Bulletin 230A-Metric

evapco

eco-Coolers

The NEW Family of Closed Circuit Coolers

eco-ATW

eco-ATWE

Sage®

CERTIFIED EN ISO 9001 & ISO 14001

CTI CERTIFIED

Environmentally Conscious Operation Featuring Water & Energy Conserving Technology

U.S. GREEN BUILDING COUNCIL MEMBER

Since its founding in 1976, EVAPCO, Incorporated has become an industry leader in the engineering and manufacturing of quality heat transfer products around the world. EVAPCO's mission is to provide first class service and quality products for the following markets:

- Industrial Refrigeration
- Commercial HVAC
- Industrial Process
- Power

EVAPCO's powerful combination of financial strength and technical expertise has established the company as a recognized manufacturer of market-leading products on a worldwide basis. EVAPCO is also recognized for the superior technology of their environmentally friendly product innovations in sound reduction and water management.

EVAPCO is an employee owned company with a strong emphasis on research & development and modern manufacturing plants. EVAPCO has earned a reputation for technological innovation and superior product quality by featuring products that are designed to offer these operating advantages:

- Higher System Efficiency
- Environmentally Friendly
- Lower Annual Operating Costs
- Reliable, Simple Operation and Maintenance

With an ongoing commitment to Research & Development programs, EVAPCO provides the most advanced products in the industry– ***Technology for the Future, Available Today***!

EVAPCO products are manufactured in 17 locations in 8 countries around the world and supplied through a sales network consisting of over 170 offices.

NEW!

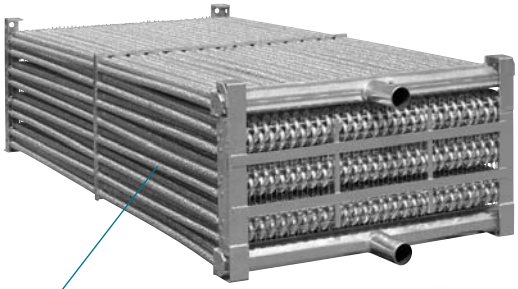
Ellipti-fin™

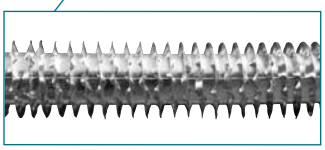
MOTOR AND DRIVE 5 Year WARRANTY

Featuring Elliptical Spiral Fin Coil Technology

Introducing the Most Efficient Closed Circuit Cooler Coil in the HVAC industry! The **Ellipti-fin™** provides:

- Patent Pending finned Thermal-Pak elliptical tube design with ALL coil rows finned.
- Lower airflow resistance than typical finned round tubes
- Increased Evaporative and Dry Cooling efficiency

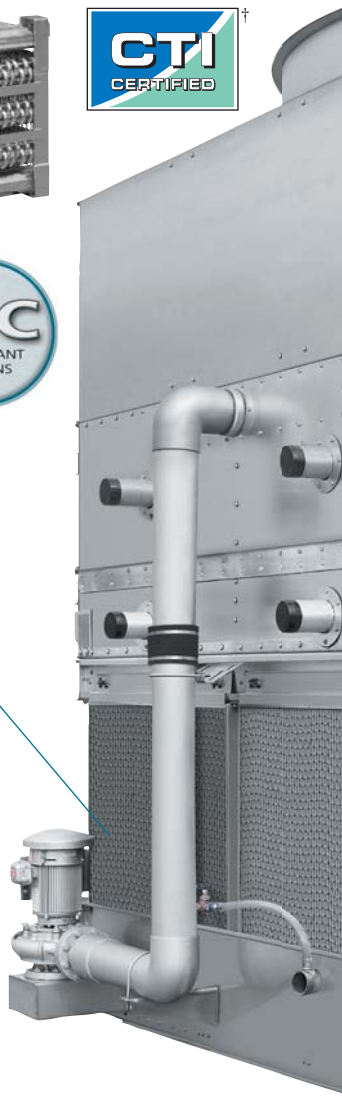




CTI Certified

CTI CERTIFIED †

IBC COMPLIANT DESIGNS



Most Accessible Basin

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

Featuring

Louver Access Door

- Louver access door is standard 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

eco-ATW Design and Construction Features

The *New* eco-ATW line of Closed Circuit Coolers has been specifically designed to dramatically increase both the evaporative (latent) and dry (sensible) modes of cooling. With this new revolutionary design, the EVAPCO eco-ATW will also save water and energy by increasing the unit's efficiency in both the evaporative and dry cooling modes of operation. The eco-ATW utilizes the EVAPCO Ellipti-*fin*™ coil which features elliptical spiral fin technology to maximize the surface area available for heat transfer. The eco-ATW is the ideal solution for: Lower Energy Costs, Reducing Water Consumption, Higher Dry Bulb Switchover, Super Low Sound Levels. **This new product is designed with IBC Compliant construction and CTI† Certified Performance.**

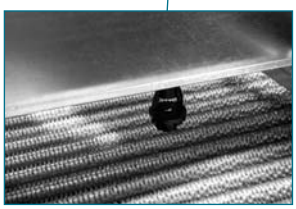
Super Low Sound Fan (Optional)

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

Efficient Drift Eliminators

- Advanced design removes mist from the leaving airstream
- Made from corrosion resistant PVC for long life

(U.S. Patent No. 6315804)



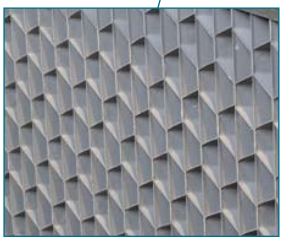
PVC Spray Distribution Header with ZM® II Nozzles

- Nozzles are threaded into header at proper orientation
- Large orifice fixed position nozzles prevent clogging
- Threaded end caps for ease of cleaning

Easy Field Assembly

- A new field assembly seam design which ensures easier assembly and fewer field seam leaks
- Self-guiding channels guide the coil casing section into position improving the quality of the field seam
- Eliminated up to 66% of fasteners

(Patent Pending)



NEW & Improved!

