group

EVAPCO...Specialists in Heat Transfer Products and Services.

evapco for LIFE

ATW

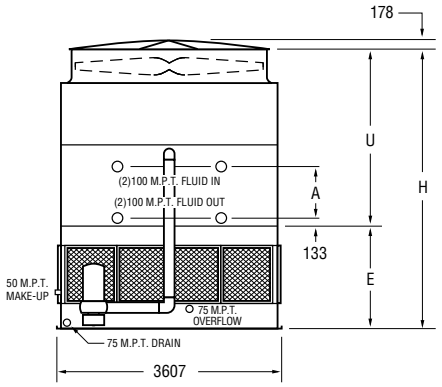


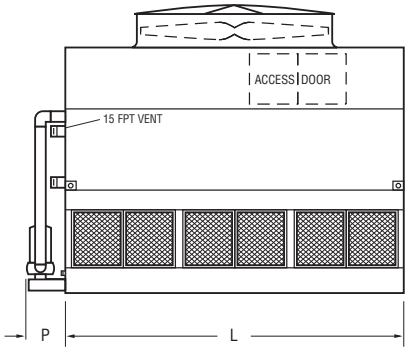
Engineering Data & Dimensions

ATW

Engineering Data & Dimensions

Models: 144-3K to 216-6O





Note: The number of coil connections doubles when the flow rate exceeds 56 l/s on Models ATW 144-3K thru ATW 216-6O.

ATW Model No.	Weights (kg)			Fans		Spray Pump kW	Coil Volume (Litres)	Remote Sump††			Dimensions$^{\Delta}$ (mm)					
	Shipping	Heaviest Section†	Operating	kW	m^3/s			Liters Req'd*	Conn. Size(mm)	Operating Weight	H	U	E	A	P	L
144-3K	6440	5275	10350	15	37,4	4	1179	1855	300	8575	4112	2530	1581	565	485	3651
144-3L	6465	5300	10375	18,5	39,8	4	1179	1855	300	8600	4112	2530	1581	565	485	3651
144-4K	7475	6310	11755	15	36,3	4	1548	1855	300	9985	4328	2746	1581	781	485	3651
144-4L	7500	6330	11780	18,5	38,7	4	1548	1855	300	10005	4328	2746	1581	781	485	3651
144-4M	7545	6380	11825	22	40,7	4	1548	1855	300	10050	4328	2746	1581	781	485	3651
144-5L	8485	7320	13135	18,5	37,5	4	1917	1855	300	11360	4543	2962	1581	997	485	3651
144-5M	8530	7365	13180	22	39,5	4	1917	1855	300	11410	4543	2962	1581	997	485	3651
144-6M	9605	8435	14620	22	38,2	4	2286	1855	300	12845	4759	3178	1581	1213	485	3651
144-6N	9715	8550	14735	30	41,5	4	2286	1855	300	12960	4759	3178	1581	1213	485	3651
168-3L	7305	5980	11895	18,5	44,5	4	1368	2160	300	9840	4264	2530	1734	565	485	4261
168-3M	7335	6010	11925	22	46,8	4	1368	2160	300	9870	4264	2530	1734	565	485	4261
168-4L	8525	7200	13545	18,5	43,2	4	1799	2160	300	11490	4480	2746	1734	781	485	4261
168-4M	8555	7230	13575	22	45,5	4	1799	2160	300	11520	4480	2746	1734	781	485	4261
168-5M	9690	8365	15140	22	44,1	4	2231	2160	300	13085	4696	2962	1734	997	485	4261
168-5N	9805	8480	15260	30	47,8	4	2231	2160	300	13205	4696	2962	1734	997	485	4261
168-6M	11050	9725	16935	22	42,7	4	2662	2160	300	14880	4912	3178	1734	1213	485	4261
168-6N	11165	9845	17050	30	46,3	4	2662	2160	300	14995	4912	3178	1734	1213	485	4261
216-3L	9165	7440	15030	18,5	54,5	5,5	1744	2725	300	12350	4416	2530	1886	565	660	5486
216-3M	9210	7490	15080	22	57,9	5,5	1744	2725	300	12400	4416	2530	1886	565	660	5486
216-4L	10720	8995	17145	18,5	52,9	5,5	2302	2725	300	14465	4632	2746	1886	781	660	5486
216-4M	10770	9045	17195	22	56,2	5,5	2302	2725	300	14515	4632	2746	1886	781	660	5486
216-4N	10885	9165	17315	30	61	5,5	2302	2725	300	14635	4632	2746	1886	781	660	5486
216-5M	12265	10540	19245	22	54,5	5,5	2859	2725	300	16565	4848	2962	1886	997	660	5486
216-5N	12385	10660	19365	30	59,2	5,5	2859	2725	300	16585	4848	2962	1886	997	660	5486
216-6N	13920	12195	21460	30	57,4	5,5	3416	2725	300	18780	5064	3178	1886	1213	660	5486
216-6O	13950	12225	21485	37	61,1	5,5	3416	2725	300	18805	5064	3178	1886	1213	660	5486

