

CLOSED CIRCUIT COOLERS

ATWB

The Industry's Smartest Induced Draft, Closed Circuit Coolers



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FEATURING**

CROSSCOOL™

INTERNALLY ENHANCED
COIL TECHNOLOGY



for LIFE



† Mark owned by the Cooling Technology Institute



Get to Know EVAPCO

- The global innovator in heat transfer solutions
- Serving the commercial HVAC, Industrial Refrigeration, Power Generation, and Industrial Processing markets
- Founded in 1976
- Employee-owned
- 24 manufacturing facilities in 10 countries
- More than 170 sales offices worldwide

Learn More Now

Visit www.evapcoasia.com to download product catalogs, view complete product specifications, and more.

EVAPCO is more than a name.

It is a pledge to make everyday life easier, more comfortable, more reliable, and more sustainable for people everywhere. How do we fulfill that promise? It's simple.

We never stop innovating.

At EVAPCO, we do not just talk about innovation. It is ingrained in our workflow. Guided by our annually developed R&D plans, we set out to find groundbreaking solutions that transform the way the world works for the better. It is why we have more than 28 patents worldwide in the last 10 years alone.

We craft exceptionally built solutions.

As an employee-owned company, we take pride in our work. We are proud to be one of the most experienced teams of engineers and craftsmen in the industry. This translates into solutions that are always exceptionally built. EVAPCO has an unwavering commitment to provide "best in class" heat transfer solutions and services.

We guarantee performance.

Every EVAPCO solution is put through rigorous research and testing to ensure maximum efficiency and reliability. But we do not stop there. EVAPCO is an industry leader in independent, third-party performance certifications. These certifications guarantee our performance metrics—so that you can plan your projects with complete peace of mind.

We protect the environment.

Innovation and environmental sustainability go hand-in-hand at EVAPCO. EVAPCO's industrial heat transfer equipment not only conserves natural resources and helps reduce noise pollution, they also feature recycled steel content in their construction. Our stainless steel units are constructed of panels that contain up to 75% recycled content; over 80% in galvanized units construction. From sound reduction to water conservation to chemical elimination, we are constantly developing new technologies that deliver the ultimate operating advantages for our clients— and protect the planet for every generation that comes after us.



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*Dimensions, weights, and data are subject to change without notice.

ATWB Principle of Operation

Advanced Technology (AT) Closed Circuit Coolers



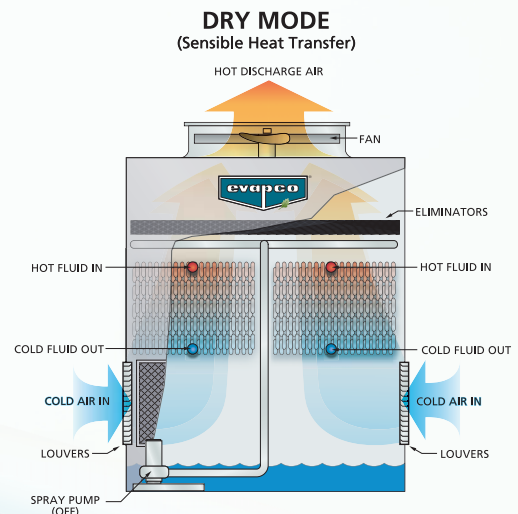
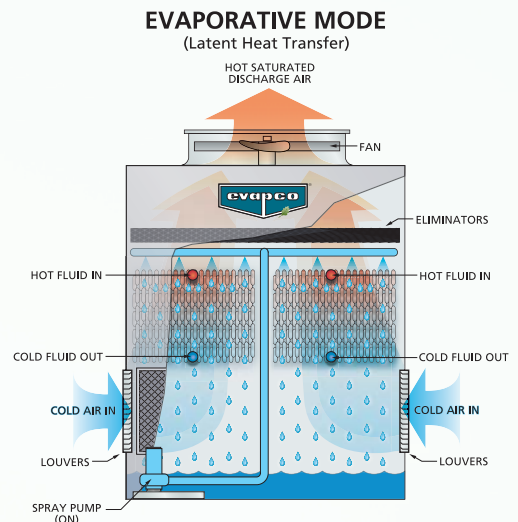
The ATWB line of Closed Circuit Coolers has always reflected EVAPCO's commitment to product development. Its advanced design and owner oriented features provide many operational and performance advantages. **The ATWB's Thermal-Pak® Coil now features CROSSCOOL™ Internal Tube Enhancement which increases the internal heat transfer coefficient of the coil and thus increases the cooling capacity of the unit.** The now improved ATWB offers the most models and box sizes in the industry and is designed with IBC Compliant Construction and CTI Certified Performance.

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.

Dry Operation

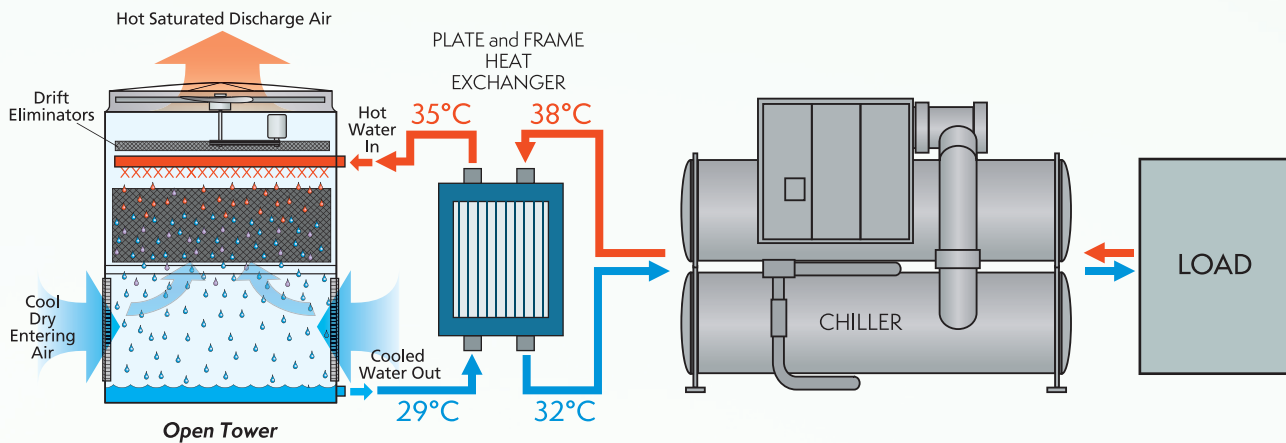
The ATWB closed circuit cooler is capable of higher dry bulb switchover temperatures than other bare-tube induced draft coolers due to a full footprint elliptical tube coil located entirely in the airstream. The number of coil rows and entering cold air combine to provide dry operation at times where the heat load and ambient conditions are favorable. The ability to satisfy the heat load without operating the spray pump provides both water and energy savings for a diversity of applications such as; Commercial HVAC, Data Centers, Industrial Process, Water Source Heat Pumps, Critical Chilled Water Facilities, Manufacturing Plants and many more.