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

(Patent Pending)

Optional Sage²®

Water and Energy Conservation Control System

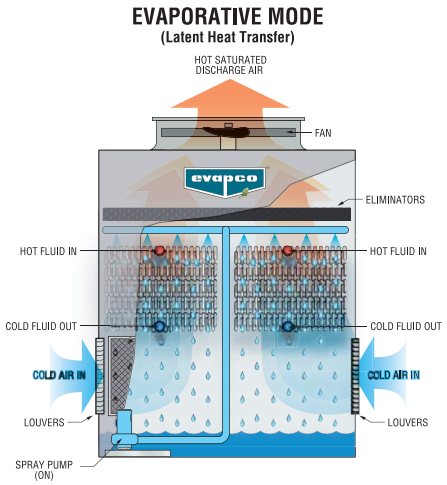
The best way to properly control and operate the eco-ATW Closed Circuit Cooler is with the optional *Sage²* ® Water and Energy Conservation Control System. The *Sage²* ® is designed to optimally control the fan motor(s) and the pump motor(s) of the unit. The *Sage²* ® will efficiently reject the building load using the minimal amount of water and energy.

† Mark owned by the Cooling Technology Institute

Principles of Operation

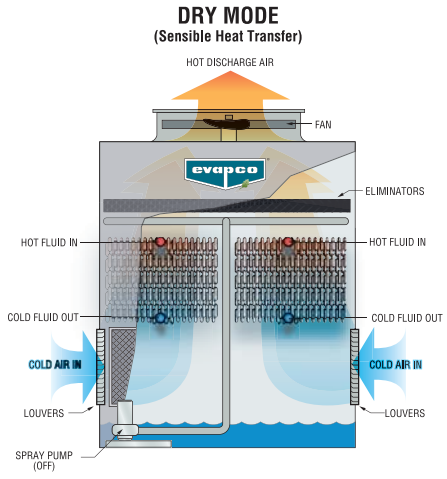
Evaporative Mode (Latent Heat Transfer)

In the evaporative mode, the process fluid enters the cooler through the top coil connection and circulates through the finned coils. With the pump and fan energized, the heat from the process fluid is transferred through the tube wall and fins to the water cascading downward over the coils while simultaneously air is drawn upward over the coil opposite the water flow. A small portion of the water is evaporated to dissipate the heat to the atmosphere in a latent heat transfer. This mode of operation provides fan energy savings due to enhanced evaporative performance and lower leaving water temperatures by utilizing evaporative cooling.



Dry Mode (Sensible Heat Transfer)

In the dry mode, the recirculating spray pump is deenergized (Fan on, Pump off). The process fluid enters the eco-ATW cooler through the top coil connection and circulates through the finned coil with the fan energized. Heat from the process fluid is dissipated to the atmosphere by sensible heat transfer through the tube wall and fins to the air passing over the coils. The coils are finned to promote optimal airflow over the coil and to maximize heat transfer area. Air is drawn over the finned coil by the fan drive system. The process fluid then returns to the heat source via the bottom coil connection. This mode of operation eliminates water consumption!



Maintenance Free ZMII® Spray Nozzle Water Distribution System

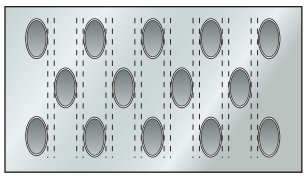

ZMII® Nozzle

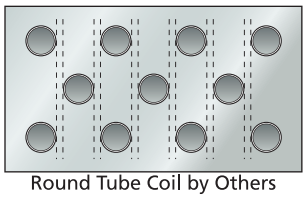
EVAPCO'S Zero Maintenance ZM®II Spray Nozzle remains clog-free while providing even and constant water distribution for reliable, scale-free evaporative cooling under all operating conditions.

The heavy duty ABS ZM®II Spray nozzles have a 32mm diameter opening and a 32mm splash plate clearance. 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 unequaled coil coverage and scale prevention, and make the industry's best performing non-corrosive, maintenance-free water distribution system.

Cooling Coil

The new eco-ATW Closed Circuit Cooler utilizes Evapco's patent pending **Ellipti-*fin*™** coil design which assures even 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 revolutionary **Ellipti-*fin*™** design utilizes elliptical spiral fin coil technology and has lower resistance to airflow than typical finned coil designs. This permits greater water loading, making the new **Ellipti-*fin*™** coil the most efficient coil design available on the market.


Thermal-Pak® Coil by EVAPCO


Round Tube Coil by Others

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 2.76 MPa 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 in molten zinc (hot-dip 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 cooler leading to premature failure.

Efficient Drift Eliminators

The eco-ATW is equipped with an efficient drift eliminator system that effectively reduces entrained water droplets from the air discharge to less than 0.001% of the spray water flow rate.

The eliminators are constructed of non-corrosive PVC with a multi-pass design for maximum drift reduction. They are assembled in modular sections for easy removal and access to the water distribution system.

In addition to reducing drift, the eliminators also function as effective debris screens which protect the spray system from sunlight and debris.

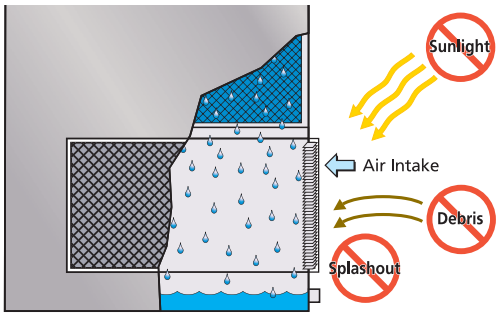
Patent #: 6,315,804

Superior Air Inlet Louver and Screen Design - *New & Improved*

EVAPCO'S WST II Inlet Louvers (patent pending) keep water in and sunlight out of induced draft products. The unique non-planar design is made from light-weight framed PVC sections which have no loose hardware, enabling easy unit access.