The motors are shipped loose for field mounting.

† Heaviest section is the coil / fan section

†† When a remote sump arrangement is selected, the spray pump, suction strainer and associated piping are omitted; the unit is provided with an oversized outlet to facilitate drainage to the remote sump

* Liters shown is water in suspension in unit and piping. Allow for additional water in bottom of remote sump to cover pump suction and strainer during operation. (300mm would normally be sufficient).

$^{\Delta}$ Unit dimensions and coil connections may vary slightly from catalog. See factory certified prints for dimensions, quantity of coil connections, and piping configuration.

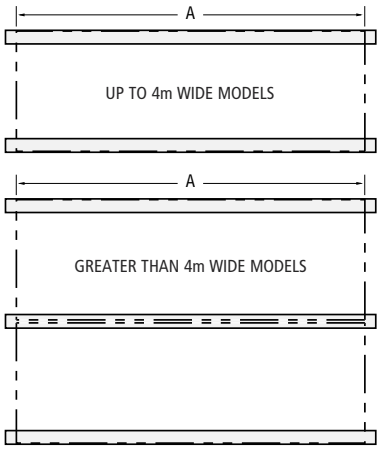
ATW

Recommended Steel Support

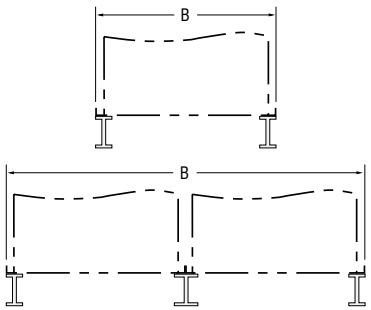
The recommended support for EVAPCO Closed Circuit Coolers is structural "I" beams located under the outer flanges and running the entire length of the unit. The unit should be elevated to allow access underneath the unit and to the roof below. Mounting holes 19 mm in diameter are located in the bottom flanges of the pan section to provide for bolting to the structural steel. (Refer to certified drawings from the factory for bolt hole locations.)

Beams should be level before setting the unit in place. Do not level the unit by shimming between the unit and the structural steel. Dimensions weights and data are subject to change without notice. Refer to the factory certified drawings for exact dimensions.

Plan Views



End Elevations



ATW SUPPORTING STEEL DIMENSIONS		
	A	B
ATW 9	908	927
ATW 16	1213	1231
ATW 24	1826	1231
ATW 36	2731	1231
ATW 48	3651	1231
	A	B
ATW 64	2578	2283
ATW 72	2731	2388
ATW 84	3188	2388
ATW 96	3651	2388
ATW 112	4261	2388
ATW 142	5486	2388
ATW 166	6401	2388
	A	B
ATW 120	3651	2991
ATW 180	5486	2991
ATW 241	7366	2991
ATW 360	11036	2991
	A	B
ATW 192	7366	2388
ATW 224	8586	2388
ATW 284	11036	2388
ATW 332	12866	2388
ATW 166W	3188	4906
ATW 192W	3651	4906
ATW 224W	4261	4906
	A	B
ATW 144	3651	3607
ATW 168	4261	3607
ATW 216	5486	3607
ATW 286	7366	3607
ATW 334	8585	3607
ATW 430	11036	3607
	A	B
ATW 242	3651	6112
ATW 362	5486	6112
	A	B
ATW 290	3651	7344
ATW 338	4261	7344
ATW 434	5486	7344
ATW 578	7366	7344
ATW 672	8585	7344
ATW 866	11036	7344