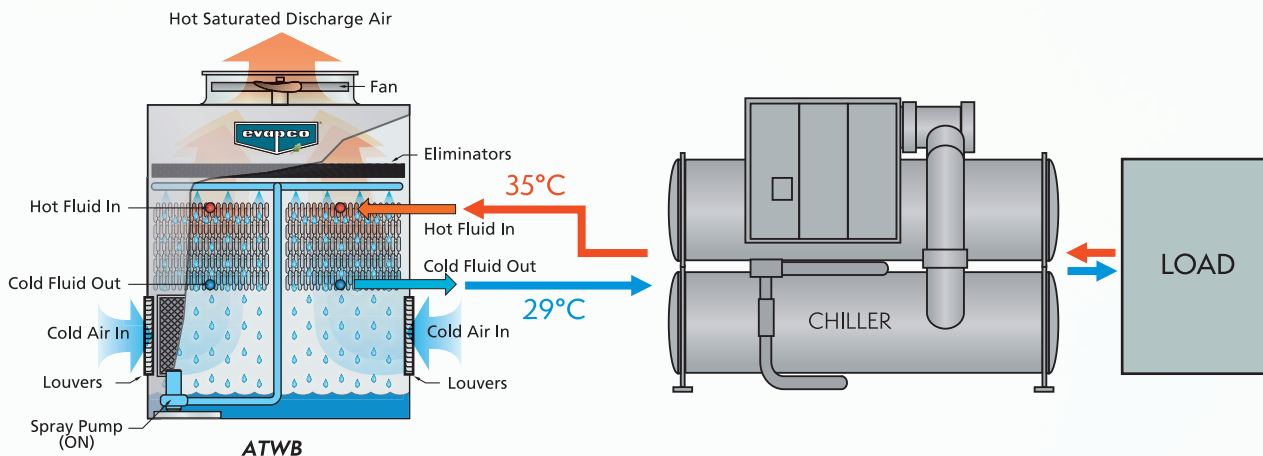
Application Versatility

Closing the Loop

Open cooling tower systems are susceptible to fouling on the heat transfer surfaces due to the process water being open to the environment, and pulling in dirt and debris from the surrounding area. Often, when used in conjunction with a plate and frame heat exchanger, there is the need to oversize the tower to make up for the efficiency lost across the heat exchanger. By closing the process fluid in the coils of a closed circuit cooler, both of these issues are eliminated.



EVAPORATIVE MODE (Latent Heat Transfer)



High Temperature Applications

Many industrial applications have higher entering process fluid temperatures. A standard open cooling tower is limited by the fill at 55°C. The ATWB closed circuit cooler can operate with inlet process fluid temperatures up to 76.7°C. Galvanized steel, as well as type 304 and type 316 stainless steel materials can be used in the construction of the basin, casing and coil(s), providing years of reliable operation and corrosion resistance.

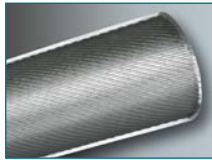
Note: Some high temperature applications require high temperature rated PVC materials. Please contact your local sales representative for high temperature applications.

ATWB Design & Construction Features

Galvanized Steel Coil

Elliptical Thermal-Pak® COIL Construction Featuring CROSSCOOL™ Internal Tube Enhancement Technology

- Internal tube enhancement increases fluid turbulence providing **additional evaporative capacity**
- Elliptical return bends allows for more circuits per coil bundle increasing maximum capacity per footprint
- Coil located in the airstream increasing dry bulb switchover



CROSSCOOL™
INTERNAL TUBE



Optional Factory Mounted Solid Chemical Water Treatment Systems

The ATWB is available with a **Smart Shield®** (*not shown*) solid chemical water treatment system. The **Smart Shield®** is environmentally sensitive alternatives for treating water in evaporative cooled equipment. The **Smart Shield®** systems include all components required for an effective water treatment system; factory mounted and wired.



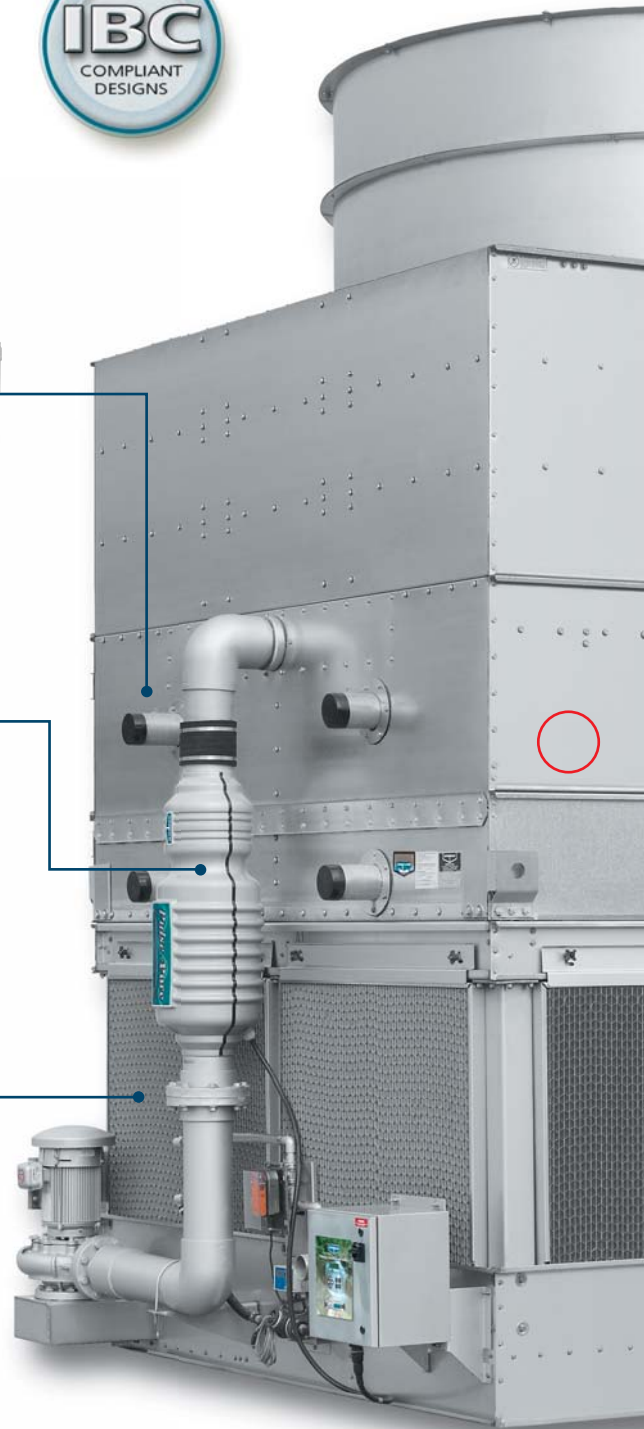
Most Accessible Basin

- Access from all four sides
- Large open area simplifies maintenance
- Basin may be inspected with pumps running



Louver Access Door

- Louver access door is available on models with 1.5m and 1.8m louver sizes
- Hinged access panel with quick release mechanism
- Allows easy access to perform routine maintenance and inspection of the makeup assembly, strainer screen and basin



Super Low Sound Fan

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



Unique Fan Drive System

- 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 constructed of corrosion resistant materials
- Totally enclosed fan motors assure long life



Efficient Drift Eliminators

- Advanced design minimizing drift from the leaving airstream
 - Made from corrosion resistant PVC for long life
- (U.S. Patent # 6,315,804)



PVC Spray Distribution Header with ZM®II Nozzles

- Large orifice fixed position nozzles prevent clogging



The EVAPCO Performance Guarantee

Every ATWB product is rigorously thermal performance tested by EVAPCO and then independently certified by the Cooling Tower Institute (CTI) so you know you're getting a solution that's guaranteed to get the job done.

† Mark owned by the Cooling Technology Institute

WST II Air Inlet Louvers (Water and Sight Tight)

- Easily removable for access
- Improved design to keep sunlight out—preventing biological growth
- Keeps water in while keeping dirt and debris out

U.S. Patent # 7,927,196



Innovative Design Features

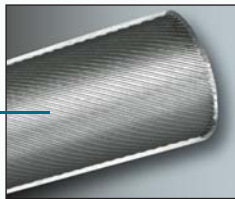
Elliptical Thermal-Pak® Heat Transfer Coil



Featuring



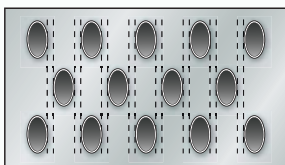
THERMAL-PAK® ELLIPTICAL TUBE



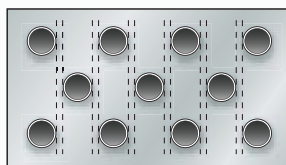
CROSSCOOL™
INTERNAL TUBE ENHANCEMENT

Galvanized steel elliptical Thermal-Pak® coil featuring **CROSSCOOL™** Internal Tube Enhancement Technology

- Internal Tube Enhancement provides additional evaporative capacity
- Elliptical tube design allows for more circuits per coil bundle increasing maximum capacity per footprint
- Elliptical tube design results in lower airflow resistance than typical round tube designs



**EVAPCO's Thermal-Pak®
Elliptical Tube**



**Competitors
Round Tube Coil**

The ATWB closed circuit coolers utilize EVAPCO's Thermal-Pak® coil design. 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 efficient design available.