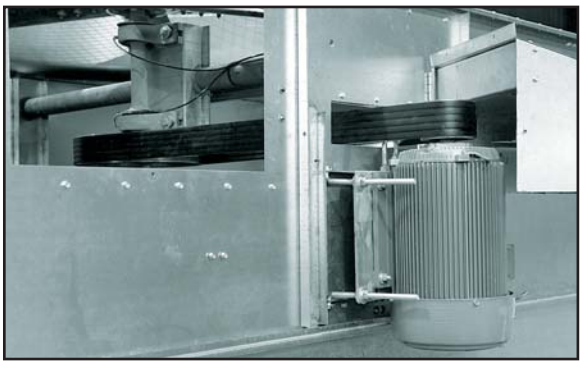
Developed with computational fluid dynamics (CFD) software, the louver's air channels are optimized to maintain fluid dynamic and thermodynamic efficiency and block all line-of-sight paths into the basin eliminating splash-out; even when the fans are off. Additionally, algae growth is minimized by blocking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

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



Belt Drive Units - 0.9m, 1.2m, 2.5m and 5.2m Wide Models

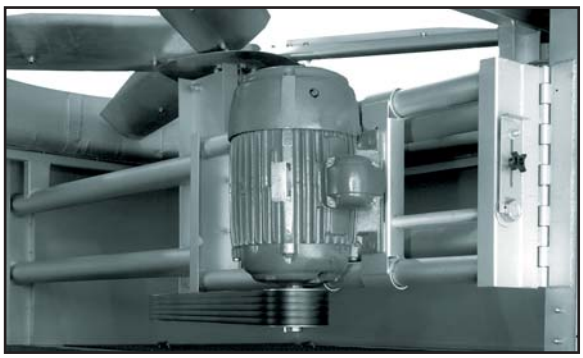
The fan motor and drive assembly on these units are designed to allow easy servicing of the motor and adjustment of the belt tension from the exterior of the unit. A T.E.F.C. fan motor is mounted on the outside of these models. A protective cover swings away to allow servicing and belt adjustment.



External Motor Mount

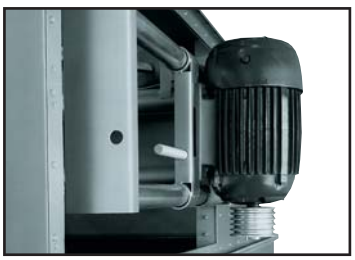
Belt Drive Units - 3m, 3.6m, 6.1m & 7.3m Wide Models

The fan motor and drive assembly are 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.



Motor Base Assembly

The motor base is designed to swing out through a very large, 1.3 square meters access opening. This allows for easy servicing of the motor from outside of the unit.



Motor Access

eco-ATW Specifications

SECTION 23 65 00 – FACTORY-FABRICATED COOLING TOWERS

PART 1 – DESIGN CONDITIONS

A. Furnish and install as shown on the plans on EVAPCO Model _____ induced draft counterflow closed circuit cooler. Each unit shall be CTI Certified (with water) and have the capacity to cool _____ lps of _____ from _____°C to_____ °C with a _____ °C entering wet bulb temperature and a dry bulb switchover temperature of _____ °C (Dry Capacity not CTI Certified.

Optional: (If dry operating condition are different than the wet operating conditions)

Each unit shall also cool _____ lps of_____ from_____ °C to_____ °C with a _____ °C entering dry bulb temperature.

B. Controls optional with unit. See Controls Technical Specifications.

PART 2 – GENERAL

2.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 1 Specification Sections, apply to this section.

2.2 SUMMARY:

A. This Section includes factory assembled and tested, closed circuit, induced draft counterflow cooling tower (also known as a closed circuit cooler).

2.3 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.

2.4 QUALITY ASSURANCE

A. Verification of Performance:

1. Test and certify closed circuit cooler thermal performance according to CTI Standard 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.

2.5 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 from start-up, not to exceed eighteen (18) months from shipment on the unit.

PART 3 - PRODUCTS

3.1 MANUFACTURERS

A. Manufactures: Subject to compliance with requirements, provide closed circuit coolers manufactured by one of the following:

1. EVAPCO, Inc.

2. Approved Substitute

3.2 MATERIALS

A. Galvanized Sheet Steel casing and fan housing complying with ASTM A 653/A 653M and having G-235 designation.

B. Optional Type 304 and/or 316 Stainless Steel as specified.

3.3 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 5 feet 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.

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 __ psf(or kPa).

F. Collection Basin Material: Galvanized Steel. Type 304/316 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: Each row of the heat exchanger coil shall be provided with elliptical spiral fins to increase the evaporative and dry thermal performance of the unit as well as lowering the air pressure drop. Cooling coil(s) shall be all primed surface steel, encased in a steel framework and hot-dip galvanized after fabrication as a complete assembly. The tubes shall be arranged in a self-spacing, staggered pattern in the direction of airflow for maximum heat transfer efficiency and minimum pressure drop. The coil(s) shall be pneumatically tested at 2.76 MPa, under water.

H. Casing: Galvanized Steel. Type 304/316 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 ____ kW totally enclosed for outdoor service on ____ volts, ____ hertz, and ____ phase.

3.4 MOTORS AND DRIVES

A. General requirements for motors are specified in Division 15 Section "Motors".

B. Enclosure Type: TEAO or TEFC

C. Fan Motor Speed: Single speed (option: VFD Duty, 2-speed)

1. Motors shall be provided with space heaters.

D. Drive: Power Band Belt designed for 150% of the motor nameplate kW.

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 in NEMA 4 enclosure.

3.5 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.

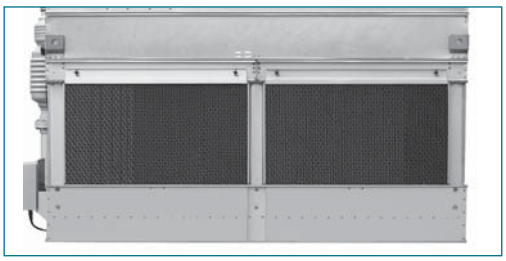
Electric Water Level Control

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 Basin

EVAPCO coolers have a modular design which allows specific areas to be enhanced for increased corrosion protection. The basin area of the cooler experiences turbulent mixing of air and water, in addition to silt build-up. In conjunction with the EVAPCOAT Corrosion Protection System, EVAPCO offers an optional Stainless Steel Basin. This option provides Type 304 or 316 stainless steel for the entire basin area including the support columns of the cooler and the louver frames.

The basin section provides structural support for the unit; it is also the part of the unit that is most prone to corrosion. For maximum protection against corrosion, EVAPCO can provide a Stainless Steel Basin as an affordable option.



Capacity Control

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.

Self Supporting Working Platform

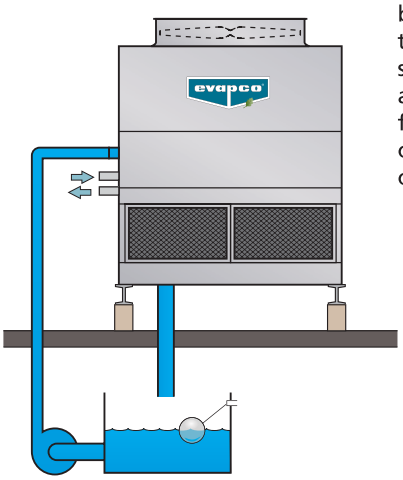
EVAPCO coolers are available with a self-supporting platform with ladder, which may be easily installed in the field. This option offers significant savings compared to field constructed catwalks, which must be supported by a structure external to the unit. The platform may be installed on either side, or the end opposite the connections.