Heat Loss Data, kW

ATW

Unit	Standard Unit	Unit with Hood	Hood & Insulation
ATW 9-2	5,6	5,3	3,2
ATW 9-3	7,0	5,9	3,8
ATW 9-4	8,2	6,2	4,1
ATW 9-5	9,4	6,7	4,4
ATW 16-2	10,6	10,0	6,4
ATW 16-3	13,2	11,1	7,0
ATW 16-4	15,8	12,0	7,6
ATW 16-5	17,9	12,6	8,2
ATW 24-3	19,6	16,7	10,6
ATW 24-4	23,7	17,9	11,4
ATW 24-5	26,7	19,0	12,3
ATW 36-3	29,9	21,1	13,5
ATW 36-4	36,0	22,6	14,7
ATW 36-5	40,4	24,3	15,5
ATW 48-3	40,2	27,5	17,6
ATW 48-4	48,4	29,6	19,0
ATW 48-5	54,5	31,7	20,2
ATW 64-3	56,3	31,9	20,5
ATW 64-4	68,0	34,0	21,7
ATW 64-5	76,5	36,0	23,2
ATW 64-6	81,8	37,8	24,3
ATW 72-3	65,6	35,8	22,9
ATW 72-4	79,1	37,8	24,3
ATW 72-5	89,1	40,2	25,8
ATW 72-6	95,0	42,2	27,0
ATW 84-3	76,8	38,7	24,9
ATW 84-4	92,6	41,0	26,4
ATW 84-5	104,3	43,4	27,8
ATW 84-6	111,4	45,7	29,3
ATW 96-3	87,9	41,6	26,7
ATW 96-4	106,4	44,3	28,4
ATW 96-5	119,6	46,9	29,9
ATW 96-6	127,5	49,2	31,7
ATW 112-3	103,2	45,7	29,3
ATW 112-4	124,6	48,4	31,1
ATW 112-5	140,1	51,3	32,8
ATW 112-6	149,2	53,9	34,6
ATW 142-3	133,1	58,6	37,5
ATW 142-4	160,6	61,8	39,6
ATW 142-5	180,8	65,1	41,6
ATW 142-6	192,8	68,6	44,0
ATW 166(W)-3	155,3	64,5	41,3
ATW 166(W)-4	187,9	68,3	43,7
ATW 166(W)-5	212,2	71,8	46,0
ATW 166(W)-6	225,4	75,6	48,4
ATW 192(W)-3	175,8	83,2	53,3
ATW 192(W)-4	212,8	88,5	56,9
ATW 192(W)-5	239,1	93,8	59,8
ATW 192(W)-6	255,0	98,5	63,3
ATW 224(W)-3	206,3	91,4	58,6
ATW 224(W)-4	249,1	96,7	62,1
ATW 224(W)-5	280,2	102,6	65,6
ATW 224(W)-6	298,3	107,9	69,2