The Thermal-Pak® coil design also features EVAPCO's Internal Tube Enhancement Technology. This increases fluid turbulence through the coil, further increasing the evaporative capacity.

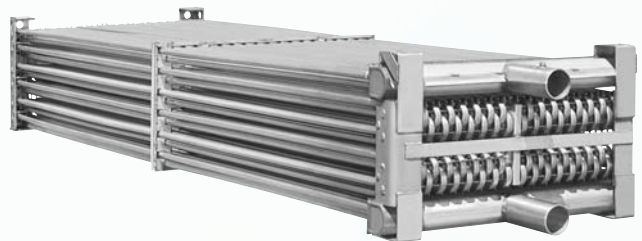
The coils are manufactured from high quality steel tubing following the most stringent quality control procedures. Each circuit is inspected to ensure the material quality and then tested before being assembled into a coil. Finally, the assembled coil is pneumatically tested at 2.69MPa under water to ensure it is leak free.

To protect the coil against corrosion, it is placed in a heavy steel frame and then the entire assembly is dipped into molten zinc (hot-dipped galvanized) at a temperature of approximately 427°C.

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 coil leading to premature failure.

Stainless Steel Coil Option

EVAPCO offers the optional TITAN COIL. Constructed with type 304L Stainless Steel, the TITAN COIL is manufactured using EVAPCO's elliptical tube Thermal-Pak® design upgraded to Xtra Tough construction featuring: Xtra Durability, Xtra Corrosion Resistance, and an Xtra long **5 Year Coil Warranty**.



Thermal-Pak® Coil

Innovative Design Features



Smooth Flow Fans

Smooth flow axial propeller fans come standard on all Advanced Technology series closed circuit coolers. Fan construction is dependent on unit size:

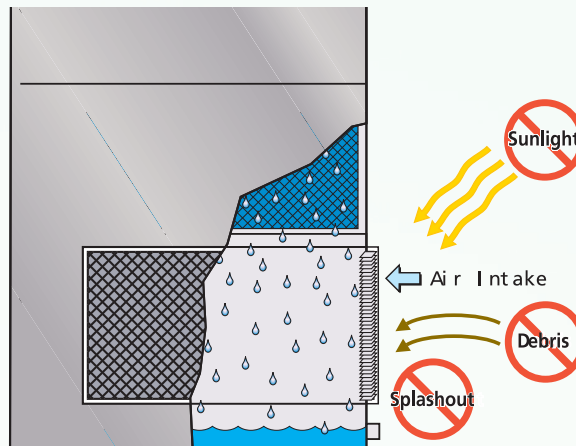
- 0.9m and 1.2m-wide: Fiberglass-reinforced polypropylene wide chord blades with die-cast aluminum hub
- Over 1.2m: 100% aluminum alloy fan blades

All fans are statically and dynamically balanced and installed in a closely fitted cowl with venturi air inlet for maximum efficiency. Fan screens are constructed of galvanized steel or optional type 304 stainless steel, and have steel frames bolted to the fan cowl.

Low sound and super low sound fan options are also available. See page 15 to learn more.

Pressurized Water Distribution System

The Advanced Technology series' water distribution system is made of schedule 40 PVC pipe and ZM®II ABS plastic water nozzles for maximum corrosion protection. The piping is easily removable for cleaning. The water nozzles have a 33.3mm diameter opening to help eliminate costly clogging.



Superior Air Inlet Louver Screen Design

EVAPCO's Water and Sight Tight (WST) inlet louver screens keep water in and sunlight out of your ATWB series closed circuit cooler. The unique, non-planar design is made from lightweight, framed PVC sections which have no loose hardware, enabling easy unit access. 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. And because all sunlight is blocked, algae growth is minimized. The end result: reduced maintenance hours, water consumption, and water treatment costs.

Maintenance Free ZM®II Spray Nozzle Water Distribution System

EVAPCO'S Zero Maintenance ZM®II Spray Nozzle remains clog-free while providing even and constant water distribution for reliable, scale-free evaporative cooling under all operating conditions.

The heavy duty nylon ZM®II Spray nozzles have a 33.3mm diameter opening. Furthermore, the fixed position ZM®II nozzles are mounted in corrosion-free PVC water distribution pipes that have threaded end caps. Together, these elements combine to provide unequalled coil coverage and scale prevention, making it the industry's best performing non-corrosive, maintenance-free water distribution system.

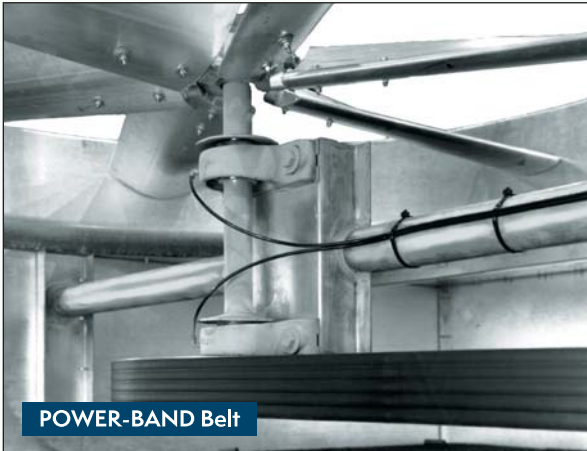


ZM®II Nozzle

The Power-Band Belt Drive System

Power-Band Drive System Design

The ATWB Closed Circuit Cooler features the highly successful POWER-BAND Belt Drive System. The POWER-BAND Drive System has performed consistently with trouble-free operation in the most severe conditions of closed circuit cooler applications. The reliability of the drive system is backed-up by a Five (5) Year complete drive system warranty.



POWER-BAND Belt



TEFC Fan Motor



TEAO Fan Motor

POWER-BAND Drive System Includes:

- Solid back POWER-BAND drive belt
- Totally Enclosed Fan Motors
- Aluminum sheaves
- Fan shaft bearings with minimum 75,000 hrs. L-10 life
- 5 year drive system warranty

Power-Band Belt Drive

The Power-Band drive is a solid-backed multigroove belt designed for closed circuit cooler service. The drive belt is sized for 150 percent of the motor nameplate horsepower and constructed of neoprene with polyester chords.

Drive System Sheaves

Drive system sheaves are constructed of an aluminum alloy for corrosion resistance in the humid closed circuit cooler environment.

Fan Shaft Bearings

The fan shaft bearings are specially selected to provide long life, minimizing costly downtime. They are rated for an L-10 life of 75,000 to 135,000 hours, making them the heaviest duty pillow block bearings in the industry.

Fan Motors

All EVAPCO closed circuit coolers utilize totally enclosed fan motors (T.E.F.C. or T.E.A.O.) designed specifically for evaporative cooling applications. Fan motors which are compatible with variable frequency drive (VFD) systems, come standard on all ATWB models.

Five Year Drive Warranty

EVAPCO provides a standard 5 year motor and drive warranty on all Power-Band drive systems. This warranty provides end users with complete protection against fan motor or drive component failure. The comprehensive warranty includes the fan, fan motor, fan shaft, belts, sheaves, and fan bearings.



The Industry's Easiest Drive System Maintenance

Standard Coolers (2578mm Wide or Less)

The totally enclosed fan cooled (TEFC) motor is mounted on the outside and protected from the weather by a hinged cover that swings away for maintenance. A large, hinged access door is located on the side of the unit for easy access to the fan drive system. The belt can be adjusted by tightening the j-bolts on the motor base, and tension can be checked easily through the access door. The bearing lubrication lines have been extended to the exterior casing and are located by the access door, thus making bearing lubrication easy. Optional sloped maintenance ladders and working platforms are available to make maintenance even easier.