Motor Davit

In the event that a 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 to the ground.

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 is furnished with an oversized bottom outlet.



Solutions for Sound Sensitive Applications

The eco-ATW & eco-ATWE Closed Circuit Coolers are now available with four (4) equipment options to reduce the overall sound generated from the side or top of the eco Closed Circuit Cooler. Each option provides various levels of sound reduction and options can be combined to provide the lowest sound level. Consult EVAPCO's evap-*Select* selection program 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.

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

Super Low Sound Fan

9–15 dB(A) Reduction versus Standard Fan!

The Super Low Sound Fan offered by EVAPCO uses an extremely wide chord blade design for very sound sensitive applications where the lowest sound levels are required. The fan is one-piece molded heavy duty FRP construction utilizing a forward swept blade design. The Super Low Sound fan is capable of reducing the unit sound pressure levels **9 dB(A) to 15 dB(A)**, depending on specific unit selection and measurement location. The fans are high efficiency axial propeller type.

The Super Low Sound Fan is available on all 2.5m and larger eco-ATW & eco-ATWE Closed Circuit Coolers.

Low Sound Fan

4–7 dB(A) Reduction!

The Low Sound Fan offered by EVAPCO uses a wide chord blade design for sound sensitive applications where low sound levels are desired. Low Sound Fan construction uses aluminum blades and a steel fan hub. The Low Sound Fan is capable of reducing the unit sound pressure levels **4 dB(A) to 7dB(A)**, depending on specific unit selection and measurement location. The fans are high efficiency axial propeller type.

Fan Discharge Sound Attenuation

Up to 10 dB(A) Reduction!

The eco-ATW & eco-ATWE Fan Discharge Attenuator offered by EVAPCO is an additional option available to further reduce the sound level of the unit. The attenuator can be used with the standard eco-ATW & eco-ATWE fan or in combination with the Low Sound Fan option.

The discharge attenuator is a factory-assembled straight-sided discharge hood designed to reduce overall discharge sound levels at full fan speed **5 dB(A) to 10 dB(A)**, depending on specific unit selection and measurement location. It is

constructed of G-235 galvanized steel as standard (options available for Type 304 stainless steel) and includes insulated walls and a low pressure drop baffling system that is acoustically lined with high density fiberglass. The discharge attenuator is self-supported by the unit and is shipped loose for field mounting. A heavy-gauge, hot-dip galvanized steel fan guard covers the discharge attenuator to prevent debris from entering the attenuator.

The discharge attenuator has minimal impact on unit thermal performance (0%-2% derate depending on specific unit selection).

The Discharge Attenuator is available on: ALL standard eco-ATW & eco-ATWE Closed Circuit Coolers. It is also available on 3m, 3.6m, 6.1m and 7.3m wide eco-ATW, eco-ATWE Models with the Low Sound Fan option.

(Note: The eco-ATW & eco-ATWE Fan Discharge Attenuator Option is NOT available on eco-ATW & eco-ATWE Models provided with the Super Low Sound Fan.)

Water Silencer

Up to 7 dB(A) Reduction!

The water silencer option is available for all eco-ATW & eco-ATWE models and is located in the falling water area of the cold water basin. The water silencer reduces 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 1.5m 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 1.5m 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.

Notes

The Sage³®

Water and Energy Conservation Control System

The only way to properly control and operate the eco-ATWE Closed Circuit Cooler is to provide, as standard, the *Sage³®* Water and Energy Conservation Control System. The *Sage³®* is designed to optimally control the fan motor(s) and the pump motors of the unit. The *Sage³®* will efficiently reject the building load using the minimal amount of water and energy.

- Sophisticated control system that measures & analyses water inlet & out-let temperatures and the ambient dry bulb to minimize water consumption
- Variable frequency drive controls for fan motor(s)
- Maximizes water and energy savings

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

IBC Certification Label

- Provided with every unit to indicate independent certification and compliance

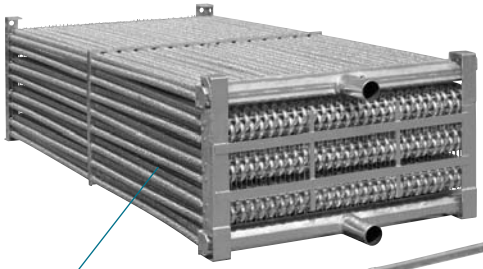
NEW!

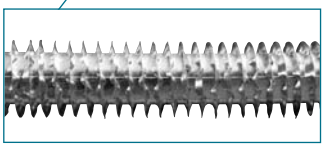
Ellipti-*fin*™

Featuring Elliptical Spiral Fin Coil Technology

Introducing the Most Efficient Closed Circuit Cooler Coil in th HVAC industry! The Ellipti-*fin*™ provides:

- All coil rows feature patent pending finned Thermal-Pak® elliptical tube design
- Lower airflow resistance than typical finned round tubes
- Increased Evaporative and Dry Cooling efficiency





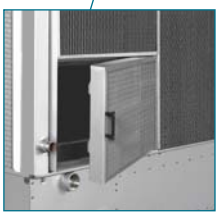
CTI Certified

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.