Unit	Standard Unit	Unit with Hood	Hood & Insulation
ATW 120-3	101,4	47,2	30,2
ATW 120-4	122,5	49,8	31,9
ATW 120-5	137,7	52,5	33,7
ATW 120-6	147,1	55,4	35,5
ATW 180-3	153,3	59,5	38,1
ATW 180-4	184,9	63,0	40,4
ATW 180-5	208,4	66,2	42,5
ATW 180-6	222,1	69,8	44,5
ATW 241-3 & ATW 242-3	202,8	94,7	60,4
ATW 241-4 & ATW 242-4	245,0	99,6	64,2
ATW 241-5 & ATW 242-5	275,5	104,9	67,4
ATW 241-6 & ATW 242-6	294,0	110,8	70,6
ATW 360-3 & ATW 362-3	306,3	119,3	76,5
ATW 360-4 & ATW 362-4	370,1	126,0	80,9
ATW 360-5 & ATW 362-5	416,5	132,5	85,0
ATW 360-6 & ATW 362-6	444,0	139,8	89,4
ATW 144-3	125,1	58,3	37,2
ATW 144-4	151,2	61,5	39,6
ATW 144-5	170,0	64,8	41,6
ATW 144-6	181,4	68,3	43,7
ATW 168-3	146,5	63,3	40,4
ATW 168-4	177,0	66,8	42,8
ATW 168-5	199,0	70,6	45,1
ATW 168-6	212,5	74,1	47,5
ATW 216-3	189,0	73,6	47,2
ATW 216-4	228,3	77,7	49,8
ATW 216-5	257,0	81,8	52,5
ATW 216-6	274,0	86,2	55,1
ATW 286-3 & ATW 290-3	250,3	116,6	74,4
ATW 286-4 & ATW 290-4	302,4	123,1	79,1
ATW 286-5 & ATW 290-5	340,0	129,5	83,2
ATW 286-6 & ATW 290-6	362,8	136,6	87,3
ATW 334-3 & ATW 338-3	293,1	126,6	80,9
ATW 334-4 & ATW 338-4	354,0	133,6	85,6
ATW 334-5 & ATW 338-5	398,0	141,3	90,3
ATW 334-6 & ATW 338-6	425,0	148,3	95,0
ATW 430-3 & ATW 434-3	378,1	147,1	94,4
ATW 430-4 & ATW 434-4	456,6	155,3	99,6
ATW 430-5 & ATW 434-5	514,0	163,5	104,9
ATW 430-6 & ATW 434-6	548,0	172,3	110,2
ATW 578-3	500,6	233,3	148,9
ATW 578-4	604,9	246,2	158,3
ATW 578-5	679,9	259,1	166,5
ATW 578-6	725,6	273,1	174,7
ATW 672-3	586,1	253,2	161,8
ATW 672-4	708,1	267,3	171,2
ATW 672-5	796,0	282,5	180,5
ATW 672-6	849,9	296,6	189,9
ATW 866-3	756,1	294,2	188,7
ATW 866-4	913,2	310,7	199,3
ATW 866-5	1028,1	327,1	209,8
ATW 866-6	1096,1	344,7	220,4

FACTORY FABRICATED INDUCED DRAFT ATW CLOSED CIRCUIT COOLER

General

Furnish and install factory assembled closed circuit cooler of induced draft counterflow design with a horizontal multiple side air entry and a vertical air discharge.
The unit shall be completely factory assembled and conform to the specifications and schedules.

The closed circuit cooler shall have the capacity to cool ____ l/s water / glycol from _____°C to_____°C with a_____ °C entering wet bulb temperature.

The total fan power should not exceed _____kW.
The total pump power should not exceed _____ kW.

The total overall unit dimensions should not exceed the following:
Length: _____ mm Width: _____ mm Height: _____ mm

The maximum operating weight should not exceed _____ kg.

The unit will be delivered in two parts: the bottom basin - louver section and the heat transfer - fan section.
The unit (top and bottom section) shall be joined together with elastic sealer and bolted together with corrosion resistant fasteners.

Approved manufacturer Evapco – model ATW _____

Thermal Performance – Performance Warranty
The tower shall be capable of performing the thermal duties as shown in the schedule and on drawings and its design thermal rating shall be certified by the manufacturer.

Applicable Standards

CTI ATC 128 Test Code for Measurement of Sound from Water Cooling Towers

Submittals

a) The manufacturer shall submit a five year history of the proposed type of closed circuit cooler with a minimum of 10 installations for similar sized equipment.
b) Shop drawings: submit shop drawings indicating dimensions, weight loadings and required clearances.
c) Product data: submit manufacturers technical product data, original selection printouts and clearance requirements.
d) Complete noise data sheet for the selected closed circuit cooler(s).
e) Maintenance data for the closed circuit cooler(s) and accessories.
f) The manufacturer shall provide factory test run certificates of the fans and fan motor.

Product Delivery – Storage and Handling

a) a)The contractor shall make the provisions for proper storage at site before installation and handle the product per the instructions of the manufacturer.
b) Once installed provide the necessary measures to keep units clean and protected from any dust and mechanical damage.