Large Coolers (Over 2578mm Wide)

The totally enclosed air over (TEAO) motor is located inside the fan casing and mounted on a unique, heavy-duty adjustable motor base that is designed to swing completely to the outside of the unit through a large, hinged access door (1.3 square meters). The belt can be easily adjusted from outside the unit via an all-thread that runs through the motor base, or via the motor base's unique locking mechanism if a wrench is not available. Bearing lubrication fittings are extended to the side of the unit inside the access door to allow for easy application of the bearing lubricant. To facilitate motor removal, an optional motor davit is available.



Worry Free Maintenance Basin Design



Easy Access

The cold water basin section is easily accessible from ground level by simply lifting out the lightweight louver. The basin can be accessed from all four sides of the cooling tower, and the bottom of the fill section is a minimum of 4 feet (1.2 m) above the basin floor. This open design enables the basin to be easily cleaned. Note: 0.9m and 1.2m-wide models are accessible on only two sides.

Louver Access Door

To aid in basin maintenance, most ATWB models can be equipped with an optional louver access door. This allows easy access to perform routine maintenance and inspection of the makeup assembly, strainer screen, and basin without removing an entire inlet louver. Note: This feature is standard on models with louvers 1.5 meters and taller and optional on models with 1.2m-tall louvers.



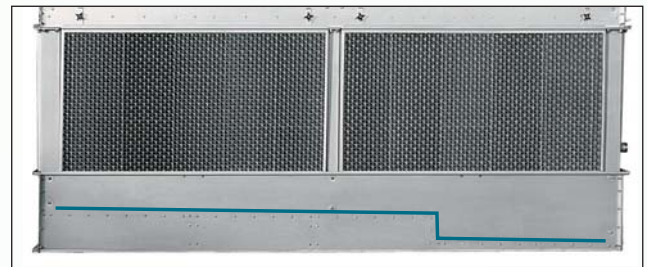
Electric Water Level Control (Optional)

Closed Circuit 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.



Stainless Steel Strainers

For most ATWB's, the strainer is subject to excessive wear and corrosion. All EVAPCO strainers are constructed with stainless steel—a long-standing EVAPCO standard—ensuring that yours will last the life of your closed circuit cooler.



Clean Pan Design

The Advanced Technology series also 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 closed circuit cooler spray water will drain from the upper section to the depressed lower pan section where the dirt and debris can be easily flushed out through the drain. This design helps prevent buildup of sedimentary deposits and biological films, and minimizes standing water. Note: On 0.9m and 1.2m-wide units, the pan is sloped without the step.

Optional Equipment

Sloped Maintenance Ladders

Designed by EVAPCO and OSHA-compliant, this sloped “ships type” ladder enables visual inspection of the water distribution system and drive components. What’s more, all standard drive system maintenance can be performed from the ladder. A handrail is attached to the sloped ladder for safe and easy ascent and descent—no need for safety cages. *Note: Available on all models wider than 1.2 meters. A vertical ladder is available for smaller models. Ladder ships loose and must be field mounted.*



Working Platform & Ladder with Davit

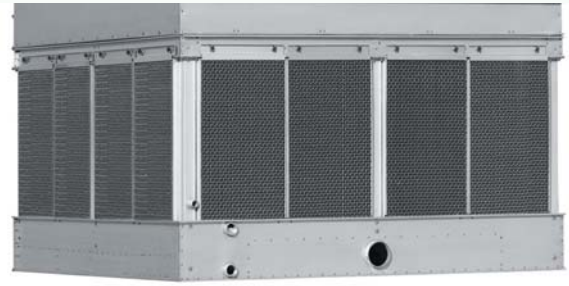
Make it easy to service the fan motor and water distribution system with this heavy-duty, self-supporting working platform and standard ladder. A less expensive alternative to field erected catwalks, the system is OSHA compliant and ships in sections for easy installation. *Note: The working platform is not available on 0.9m or 1.2m-wide models.*

Eliminate crane rentals with an optional davit that facilitates the easy removal of motors, gear drives, and fans. The davit is constructed of aluminum and is mounted on the side of the unit with a galvanized steel bracket. *Note: Davit ships loose and is installed in the field.*



Welded Stainless Steel Basin

The basin area of the fluid cooler often experiences dirt and debris build-up. Type 304 or 316 stainless steel is available to provide increased corrosion protection for the entire basin area including the support columns of the cooler and the air inlet louver frames.



All Stainless Steel Option (Excluding Fans/Coils)

In addition to the basin, the remainder of the unit is constructed of type 304 or 316 stainless steel. When this option is selected the unit panel construction contains either type 304 or 316 stainless steel. Fan cylinder and fan screen are also constructed of the same material.

Basin Level Platform & Ladder

Available on select ATWB models that are elevated, the basin level platform and ladder facilitates easy basin inspections and maintenance, including float assembly adjustment and basin/suction strainer cleaning. The platform and ladder ship in modules for easy installation. *Note: Ladder requires field support.*



Water Treatment Solutions

SMART SHIELD® Solid Chemical Water Treatment System

The ATWB is available with EVAPCO's **Factory Mounted** water treatment systems. EVAPCO offers a solid chemical solution for water treatment to maintain your heat transfer efficiency and extend the life of the equipment. Each system has been specifically designed for your cooler.

EVAPCO's Water Systems offer ATWB owners a single-source of responsibility for equipment, water treatment, and service. Smart Shield® is manufactured and warranted by EVAPCO.

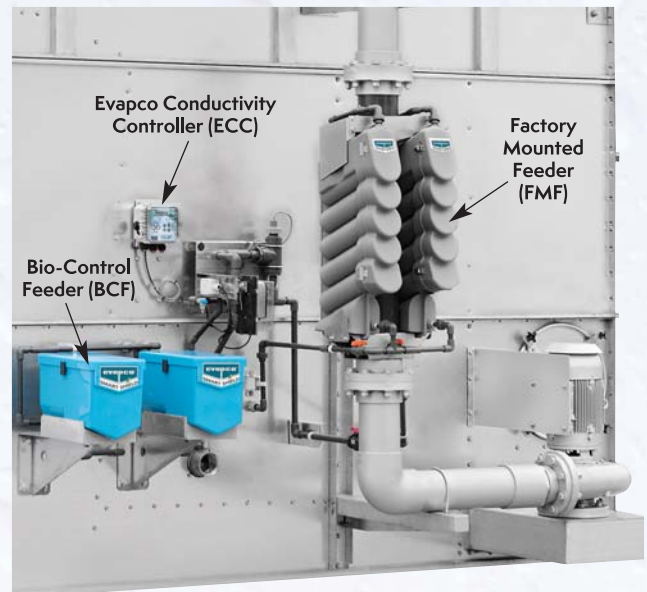
Benefits of adding an EVAPCO water treatment system include:

- **SAVES MONEY** by simplifying commission:
 - Single power connection is the only field installation requirement
- **Factory Mounting** your water treatment system ensures that it is installed to factory specifications.
- **Patented self-draining piping** eliminates the need for line insulation and heat tracing above the overflow level.
- **A Factory Authorized Service Partner** provides the first year of water system service and monitoring, to ensure proper operation and ongoing success.
- **Conductivity control package** maximizes water efficiency and features:
 - Low maintenance non-fouling torodial probe
 - USB port for downloadable 60 day audit trail of system operation
 - Motorized blowdown valve that provides the most reliable bleed control with power open / spring return operation.



EVAPCO's **Smart Shield®** system utilizes proven solid chemistry delivered via our revolutionary feed system. Patented controlled release scale and corrosion inhibitor is fed whenever your spray water pump is energized, keeping your system protected anytime the spray water pump is operating. **Smart Shield®** is a complete water treatment package that:

- Utilizes 'Bag in Bag' no touch chemical replenishments, making reloads easier and safer.
- Creates reduced packaging, shipping and handling providing a reduced carbon footprint compared to liquid chemicals.
- Eliminates the hazards associated with liquid chemicals, potential for liquid spills and the need for expensive feed pumps making it the easiest and safest chemical water treatment system available today.