Most Accessible Basin

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



Featuring... Louver Access Door

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

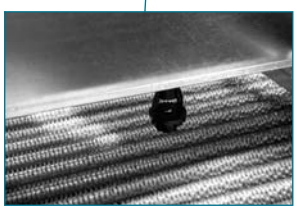
eco-ATWE Design and Construction Features

The *New* eco-ATWE line of Closed Circuit Coolers offers the same great design benefits and features as the eco-ATW but it has also been specifically designed to optimize both the evaporative (latent) and dry (sensible) modes of cooling simultaneously. This unique design joins an evaporative cooler and a dry cooler into one unit. The eco-ATWE utilizes the EVAPCO Ellipti-*fin*™ coil which features elliptical spiral fin technology to maximize the surface area available for heat transfer. This decreases water consumption and offers additional cost savings through reduced water make-up, blow-down, and chemical consumption. Evaporative cooling provides lower system operating temperatures and higher overall system efficiencies. The eco-ATWE is the ideal solution for: Lower Energy Costs, Reducing Water Consumption, High Dry Bulb Switchover, Super Low Sound Levels. **This new product is designed with IBC Compliant construction and CTI† Certified Performance.**

Efficient Drift Eliminators

- Advanced design removes mist from the leaving airstream
- Made from corrosion resistant PVC for long life

(U.S. Patent No. 6315804)



PVC Spray Distribution Header with ZM®II Nozzles

- Nozzles are threaded into header at proper orientation
- Large orifice fixed position nozzles prevent clogging
- Threaded end caps for ease of cleaning

Easy Field Assembly

- A new field assembly seam design which ensures easier assembly and fewer field seam leaks
- Self-guiding channels guide the coil casing section into position improving the quality of the field seam
- Eliminated up to 66% of fasteners

(Patent Pending)

Partition Panel

A water tight partition spans from the fan section of the unit down to the basin. This partition separates the two coils and ensures water does not contact the dry coil when the unit is operating in the water efficient mode.

Multiple Water Distribution Systems

Each coil in this unit features its own water distribution system. This allows each coil to operate in a mode independent of the other coil.

NEW & Improved!

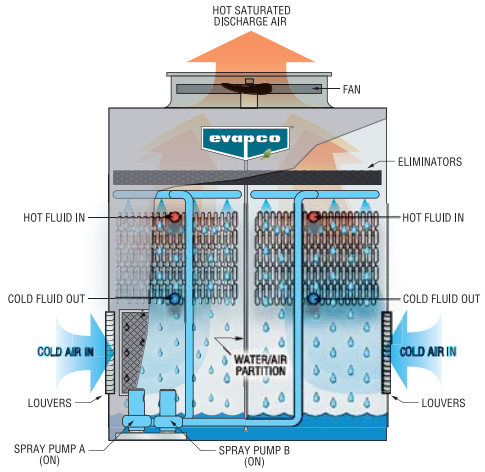
WST II Air Inlet Louvers (Water and Sight Tight)

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

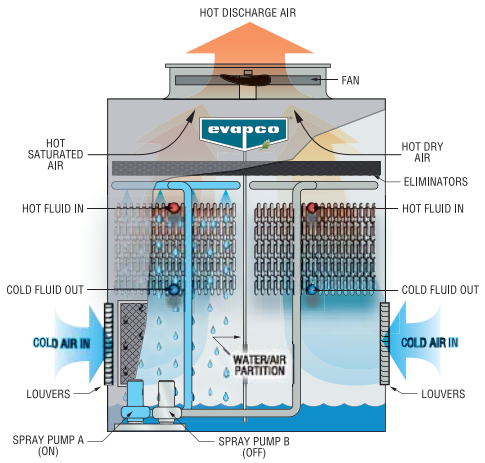
(Patent Pending)

† Mark owned by the Cooling Technology Institute

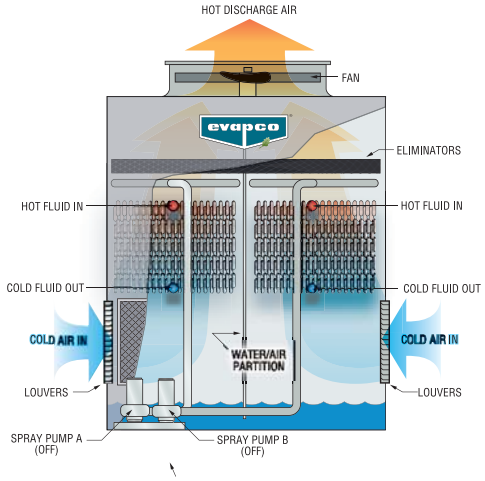
EVAPORATIVE MODE
(Latent Heat Transfer)



WATER EFFICIENT MODE
(Latent and Sensible Heat Transfer)



DRY MODE
(Sensible Heat Transfer)



Principles of Operation

Evaporative Mode

(Latent Heat Transfer)

In the evaporative mode, the process fluid enters the eco-ATWE cooler through the top coil connections and circulates through the finned coils. With both pumps energized, the heat from the process fluid is transferred through the coil tubes to the water cascading downward over the coils while simultaneously air is drawn upward over the coil opposite the water flow using the fan drive system (Fan on, Pump A & B on). A small portion of the water is evaporated to dissipate the heat to the atmosphere in a latent heat transfer. This mode of operation provides fan energy savings and lower leaving water temperatures by utilizing evaporative cooling.

Water Efficient Mode

(Evaporative and Sensible Heat Transfer)

The joint wet and dry operation mode provides water savings as well as low approach temperatures. In this joint mode of operation, the fan is on and the process fluid enters the coils through the top coil connections (Fan on, Pump A on, Pump B off). Recirculating pump B is turned off and coil B rejects a portion of the heat load to the atmosphere through the tube and fin walls to the air passing over the coils using sensible heat transfer. Pump A is left on where heat from the process fluid is transferred through the coil tubes to the water cascading downward over coil A. This mode of operation minimizes the amount of water used while maintaining the cooling capacity required. The cooled fluid then returns to the process via the bottom coil connection.

Dry Mode

(Sensible Heat Transfer)

In the dry mode, the recirculating spray pumps are deenergized (Fan on, Pump A & B off). The process fluid enters the eco-ATWE cooler through the top coil connection and circulates through the coil with the Fan On. Heat from the process fluid is dissipated to the atmosphere by sensible heat transfer through the tube walls to the air passing over the coils. The coils are finned to promote optimal airflow over the coil and to maximize heat transfer area. Air is drawn over the finned coils by the fan drive system. The process fluid then returns to the heat source via the bottom coil connection. This mode of operation eliminates water consumption when the dry bulb temperature is favorable.

SECTION 23 65 00 – FACTORY-FABRICATED COOLING TOWERS

PART 1 – DESIGN CONDITIONS

A. Furnish and install as shown on the plans on EVAPCO Model _____ induced draft counterflow closed circuit cooler. Each unit shall be CTI Certified (with water) and have the capacity to cool _____ lps of _____ from _____°C to_____ °C with a _____ °C entering wet bulb temperature and a dry bulb switchover temperature of _____ °C (Dry Capacity is not CTI Certified).
Optional: (If dry operating condition are different than the wet operating conditions)
Each unit shall also cool _____ lps of_____ from_____ °C to_____ °C with a _____ °C entering dry bulb temperature.