Quality Assurance

a) The manufacturer shall have a quality assurance system in place which is certified by an accredited registrar and complying with the requirements of ISO 9001. This is to guarantee a consistant level of product and service quality.
b) Manufacturers without ISO 9001 certification are not acceptable.

Warranty

a) The products will be warranted for a period of minimum two years from the date of shipment.

PRODUCT

Construction – Corrosion Resistance

a) The structure and all steel elements of the pan and casing shall be constructed of Z 725 hot dip galvanized steel for long life and durability. Alternatives with lower zinc layer thickness and external paint or coating are not accepted as equal.
b) The strainer shall be made of stainless steel type 304.
c) During fabrication all panel edges shall be coated with a 95 % pure zinc compound.
d) Casing materials shall be of non flammable construction only.

OPTIONAL EXECUTION – BASIN IN AISI 304

Construction – Corrosion Resistance

a) The structure and all steel elements of the Basin and Louver section up to the water level shall be made of stainless steel AISI 304.
b) Alternatives with hot dip galvanized steel and epoxy coatings in lieu of the stainless steel AISI 304 are not considered to be equal and are not accepted.
c) All other steel components of the casing shall be constructed of Z 725 hot dip galvanized steel for long life and durability. Alternatives with lower zinc layer thickness and external paint or coating or FRP materials are not accepted as equal.
d) The strainer shall be made of stainless steel AISI 304.
e) During fabrication all galvanized steel panel edges shall be coated with a 95 % pure zinc compound.
f) Casing materials shall be of non flammable construction only.

OPTIONAL EXECUTION – COMPLETE UNIT IN STAINLESS STEEL AISI 304 (except heat exchange coil(s))

Construction – Corrosion Resistance

a) The structure and all steel elements shall be made of AISI 304.
b) Alternatives with hot dip galvanized steel and epoxy coatings in lieu of the AISI 304 are not considered to be equal and are not accepted.
c) The strainer shall be made of stainless steel AISI 304.
d) Casing materials shall be of non flammable construction only.

Closed Circuit Cooler Basin

a) Standard basin accessories include: overflow, drain, strainer and brass make up valve with plastic float ball.
b) The strainer shall be made of AISI 304.
c) The entire pan area shall incorporate a sloped and stepped basin design to prevent sediment built up, biological film and standing water.
d) Upper and lower basin bottoms shall be sloped to provide drainage of the complete basin section.
e) The basin can be inspected while the unit is in operation with the fan(s) and pump(s) running.

Air Inlet Louvers

a) The air inlet louvers shall be constructed of UV inhibited polyvinyl chloride (PVC), mounted in easily removable frames for easy access to the basin.
b) The louvers shall be at four sides to provide easy access to the basin interior.
c) The louvers shall have a minimum of two changes in air direction to prevent splash out and block direct sunlight from entering the basin.
d) The louvers will have a 19 mm opening to prevent debris from entering the basin.

Casing Section

Heat Transfer Coil

a) The closed circuit cooler shall use internally enhanced heat exchange coils of an elliptical tube design to obtain lower air flow resistance and allow higher water loadings around the tubes.

SPECIFICATIONS

ATW

b) The heat transfer coil(s) shall be made of all prime surface, encased in a steel framework and hot dip galvanized after fabrication as a complete assembly.
c) The tubes shall be arranged in a self spacing, staggered pattern in the direction of air flow for maximum heat transfer efficiency and minimum pressure drop.
d) The heat exchange coils shall be air pressure tested under water.
e) The design and manufacturing process shall be approved and in accordance with the "Pressure Equipment Directive " – PED 97 / 23 EC.
f) The manufacturer shall be responsible for the manufacturing and performance testing of the entire heat transfer coil. This is to assure single source responsibility.
g) The casing shall totally encase the complete coil section to protect the complete coil from direct atmospheric contact.
h) The pressure drop of the process fluid through the coil shall not exceed ____kPa.