Optional Equipment: Low Sound Solutions

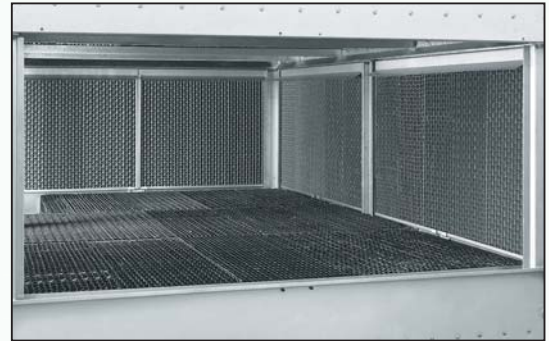
Super Low Sound Fan – 9-15 dB(A) Reduction

When you are tasked with achieving the lowest sound levels possible, there is only one choice: the EVAPCO super low sound fan, the quietest, most noise efficient fan in the industry—capable of reducing sound pressure level by 9 to 15 dB(A) at most, depending on specific unit selection and measurement location. *Note: Not available on 0.9m and 1.2m-wide models.*



Water Silencer – Reduces Water Noise up to 7 dB(A)

Located in the cold water basin, EVAPCO's water silencers reduce the high frequency noise associated with falling water and are capable of lowering overall sound levels 4 to 7 dB(A) when measured at 1.5m from the side or end of the unit. When water is circulated with fans off, the results are even greater: as much as 9 to 12 dB(A) lower at the same measured distance (depending on water loading and louver height). Constructed of lightweight PVC sections, the silencers can be easily removed for access to the basin area. It will have no impact on thermal performance and is CTI certified. *Note: Only available on 0.9m and 1.2m-wide models with electronic water level controller package.*



Low Sound Fan – 4-7 dB(A) Reduction

Ideal for sound-sensitive applications, EVAPCO's low sound fan features a wide chord blade and a unique soft-connect blade-to-hub design that is compatible with variable speed drives. Since the blades are not rigidly connected to the fan hub, no vertical vibration forces are transmitted to the unit structure. This reduces sound pressure levels by 4 to 7 dB(A) at most, depending on specific unit selection and measurement location.

The fan is a high efficiency axial propeller and is CTI certified. The low sound fan has a thermal performance derate of 3.5%. Consult your EVAPCO representative for actual thermal performance.



Offset Sound Attenuation Walls

Add EVAPCO's CTI-certified offset sound attenuation walls to your super low sound fan and water silencer options for the ultimate sound control. Constructed of G-235 galvanized steel and lined inside with acoustical padding, the walls will typically reduce the 15m free-field sound level by an additional 3 dB(A). Stainless steel construction also available. Requires external support by others. *Note: Available only in combination with super low sound fan and water silencer.*



Optional Equipment: Electric Basin Heaters

Electric immersion heaters can be added to the basin of your Advanced Technology series closed circuit cooler. They are sized to maintain a +40° F (4.5° C) pan water temperature with the fans and system pumps off. A thermostat and low-water protection device cycle the heater on when required and prevent the heater elements from energizing unless they are completely submerged. All components are protected by rugged, weatherproof enclosures for outdoor use.

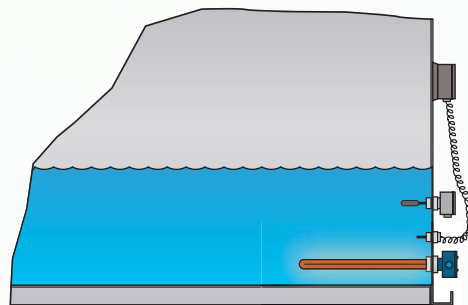
ATWB Heater Sizes *

Unit No.	0°F/-18°C kW	-20°F/-29°C kW	-40°F/-40°C kW
ATWB 3x3	(1) 2	(1) 2	(1) 3
ATWB 4x4	(1) 2	(1) 3	(1) 4
ATWB 4x6	(1) 3	(1) 4	(1) 5
ATWB 4x9	(1) 4	(1) 5	(1) 7
ATWB 4x12	(1) 5	(1) 7	(1) 9
ATWB 7x9	(1) 6	(1) 8	(2) 6
ATWB 7x12	(1) 8	(2) 6	(2) 8
ATWB 7x18	(1) 8	(2) 6	(2) 8
ATWB 7x24	(2) 8	(4) 6	(4) 8
ATWB 7x36	(2) 8	(4) 6	(4) 8
ATWB 14x9	(2) 6	(2) 8	(4) 6
ATWB 14x12	(2) 8	(4) 6	(4) 8
ATWB 14x18	(2) 8	(4) 6	(4) 8
ATWB 9x8	(1) 6	(1) 7	(1) 9
ATWB 9x9	(1) 7	(1) 10	(1) 15
ATWB 9x11	(1) 8	(1) 12	(1) 15
ATWB 9x12	(2) 4	(2) 7	(2) 9
ATWB 9x14	(2) 5	(2) 7	(2) 10
ATWB 9x18	(2) 6	(2) 9	(2) 12
ATWB 9x21	(2) 7	(2) 12	(2) 15
ATWB 17x12	(4) 4	(4) 7	(4) 9
ATWB 17x14	(4) 5	(4) 7	(4) 10
ATWB 10x12	(2) 5	(2) 8	(2) 10
ATWB 10x18	(2) 7	(2) 12	(2) 15
ATWB 10x24	(4) 5	(4) 8	(4) 10
ATWB 10x36	(4) 7	(4) 12	(4) 15
ATWB 20x12	(4) 5	(4) 8	(4) 10
ATWB 20x18	(4) 7	(4) 12	(4) 15
ATWB 20x24	(4) 10	(4) 15	(4) 20
ATWB 20x36	(4) 15	(6) 15	(6) 20

* Electric heater selection based on ambient air temperature shown.

ATWB Heater Sizes *

Unit No.	0°F/-18°C kW	-20°F/-29°C kW	-40°F/-40°C kW
ATWB 12x12	(2) 6	(2) 9	(2) 12
ATWB 12x14	(2) 7	(2) 10	(2) 15
ATWB 12x18	(2) 9	(2) 15	(2) 18
ATWB 12x20	(2) 10	(2) 15	(3) 15
ATWB 12x24	(4) 6	(4) 9	(4) 12
ATWB 12x28	(4) 7	(4) 10	(4) 15
ATWB 12x36	(4) 9	(4) 15	(4) 18
ATWB 12x40	(4) 10	(4) 15	(6) 15
ATWB 24x12	(4) 6	(4) 9	(4) 12
ATWB 24x14	(4) 7	(4) 10	(4) 15
ATWB 24x18	(4) 9	(4) 15	(4) 18
ATWB 24x20	(4) 10	(4) 15	(4) 20
ATWB 24x24	(4) 12	(4) 18	(6) 15
ATWB 24x28	(4) 15	(4) 20	(6) 18
ATWB 24x36	(4) 18	(6) 18	(8) 18
ATWB 24x40	(4) 20	(6) 20	(8) 20



Note: Heater control packages that include contactor, transformer or disconnects are also available; speak to your local EVAPCO representative to learn more about these options.

Coil Connection Options



Beveled For Weld (BFW) Coil Connections

EVAPCO Closed Circuit Coolers are provided with Beveled For Weld (BFW) coil connections as standard. Beveled edges simplify field welding and allow welds to fully penetrate.



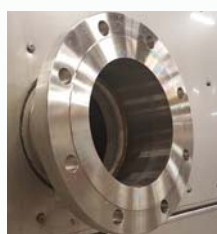
Optional Factory Mounted Crossover Piping

Some EVAPCO Closed Circuit Coolers are design for "series flow" coil operation where the coils inside of one cell are operated in series. These units are denoted by a "-Z" following the unit model number. These units require "crossover piping" from one coil to the other. As an option, this piping can be installed in the factory for simplified field installation.