B. Controls shall be provided with unit. See Controls Technical Specifications.

PART 2 – GENERAL

2.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 1 Specification Sections, apply to this section.

2.2 SUMMARY:

A. This Section includes factory assembled and tested, closed circuit, induced draft counterflow cooling tower (also known as a closed circuit cooler).

2.3 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.

2.4 QUALITY ASSURANCE

A. Verification of Performance:

1. Test and certify closed circuit cooler thermal performance according to CTI Standard 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.

2.5 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 from start-up, not to exceed eighteen (18) months from shipment on the unit.

PART 3 - PRODUCTS

3.1 MANUFACTURERS

A. Manufactures: Subject to compliance with requirements, provide closed circuit coolers manufactured by one of the following:

1. EVAPCO, Inc.
2. Approved Substitute

3.2 MATERIALS

A. Galvanized Sheet Steel casing and fan housing complying with ASTM A 653/A 653M and having G-235 designation.

B. Optional Type 304 and/or 316 Stainless Steel as specified.

3.3 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 5 feet above the fan discharge during full speed operation in accordance with CTI Standard ATC-128.

D. Water Distribution System: Non-corrosive materials.

1. Each coil shall have a dedicated recirculation pump and water distribution system, which are completely separated by a water tight partition which begins above the water distribution systems and ends at the basin in order to allow for simultaneous wet and dry operation.
2. 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.

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 __ psf(or kPa).

F. Collection Basin Material: Galvanized Steel. Type 304/316 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: Each row of the heat exchanger coil shall be provided with elliptical spiral fins to increase the evaporative and dry thermal performance of the unit as well as lowering the air pressure drop. Cooling coil(s) shall be all primed surface steel, encased in a steel framework and hot-dip galvanized after fabrication as a complete assembly. The tubes shall be arranged in a self-spacing, staggered pattern in the direction of airflow for maximum heat transfer efficiency and minimum pressure drop. The coil(s) shall be pneumatically ested at 2.76 MPa, under water.

H. Casing: Galvanized Steel. Type 304/316 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____ kW totally enclosed for outdoor service on ____ volts, ____ hertz, and ____ phase.

3.4 MOTORS AND DRIVES

A. General requirements for motors are specified in Division 15 Section "Motors".

B. Enclosure Type: TEAO or TEFC

C. Fan Motor Speed: Single speed (Option: VFD Duty 2-speed)

D. Drive: Power Band Belt designed for 150% of the motor nameplate kW.

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 in NEMA 4 enclosure.

3.5 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.

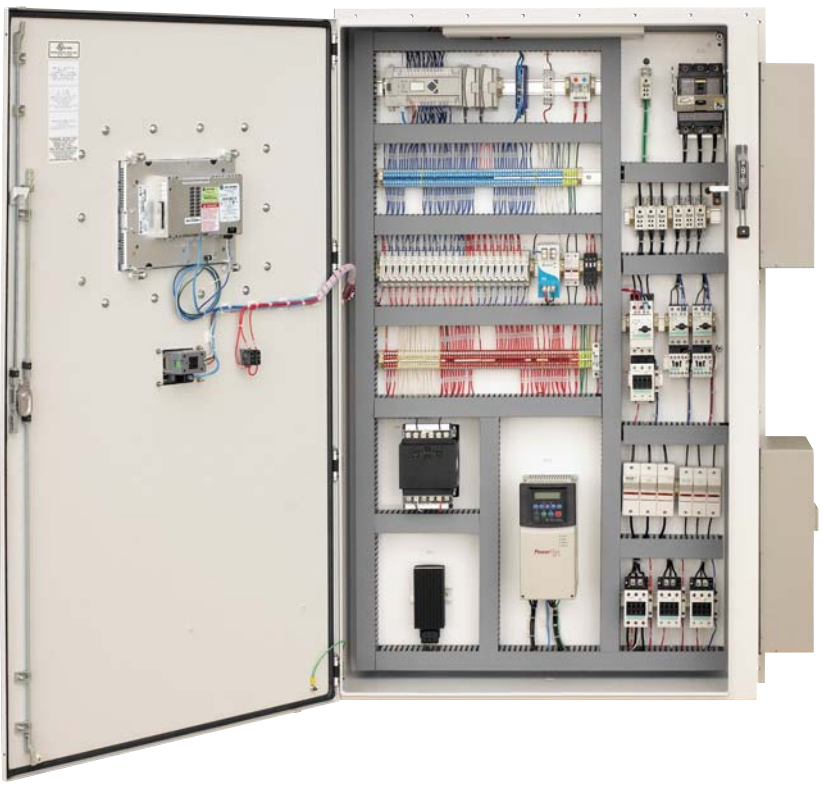
EVAPCO's Sage® … Water and Energy

The EVAPCO eco-ATW closed circuit coolers utilize the optional *Sage²®* water and energy conservation control system which controls Dry & Evaporative modes of operation. The eco-ATWE is provided standard with the *Sage³®* control panel which controls Dry, Water Efficient and Evaporative modes of operation. The control system operates by measuring and analyzing water inlet and outlet temperature simultaneous with ambient dry bulb monitoring in order to minimize the evaporative cooling mode of operation and to save system water. The Sage® can also be programmed to operate with a water savings or energy savings priority.

The Sage® Controller features a IP 65 enclosure. The panel also includes a 10" touch screen operator interface with color display and a Modbus 485* data port for communication with the building automation system. **The data points are: Inlet Temperature, Outlet Temperature, Dry Bulb Temperature, Basin Water Temperature Sensor, Fan Run Time, Pump Run Time, VFD Speed, Fan Motor Status – On/Off, Fan RPM, Pump Status – On/Off.**

Standard Control Items

- A MODBUS 485* Port for the Building Automation System
- Programmable Logic Control
- Fluid Inlet Temperature Sensor(s)
- Fluid Outlet Temperature Sensor(s)
- Basin Temperature Sensor(s)
- Ambient Dry Bulb Sensor(s)
- Variable frequency drive(s) For Fan Motor(s)
- Recirculating Pump Motor Starter(s).
- Main Disconnect
- Manual Bypass
- DC power supply for the PLC and instrumentation.
- Heater Package Controls w/ Contactor with Overload Protection
- Control Power Transformer
- 5-Probe Electronic Water Level Control Package
- High Water Level Alarm Contact(s)
- Low Water Level Alarm Contact(s)
- Fan Motor: Space Heater Control(s)