Water Distribution
a) The water distribution system shall be completely enclosed and protected from sunlight exposure, environmental elements and debris. Water distribution systems with direct exposure to the environment are not allowed.
b) The spray header and branches shall be constructed of Schedule 40, Polyvinyl Chloride (PVC) pipe for corrosion resistance.
c) The water shall be distributed over the coil by precision molded ZM spray nozzles with large minimum orifice openings and integral sludge ring to eliminate clogging.
d) The nozzles shall be threaded into the water distribution piping to assure positive positioning and easy removal for maintenance. Snap in or strapped on nozzles are not accepted.

Water Circulation Pump
a) The pump(s) shall be a close coupled, centrifugal type with mechanical seal, installed vertically at the factory to allow free drainage on shut down.
b) A ____ kW totally enclosed motor(s) suitable for outdoor service shall be furnished.
c) The motor shall be suitable for the following power supply: ____volts, ____hertz and ____ phase and ____ kW.

Drift Eliminators
a) The drift eliminators shall be constructed of entirely inert polyvinyl (PVC) that has been specially treated to resist ultra violet light.
b) Assembled in easily handled sections, the eliminator blades shall be spaced on 25 mm centers and shall incorporate three changes in air direction to assure efficient removal of entrained moisture from the discharge air stream.
c) The maximum drift rate shall not exceed 0,001 % of the circulating water rate.

Access Door
a) A large hinged access door shall provide access to the fan section for maintenance.

Mechanical Equipment
Axial Propeller Fan(s) (Standard)
a) Fan shall be heavy duty wide chord axial propeller type, statically balanced and constructed of extruded aluminum alloy blades.
b) Fans shall be installed in a closely fitted cowl with venturi air inlet for maximum fan efficiency.
c) The fans shall utilize a soft connect blade to hub design, compatible with variable speed drives, to avoid transmission of vertical forces to the unit structure.
d) Each fan blade shall be individually adjustable.
e) The fan cowl shall be covered with a heavy gauge hot dip galvanized steel wire fan guard.
f) The fan – drive system (fan – drive – motor) shall be factory mounted, adjusted and undergo a trial run in the factory before shipment.

Axial Propeller Fan(s) - Low Sound Fan (Alternative)
a) Fan shall be heavy duty wide chord axial propeller type, statically balanced and constructed of extruded aluminum alloy blades.
b) Fans shall be installed in a closely fitted cowl with venturi air inlet for maximum fan efficiency.
c) The fans shall utilize a soft connect blade to hub design, compatible with variable speed drives, to avoid transmission of vertical forces to the unit structure.
d) Each fan blade shall be individually adjustable.
e) The fan cowl shall be covered with a heavy gauge hot dip galvanized steel wire fan guard.
f) The fan – drive system (fan – drive – motor) shall be factory mounted, adjusted and undergo a trial run in the factory before shipment.

Axial Propoller Fan(s) - Super Low Sound Fan (Alternative)
a) Fan shall be extremely wide chord axial, one piece heavy duty propeller type, statically balanced and made of FRP.
b) Fans will be installed in a closely fitted cowl with venturi air inlet for maximum fan efficiency.
c) The fan cowl shall be covered with a heavy gauge hot dip galvanized steel wire fan guard.
d) The fan – drive system (fan – drive – motor) shall be factory mounted, adjusted and undergo a trial run in the factory before shipment.
e) The fans are high efficiency and operate with no loss of thermal performance

Bearings and Drive
a) The fan shaft (s) shall be supported by heavy duty, self aligning ball type bearings with cast iron housings.
b) The bearings shall be rated for an L-10 life of 75000 hours.
c) The fan drive sheaves shall be aluminum alloy.
d) The belt shall be a multigroove belt system, constructed of neoprene with polyester cords and designed for 150% of the motor nameplate horsepower.
e) The grease fittings shall be extended to a location just inside the access door.

Motor (0.9, 1.2 and 2.4 meter wide Models)
a) The fan motor shall be Totally Enclosed Fan Cooled (TEFC), squirrel cage, ball bearing type motor.
b) The motor shall be specially designed for cooling tower use with moisture protection on the winding, shaft and bearings.
c) The motor shall be minimum IP 55 degree of protection, Class F insulation, Service Factor 1 and selected for the appropriate cooling tower duty and the correct ambient temperature but minimum 40°C.
d) Motors bearings shall be double sealed non-relubricable or external grease nipples shall be provided.
e) The motor shall be mounted on an adjustable heavy duty steel motor base.
f) A hinged protective cover shall shield the motor and sheave from the weather.
g) The motor power supply shall be ____ volts, ____ hertz and ___ phase.