Optional Grooved Coil Connections

Grooved connections can be provided as an optional coil connection. The groove allows for a mechanical coupling allowing for faster and easier field piping.



Optional Flanged Coil Connections

150# Raised Faced Flanged connections can be provided as an optional coil connection. The flanged coil connection allows for faster and easier field piping to a mating flanged connection. 300# flanged can be provided in some cases. Please see your local sales representative.



Optional Nitrogen Charged Coils

For projects requiring long term storage or ocean freight, coils can be nitrogen charged at the factory to prevent corrosion inside of the coil circuits.



Optional Male Pipe Thread (MPT) Coil Connections

Male Pipe Thread connections can be provided as an optional connection for mating with Female Pipe Thread (FPT) piping.

Note: All coil connections are constructed from the same material as the coil.

Heat Exchanger Coil / Discharge Hood Dimensions

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 per unit must be maintained. Refer to Heat Loss Data Table on page 19 for heat loss data.

Minimum Flows	Standard Flow LPS	Series Flow LPS
0.9m Wide Models		
ATWB 3x3	—	1.7
1.2m Wide Models		
ATWB 4x4 to 4x12	—	2.4
2.2m Wide Models		
ATWB 7x9 to 7x18	8.9	4.5
ATWB 7x24 to 7x36	17.7	8.9
2.5m Wide Models		
ATWB 9x8 to 9x21	10.1	5.1
3m Wide Models		
ATWB 10x12 to 10x18	11.9	6
ATWB 10x24 to 10x36	23.8	11.9
3.6m Wide Models		
ATWB 12x12 to 12x20	14.7	7.4
ATWB 12x24 to 12x40	29.3	14.7
4.6m Wide Models		
ATWB 14x9 to 14x18	17.7	8.9
5.2m Wide Models		
ATWB 17x12 to 17x14	20.2	10.1
6.1m Wide Models		
ATWB 20x12 to 20x18	23.8	11.9
ATWB 20x24 to 20x36	47.5	23.8
7.3m Wide Models		
ATWB 24x12 to 24x20	29.3	14.7
ATWB 24x24 to 24x40	58.6	29.3

Discharge Hoods with Positive Closure Dampers

When a closed circuit cooler is used in a water-to-air heat pump system or in certain process cooling applications, a method of reducing the heat loss during idle periods of wintertime operation may be required. For these cases, an optional discharge hood with positive closure dampers and damper actuator is available.

The discharge hood with dampers is designed to minimize the heat loss from convective airflow through an idle cooler. Further reductions in heat loss may be obtained with the addition of insulation to the hood and casing, minimizing conductive heat losses. Insulation may be factory installed on the hood and casing or field installed by an insulation contractor.

The discharge hood and dampers are constructed of hot-dip galvanized steel. Hoods are equipped with access panels to facilitate maintenance of the eliminators and water distribution system. The dampers, damper actuator and linkage are all factory assembled. Actuator controls and wiring are field supplied by others. Damper actuators require 120 volt power supply.

The system control sequence should allow for dampers to be fully open before the fans are running and closed when the fans

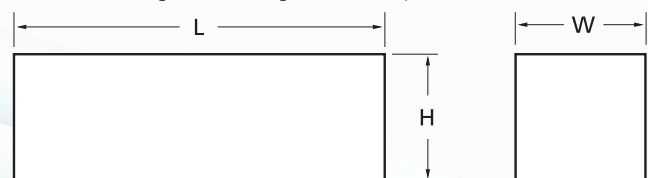
are off; the damper actuator must be interlocked with the temperature control system for this purpose.

Heat loss data is provided for standard units without hoods, with hoods and with hoods and insulation. Table ratings are based on 10°C water in the coil, -23°C ambient and 70km/hr winds (fan and pump off). Refer to page 19.

Discharge Hood Dimensions

Model	L (mm)	H* (mm)	W (mm)	Weight (kg)	Number of Hoods
ATWB 3x3	911	457	921	64	1
ATWB 4x4	1216	457	1226	109	1
ATWB 4x6	1826	457	1226	163	1
ATWB 4x9	2731	457	1226	231	1
ATWB 4x12	3651	457	1226	299	1
ATWB 9x8	2283	406	2578	386	1
ATWB 9x9	2727	406	2578	445	1
ATWB 9x11	3188	406	2578	517	1
ATWB 9x12					
ATWB 9x14					
ATWB 9x18	2731	406	2578	889	2
ATWB 9x21	3188	406	2578	1034	2
ATWB 17x12	3188	406	2578	962	2
ATWB 17x14					
ATWB 10x12	3648	356	3105	785	1
ATWB 10x18					
ATWB 10x24	3648	356	3105	1569	2
ATWB 10x36					
ATWB 20x12					
ATWB 20x18					
ATWB 20x24	3648	356	3105	3139	4
ATWB 20x36					
ATWB 12x12	3651	356	3607	816	1
ATWB 12x14					
ATWB 12x18					
ATWB 12x20					
ATWB 12x24	3651	356	3607	1633	2
ATWB 12x28					
ATWB 12x36					
ATWB 12x40					
ATWB 24x12	3651	356	3607	1633	2
ATWB 24x14					
ATWB 24x18					
ATWB 24x20					
ATWB 24x24	3651	356	3607	3266	4
ATWB 24x28					
ATWB 24x36					
ATWB 24x40					

*Overall unit height will be height of the unit plus the H dimension.