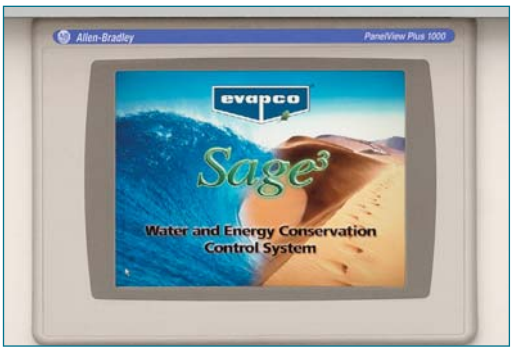
Control for Optional Accessories

- Discharge Hood Damper Controls
- Vibration Switch Controls

Conservation Control System

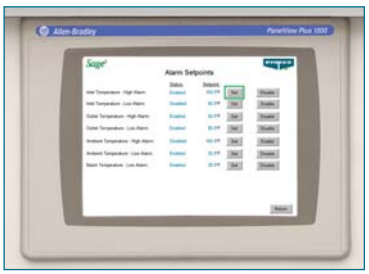
HMI Panel Display

All *Sage*[2]® and *Sage*[3]® Control Panels are provided with a 10" touch screen operator interface with a color display. This allows for easy viewing and control at the panel.



Easy-to-use Touch Screen Navigation

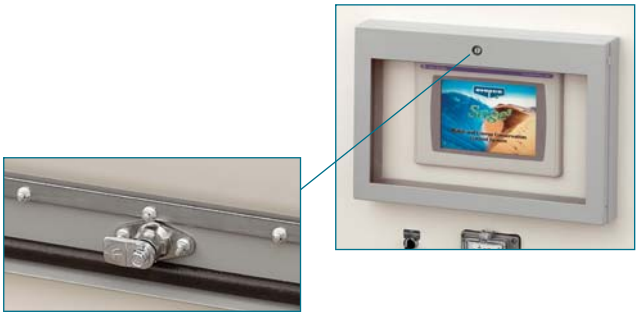
The panel boasts an easy to navigate menu which will allow the user to control each cell independently from other units and gather useful run time information at the unit.



Alarm Setpoints Screen

Plan View Screen

End View Screen



Window Enclosure

The display screen is encased by a window enclosure. This enclosure protects the HMI display from the elements.

Electric Water Level Control Package

When a *Sage*® Panel is provided, a 5-probe Electronic Water Level Controller is standard. In addition to controlling the make-up valve, this controller contains two probes that can be utilized as High/Low water alarms. This controller will also be used as a safety device, shutting off the pump and heaters if the water level becomes too low.

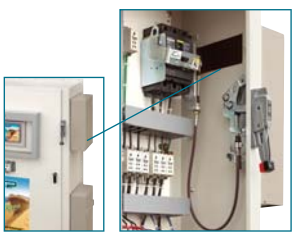
Temperature Sensors

Four separate temperature data points are monitored with this package.

- Inlet Temperature Sensor: 0°C – 100°C range
- Outlet Temperature Sensor: 0°C – 100°C range
- Dry Bulb Temperature Sensor: -34.4°C – 54.4°C range
- Basin Temperature Sensor: 0°C – 100°C range

Enclosure Temperature Control

The panel enclosure includes an intake and an exhaust ventilation fan. When the enclosure temperature rises to a predetermined set point, the exhaust fans are activated. The enclosure also contains a heater. The heater eliminates the drastic temperature changes which could create condensation inside of the enclosure.



Fan

Heater

Optional Communication Protocol May Be Available.
Please Contact Your Local Sales Representative.

eco-ATW Operating Benefits

The eco-ATW features the new EVAPCO **Ellipti-*fin*™** coil, which utilizes elliptical spiral fin coil technology. This technology allows for a significant increase in thermal performance with up to a 40% lower operating power than a typical evaporative cooler! This will result in tremendous energy savings throughout the year.

If minimizing the footprint of the unit is of greater concern, the increased thermal capacity of the **Ellipti-*fin*™** technology will allow a selection that yields up to a 40% smaller plan area!

Additionally, the **Ellipti-*fin*™** coil technology enables the eco-ATW to be operated in a 100% Dry Mode, whereby the switchover temperature is significantly higher than that of a typical bare tube coil. This leads to a significant increase in dry operating hours, thus increasing your water savings. This combination of features allows the eco-ATW to be operated with both energy and water efficiency in mind, making it the ideal choice for many installations.

eco-ATWE Operating Benefits

The eco-ATWE maintains all of the advantages of the eco-ATW with the additional benefit of enabling simultaneous wet and dry operation. The unique ***Water Efficient Mode*** of the eco-ATWE allows for a portion of the heat load to be rejected through both evaporative cooling AND dry cooling, even at high ambient temperatures, this further increases your ability to save water and offers additional associated cost savings through reduced water make-up, blow-down and chemical consumption. The eco-ATWE provides an ideal solution for applications where minimizing both energy and water consumption is critical.

Depending on the optimum eco-Cooler you select for your job, one can operate 100% wet, 100% dry or simultaneously Wet & Dry in the ***Water Efficient Mode***, offering unique advantages in freezing climates, higher temperature industrial cooling applications where 100% evaporative cooling is not always favorable.

eco-ATW and eco-ATWE Operational Savings:

Consider a Data Center cooling application for Minneapolis, MN, USA where the unit is required to reject a constant heat load of 216 tons with 41 lps (650 gpm) of water entering at a temperature of 95°F (35°C) and a leaving temperature of 85°F (29.4°C). The process operates 24 hours a day 7 days a week. Both the eco-ATW and the eco-ATWE are compared to:

- Cooler A – an evaporative cooler without dry cooling capability
- Cooler B– an induced draft counter-flow cooler capable of some dry operation