Motor (3 and 3.6 meter wide Models)
a) The fan motor shall be Totally Enclosed Air Over (TEAO), squirrel cage, ball bearing type motor.
b) The motor shall be specially designed for cooling tower use with moisture protection on the windings, shaft and bearings.
c) The motor shall be minimum IP 55 degree of protection, Class F insulation, Service Factor 1 and selected for the appropriate cooling tower duty and the correct ambient temperature but minimum 40°C.
d) Motor bearings shall be double sealed non-relubricable or external grease nipples shall be provided.
e) The motor shall be mounted on an adjustable heavy duty steel motor base.

f) The motor base shall be able to swing to the outside of the unit for repair or removal.
g) The motor power supply shall be ____ volts, ____ hertz and ____ phase.

Sound Levels

Sound Level

The maximum sound pressure levels (dB) measured 1.5 m 45° from the top of the closed circuit cooler operating at full fan speed shall not exceed the sound levels detailed below.

Location	63 Hz	125 Hz	250 Hz	500 Hz	1000 Hz	2000 Hz	4000 Hz	8000 Hz	dB(A)
Fan discharge									
Air inlet /end									

ACCESSORIES (Optional)

Electric Heaters

a) The closed circuit cooler cold water basin shall be provided with an electric heater package to prevent freezing of the water in the cold water basin, when the pump is shut down.
b) The electric heater package includes: electric heater element(s), thermostat and low water level cutoff.
c) The heaters shall be selected to maintain 4 °C basin water temperature at ____ °C ambient
d) The heater(s) shall be ____V / ____ phase / ____ Hz electric power supply.

Three Probe Electric Water Level Control Package

a) The closed circuit cooler manufacturer shall provide an electric water level control package instead of the mechanical float valve arrangement.
b) The package consist of the following elements :
- Multiple heavy duty stainless steel 316 static sensors mounted in a stilling chamber outside the unit. Electrodes or sensors mounted inside the unit are not accepted as their operation will be disturbed by the moving water in the basin.
- An ABS, IP 56 case contains all the contactors for the different level probes and will provide an output signal of a relay for automatic filling and one relay for alarm level.
- The power supply to the control package is 24 Vac / 230 Vac - ____ Hz .
- A weather protected solenoid valve (PN16) for the water make up ready for piping to a water supply with pressure between 140 kPa and 340 kPa.

Vibration Switch

a) A vibration limit switch shall be installed on the mechanical equipment support and wired into the control panel. The purpose of this switch is to interrupt power to the motor in the event of excessive vibration.
b) The switch shall be adjustable for sensitivity and shall require manual reset.

Vertical Access Ladders

a) A vertical ladder with safety cage which provide easy access to the water distribution system and drive components shall be provided with the closed circuit cooler(s).
b) The ladder will be completed with a safety cage for safety purposes.
c) Ladder safety cage shall meet OSHA - CE - BS requirements.

Service Platform

a) The closed circuit cooler shall be supplied with an external service platform.
b) The external service platform will be self supporting and include access ladders to the platform.
c) The external service platform will be installed in front of the fan access doors.
d) The platform shall meet OSHA - CE - BS requirements.

Motor Davit

a) The closed circuit cooler shall be supplied with a motor davit to facilitate the removal of fan motor(s) and fan(s).
b) The davit and braket are constructed of aluminum and are mounted on the side of the unit.
c) The fan motor davit ships loose with the unit and is installed in the field.

Water Silencer

a) The water silencers are located in the falling water area of the cold water basin.
b) The water silencers will reduce the overall sound levels 4 dB (A) to 7 dB (A) measured at 1.5 m from the side or end of the unit, when the fans are running, and 9 dB (A) to 12 dB (A) when fans are off.
c) The water silencers are constructed of lightweight PVC sections and can be easily removed for access to the basin area.
d) The water silencers will have no impact on the unit's thermal performance.

Notes:

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