Heat Loss Data

Heat Loss Data, kW

ATWB Model	Standard Unit	Unit w/Hood	Hood and Insulation	ATWB Model	Standard Unit	Unit w/Hood	Hood and Insulation	ATWB Model	Standard Unit	Unit w/Hood	Hood and Insulation	ATWB Model	Standard Unit	Unit w/Hood	Hood and Insulation
3-2x3	5.6	5.3	3.2	9-3x12	87.9	41.6	26.7	14-3x12	152.1	—	—	12-3x28	293.0	126.6	80.9
3-3x3	7.0	5.9	3.8	9-4x12	106.4	44.2	28.4	14-4x12	184.0	—	—	12-4x28	353.9	133.6	85.6
3-4x3	8.2	6.2	4.1	9-5x12	119.5	46.9	29.9	14-5x12	206.6	—	—	12-5x28	397.9	141.2	90.2
3-5x3	9.4	6.7	4.4	9-6x12	127.5	49.2	31.6	14-6x12	220.0	—	—	12-6x28	424.9	148.3	94.9
4-2x4	10.5	10.0	6.4	9-7x12	148.8	57.4	36.9	14-7x12	224.1	—	—	12-7x28	495.8	172.9	110.8
4-3x4	13.2	11.1	7.0	9-3x14	103.1	45.7	29.3	14-3x18	229.7	—	—	12-3x36	378.0	147.1	94.3
4-4x4	15.8	12.0	7.6	9-4x14	124.5	48.3	31.1	14-4x18	278.1	—	—	12-4x36	456.5	155.3	99.6
4-5x4	17.9	12.6	8.2	9-5x14	140.1	51.3	32.8	14-5x18	312.3	—	—	12-5x36	513.9	163.5	104.9
4-3x6	19.6	16.7	10.5	9-6x14	149.1	53.9	34.6	14-6x18	332.6	—	—	12-6x36	547.9	172.3	110.2
4-4x6	23.7	17.9	11.4	9-7x14	174.0	63.0	40.4	14-7x18	338.4	—	—	12-7x36	639.3	201.0	128.6
4-5x6	26.7	19.0	12.3	9-3x18	133.0	58.6	37.5	20-3x12	202.8	94.6	60.4	12-3x40	420.7	157.0	100.8
4-3x9	29.9	21.1	13.5	9-4x18	160.6	61.8	39.6	20-4x12	244.9	99.6	64.2	12-4x40	508.1	165.8	106.7
4-4x9	36.0	22.6	14.7	9-5x18	180.8	65.0	41.6	20-5x12	275.4	104.9	67.4	12-5x40	571.9	175.2	111.9
4-5x9	40.4	24.3	15.5	9-6x18	192.8	68.6	44.0	20-6x12	293.9	110.8	70.6	12-6x40	610.0	184.0	117.8
4-3x12	40.1	27.5	17.6	9-7x18	225.0	80.0	51.3	20-7x12	342.8	129.2	82.6	12-7x40	711.7	214.8	137.4
4-4x12	48.3	29.6	19.0	9-3x21	155.3	64.5	41.3	20-3x18	306.2	119.3	76.5	24-3x12	250.2	116.6	74.4
4-5x12	54.5	31.6	20.2	9-4x21	187.8	68.3	43.7	20-4x18	370.1	126.0	80.9	24-4x12	302.4	123.1	79.1
7-3x9	56.5	—	—	9-5x21	212.1	71.8	46.0	20-5x18	416.4	132.4	85.0	24-5x12	339.9	129.5	83.2
7-4x9	68.6	—	—	9-6x21	225.3	75.6	48.3	20-6x18	443.9	139.8	89.4	24-6x12	362.7	136.5	87.3
7-5x9	77.1	—	—	9-7x21	262.8	88.2	56.5	20-7x18	518.0	162.9	104.0	24-7x12	423.1	159.4	102.0
7-6x9	82.0	—	—	17-3x12	175.8	83.2	53.3	20-3x24	405.5	189.0	120.7	24-3x14	293.0	126.6	80.9
7-7x9	83.5	—	—	17-4x12	212.7	88.5	56.8	20-4x24	490.2	199.5	128.3	24-4x14	353.9	133.6	85.6
7-3x12	75.9	—	—	17-5x12	239.1	93.8	56.8	20-5x24	550.8	209.8	134.8	24-5x14	397.9	141.2	90.2
7-4x12	92.0	—	—	17-6x12	254.9	98.4	63.3	20-6x24	588.1	221.2	141.5	24-6x14	424.9	148.3	94.9
7-5x12	103.4	—	—	17-7x12	297.4	114.9	73.8	20-7x24	685.9	258.1	165.0	24-7x14	495.8	172.9	110.8
7-6x12	110.2	—	—	17-3x14	206.3	91.4	58.6	20-3x36	612.7	238.5	152.9	24-3x18	378.0	147.1	94.3
7-7x12	111.9	—	—	17-4x14	249.1	96.7	62.1	20-4x36	739.8	251.7	161.4	24-4x18	456.5	155.3	99.6
7-3x18	114.9	—	—	17-5x14	280.1	102.6	65.6	20-5x36	833.0	264.9	169.9	24-5x18	513.9	163.5	104.9
7-4x18	138.9	—	—	17-6x14	298.3	107.8	69.1	20-6x36	888.1	279.2	178.4	24-6x18	547.9	172.3	110.2
7-5x18	156.2	—	—	17-7x14	348.1	125.7	80.6	20-7x36	1036.0	325.8	208.3	24-7x18	639.3	201.0	128.6
7-6x18	166.1	—	—	10-3x12	101.4	47.2	30.2	12-3x12	125.1	58.3	37.2	24-3x20	420.7	157.0	100.8
7-7x18	169.4	—	—	10-4x12	122.5	49.8	31.9	12-4x12	151.2	61.5	39.6	24-4x20	508.1	165.8	106.7
7-3x24	152.1	—	—	10-5x12	137.7	52.4	33.7	12-5x12	169.9	64.8	41.6	24-5x20	571.9	175.2	111.9
7-4x24	184.0	—	—	10-6x12	147.1	55.4	35.5	12-6x12	181.4	68.3	43.7	24-6x20	610.0	184.0	117.8
7-5x24	206.6	—	—	10-7x12	171.4	64.5	41.3	12-7x12	211.5	79.7	51.0	24-7x20	711.7	214.8	137.4
7-6x24	220.0	—	—	10-3x18	153.2	59.5	38.1	12-3x14	146.5	63.3	40.4	24-3x24	500.4	233.2	148.8
7-7x24	224.1	—	—	10-4x18	184.9	63.0	40.4	12-4x14	177.0	66.8	42.8	24-4x24	604.8	246.1	158.2
7-3x36	229.7	—	—	10-5x18	208.3	66.2	42.5	12-5x14	198.9	70.6	45.1	24-5x24	679.8	259.0	166.4
7-4x36	278.1	—	—	10-6x18	222.1	69.7	44.5	12-6x14	212.4	74.1	47.5	24-6x24	725.5	273.1	174.6
7-5x36	312.3	—	—	10-7x18	259.0	81.5	52.2	12-7x14	247.9	86.4	55.4	24-7x24	846.5	318.5	203.6
7-6x36	332.6	—	—	10-3x24	202.8	94.6	60.4	12-3x18	189.0	73.5	47.2	24-3x28	586.0	253.2	161.7
7-7x36	338.4	—	—	10-4x24	244.9	99.6	64.2	12-4x18	228.2	77.6	49.8	24-4x28	707.9	267.2	171.1
9-3x8	56.3	31.9	20.5	10-5x24	275.4	104.9	67.4	12-5x18	257.0	81.7	52.4	24-5x28	795.8	282.5	180.5
9-4x8	68.0	34.0	21.7	10-6x24	293.9	110.8	70.6	12-6x18	274.0	86.1	55.1	24-6x28	849.7	296.5	189.9
9-5x8	76.5	36.0	23.1	10-7x24	342.8	129.2	82.6	12-7x18	319.7	100.5	64.2	24-7x28	991.2	346.0	221.5
9-6x8	81.7	37.8	24.3	10-3x36	306.2	119.3	76.5	12-3x20	210.4	78.5	50.4	24-3x36	755.9	294.2	188.7
9-7x8	95.5	44.2	28.4	10-4x36	370.1	126.0	80.9	12-4x20	254.0	82.9	53.3	24-4x36	913.0	310.6	199.2
9-3x9	65.6	35.7	22.9	10-5x36	416.4	132.4	85.0	12-5x20	286.0	87.6	56.0	24-5x36	1027.8	327.0	209.8
9-4x9	79.1	37.8	24.3	10-6x36	443.9	139.8	89.4	12-6x20	305.0	92.0	58.9	24-6x36	1095.8	344.6	220.3
9-5x9	89.1	40.1	25.8	10-7x36	518.0	162.9	104.0	12-7x20	356.0	107.2	68.9	24-7x36	1278.4	402.0	257.0
9-6x9	94.9	42.2	27.0	14-3x9	113.1	—	—	12-3x24	250.2	116.6	74.4	24-3x40	841.5	314.1	201.6
9-7x9	110.8	49.2	31.4	14-4x9	137.1	—	—	12-4x24	302.4	123.1	79.1	24-4x40	1016.1	331.7	213.3
9-3x11	76.8	38.7	24.9	14-5x9	153.8	—	—	12-5x24	339.9	129.5	83.2	24-5x40	1143.9	350.4	223.9
9-4x11	92.6	41.0	26.4	14-6x9	163.8	—	—	12-6x24	362.7	136.5	87.3	24-6x40	1220.1	368.0	235.6
9-5x11	104.3	43.4	27.8	14-7x9	167.0	—	—	12-7x24	423.1	159.4	102.0	24-7x40	1423.4	429.2	274.8
9-6x11	111.3	45.7	29.3												
9-7x11	129.8	53.3	34.3												

General Information

Design

EVAPCO closed circuit coolers 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, 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 unit 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 type system. An open type system with a cooler may result in premature coil 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 Quality

Proper water treatment is an essential part of the maintenance required for evaporative cooling equipment. A well designed and consistently implemented water treatment program will help to ensure efficient system operation while maximizing the equipment's service life. **If EVAPCO factory mounted water systems are not utilized**, a qualified water treatment company should design a site specific water treatment protocol based on equipment (including all metallurgies in the cooling system), location, makeup water quality, and usage.

Bleed off

Evaporative cooling equipment requires a bleed or blowdown line, located on the discharge side of the recirculating pump, to remove concentrated (cycled up) water from the system. EVAPCO recommends an automated conductivity controller to maximize the water efficiency of your system. **If EVAPCO factory mounted water systems are not utilized**, based on recommendations from your water treatment company, the conductivity controller should open and close a motorized ball or solenoid valve to maintain the conductivity of the recirculating water. If a manual valve is used to control the rate of bleed it should be set to maintain the conductivity of the recirculating water during periods of peak load at the maximum level recommended by your water treatment company.

Water Treatment

The water treatment program prescribed for the given conditions must be compatible with the unit's materials of construction, including any galvanized components. The initial commissioning and passivation period is a critical time for maximizing the service life of galvanized equipment. EVAPCO recommends that the site specific water treatment protocol includes a passivation procedure which details water chemistry, any necessary chemical addition, and visual inspections during the first six (6) to twelve (12) weeks of operation. During this passivation period, recirculating water pH should be maintained above 7.0 and below 8.0 at all times. Batch feeding of chemicals is not recommended.

Control of Biological Contaminants

Evaporative cooling equipment should be inspected regularly to ensure good microbiological control. Inspections should include both monitoring of microbial populations via culturing techniques and visual inspections for evidence of biofouling.

Poor microbiological control can result in loss of heat transfer efficiency, increase corrosion potential, and increase the risk of pathogens such as those that cause Legionnaires' disease. Your site specific water treatment protocol should include procedures for routine operation, startup after a shut-down period, and system lay-up, if applicable. If excessive microbiological contamination is detected, a more aggressive mechanical cleaning and/or water treatment program should be undertaken.

Specifications

SECTION 23 65 00 – FACTORY-FABRICATED COOLING TOWERS

PART 1 – GENERAL

- 1.1 RELATED DOCUMENTS
 - A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 1 Specification Sections, apply to this section.
- 1.2 SUMMARY:
 - A. This Section includes factory assembled and tested, closed circuit, induced draft counterflow cooling tower (also known as a closed circuit cooler).
- 1.3 SUBMITTALS
 - A. General. Submit the following:
 1. Certified drawings of the closed circuit cooler, sound data, recommended steel support indicating weight loadings, wiring diagrams, installation instructions, operation and maintenance instructions, and thermal performance guarantee by the manufacturer.
- 1.4 QUALITY ASSURANCE
 - A. Verification of Performance:
 1. Test and certify closed circuit cooler thermal performance according to CTI Stangard 201.
 2. Test and certify closed circuit cooler sound performance according to CTI ATC-128.
 - B. Meet or Exceed energy efficiency per ASHRAE 90.1.
- 1.5 WARRANTY
 - A. Motor/Drive System: Five (5) year comprehensive warranty against materials and workmanship including motor, fan, bearings, mechanical support, sheaves, bushings and belt.
 - B. Unit: One (1) year against defects in material and workmanship from start-up, not to exceed eighteen (18) months from shipment on the unit.

PART 2 – PRODUCTS

- 2.1 MANUFACTURERS
 - A. Manufactures: Subject to compliance with requirements, provide closed circuit coolers manufactured by one of the following:
 1. EVAPCO, Inc.
 2. Approved Substitute
- 2.2 MATERIALS
 - A. Galvanized Sheet Steel complying with ASTM A 653/A 653M and having G-235 designation.
 - B. Optional Type 304 and/or 316 Stainless Steel as specified.
- 2.3 INDUCED-DRAFT, COUNTERFLOW CLOSED CIRCUIT COOLERS
 - A. Description: Factory assembled and tested, induced draft counterflow closed circuit cooler complete with coil, fan, louvers, accessories, and rigging supports.
 - B. Closed Circuit Cooler Characteristics and Capacities: Refer to the closed circuit cooler schedule.
 - C. Fan(s):
 1. Type and Material: Axial propeller, individually adjustable wide chord blade extruded aluminum installed in a closely fitted cowl with venturi air inlet for maximum efficiency, covered with a heavy gauge hot dipped Galvanized Steel fan guard.
 2. Maximum sound pressure level of _____dB(A) measured at 1.5 meters above the fan discharge during full speed operation in accordance with CTI Standard ATC-128.
 - D. Water Distribution System: Non-corrosive materials.
 1. Evenly distribute of water over coil with pressurized spray tree.
 - a. Pipes: Schedule 40 PVC, Non-corrosive Materials
 - b. Nozzles: Non-clogging, nylon, threaded into branch piping.
 2. Maximum pressure at inlet shall be _____ KPa.
 - E. IBC Compliance: The unit structure shall be designed, analyzed, and constructed in accordance with the latest edition of the International Building Code (IBC) Regulations for seismic loads up to _____ g and wind loads up to ____ KPa.
 - F. Collection Basin Material: Galvanized Steel. Type 304 Stainless Steel Optional:

1. Removable stainless-steel strainer with openings smaller than nozzle orifices.
2. Joints: Bolted and sealed watertight or welded.
3. Overflow, makeup and side drain connections.
4. Flume plate between cells (for multiple-cell units) or Equalizer connection (for multiple- closed circuit cooler system).
- G. Heat Transfer Coil: Heavy Gauge G-235 Galvanized Steel encased in a steel framework, assembly hot-dip galvanized after construction. Type 304 Stainless Steel Optional. Coil assembly completely enclosed and protected from sunlight exposure, environmental elements and debris. Tubes sloped for free drainage of the coil and designed for low pressure drop. Coil assembly pneumatically tested at 2.69 MPa under water. Coil connections beveled for weld, flanged (optional) or grooved (optional).
- H. Casing: Galvanized Steel. Type 304 Stainless Steel Optional:
 1. Casing panels shall totally encase the heat transfer coil.
 2. Fasteners: Corrosion resistance equal to or better than materials being fastened.
 3. Joints: Sealed watertight.
 4. Welded Connections: Continuous and watertight.
- I. Drift Eliminators: PVC, for long life and durability resistant to rot, decay and biological attack; formed, bonded together for strength and durability in block format for easy removal and replacement; self extinguishing with flame spread rating of 5 per ASTM E84-81a; 0.001% drift rate.
- J. Air Inlet Louvers: Formed PVC; designed "Sight Tight" to completely block direct sunlight from entering and water from splashing out of the closed circuit cooler.
- K. Water Level Control: Brass mechanical makeup water valve and plastic float with an adjustable linkage.
- L. Water Recirculation Pump: Close-coupled, centrifugal type with mechanical seal. The pump motor shall be _____ horsepower totally enclosed for outdoor service on _____ volts, _____ hertz, and _____ phase.
- 2.4 MOTORS AND DRIVES
 - A. General requirements for motors are specified in Division 15 Section "Motors".
 - B. Enclosure Type: TEAO or TEFC
 - C. Motor Speed: VFD Duty (Option: 2-speed)
 - D. Drive: Power Band Belt designed for 150% of the motor nameplate HP.
 1. Belt: Mutli-groove, solid back V-belt type neoprene reinforced with polyester cord.
 2. Sheaves: Aluminum alloy if located inside the airstream.
 3. Bearings: Heavy duty, self-aligning pillow block bearings with lubrication lines extended to side access door. Minimum L10 life for bearings shall be 75,000 hours. Provide extended grease lines and fittings.
 4. Vibration Cutout Switch: (optional) Mechanical switch to de-energize fan motors if excessive vibration.
- 2.5 MAINTENANCE ACCESS
 - A. Internal Working / Service Platforms: Provide a complete internal working platform and ladder system for service of all drive components. A suitable working platform may be constructed of the heat transfer coil for counterflow closed circuit coolers. If a crossflow cooler is used, provide an internal walkway with ladder and elevated working platform to allow for service and maintenance to motor and drive assembly.
 - B. Handrails/Grabrails: Galvanized steel pipe complying with 29 CFR 1910.23. If access to fan deck is required, supply a perimeter handrail with ladder from grade to fan deck.
 - C. Ladders: (optional) Aluminum, sloped "ships type" with grabrail or vertical complying with 29 CFR 1910.27.

NOTES:



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