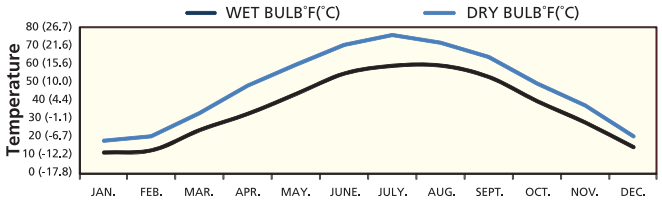
Model Attribute Comparison

	eco-ATW 12-6L12-Z	eco-ATWE 12-6L12-Z	Cooler A	Cooler B
Fan Motor HP (kW)	25 (18.5)	25 (18.5)	25 (18.5)	2x20 (2x15)
Spray Pump HP (kW)	5 (4)	2x2 (2x1.5)	10 (7.5)	2x3 (2x2.2)
Box Size ft (m)	12x12 (3.6mx3.6m)	12x12 (3.6mx3.6m)	12x12 (3.6mx3.6m)	12x12 (3.6mx3.6m)
Weight lbs. (kg)	27530 (12490)	28115 (12755)	24880 (11285)	39700 (18010)

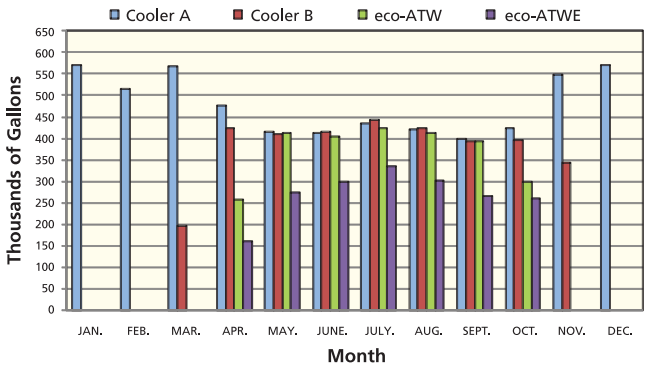
The eco-Coolers require lower pump HP than Cooler A and lower pump HP and fan HP than Cooler B. Additionally, the eco-Coolers provide either a similar or smaller footprint along with the HP savings.

With the increased dry cooling efficiency of the eco-ATW and eco-ATWE and the use of the ***Sage***® Water and Energy Conservation Control System, each unit is able to operate dry for 48.00% of the year. Additionally, the revolutionary design of the eco-ATWE allows the unit to operate in a Water Efficient Mode for an ***additional 47.9%*** of the year, further reducing water consumption. This is illustrated below:

Yearly Temperature Curve



Monthly Water Usage Comparison



Dry Mode of Operation Comparison

	eco-ATW 12-6L12-Z	eco-ATWE 12-6L12-Z	Cooler A	Cooler B
Dry Bulb Switchover °F(°C)	46.22(7.9)	46.22(7.9)	N/A	33.44(0.8)
% Dry Operation (Hrs.)	48.00%	48.00%	N/A	31.00%
% Water Efficient Mode (Hrs.)	N/A	47.90%	N/A	N/A

Due to the Dry Operation capabilities of the eco-Coolers and the added Water Efficient Mode of the eco-ATWE, the reduced costs associated with water usage are illustrated below:

Annual Water Cost Comparisons

	eco-ATW 12-6L12-Z	eco-ATWE 12-6L12-Z	Cooler A	Cooler B
Total Annual Water Usage* gallons (m^3)	2,609,876 (9878)	1,897,074 (7180)	5,753,899 (21779)	3,568,387 (13506)
% Savings vs. Cooler A/ Cooler B/	54.64%/ 26.86%	67.03%/ 46.84%	-/ -	37.98%/ -
Annual Water Savings vs. Cooler A/ Cooler B/**	$18,864/ $5,751	$23,140/ $10,027	-/ -	$8,132/ -

* Based on 3 cycles of concentration ** $US0.006 per gallon (Water & Sewer)

Summarizing these costs, the eco-Coolers will save the operator a minimum of $US18, 864 per year in associated water costs vs. a typical cooler and up to $US10,000 vs. an induced draft counter-flow cooler with some dry capacity.

Notes

In its continuing commitment to be the leaders in evaporative cooling equipment design and services, EVAPCO eco-ATW and eco-ATWE Closed Circuit Coolers are now ***Independently Certified*** to withstand both Seismic and Wind Loads in *ALL* ***Geographic Locations and Installations*** in accordance with IBC 2006.

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. The IBC is intended to replace BOCA's The National Building Code, ICBO's Uniform Building Code and SBCCI's Standard Building Code.

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 and wind load forces as the building to which they are attached.**

How Does IBC 2006 Apply to Closed Circuit Coolers?

Based on the project zip code and site design factors, calculations are made to determine the equivalent seismic "g force" and wind load on the unit. The closed circuit cooler must be designed to withstand the greater of either the seismic or wind load. More than 80% of the United States has design criteria

The New eco-ATW/eco-ATWE is offered with a choice of TWO structural design packages:

- **Standard Structural Design** – For projects with ≤ 1.0g seismic or 7kPa (145 psf) wind loads
- **Upgraded Structural Design** – Required for projects with > 1.0g seismic or 7kPa (145 psf) max wind loads

resulting in a seismic design force of 1.0g or below. These sites will be provided with the standard eco-ATW/eco-ATWE structural design. An upgraded structural design is available for installations with design criteria resulting in "g forces" greater than 1.0g. The highest upgraded structural is designed for 5.12g and 7kPa wind load.

Seismic Design

The IBC specifies that all installed components must meet the requirements of ASCE 7-05 (American Society of Civil Engineers, Minimum Design Loads for Buildings and Other Structures) . Exemptions noted in the code are for all mechanical components assigned to seismic design categories A or B. ASCE 7-05 explicitly states that in addition to the attachment and supports, the component itself must be designed to withstand the seismic forces prescribed in the code. Simply stated, the code provisions require that evaporative cooling equipment and all other components permanently installed on a structure must meet the same seismic design criteria as the building.

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.

In order to achieve this goal, an architect or civil engineer is responsible for analyzing the soil and the design of a structure to determine the factors to be used. A mechanical consulting engineer and/or design build contractor applies these factors to advise the manufacturer on the proper design for the application. EVAPCO takes this information and determines the necessary equipment to meet IBC regulations. Evapco then determines the closed circuit cooler design requirements based on the IBC criteria. The standard eco-ATW/eco-ATWE design is independently certified to meet the 1g IBC compliance factors. For applications that require a more severe seismic duty, EVAPCO offers an optional 5.12g construction design. This process ensures that the mechanical equipment and its components are seismically compliant per the provisions of the International Building Code.

Independent Certification

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 Vibrations Mountings and Controls Group (VMC) to complete the independent equipment testing and analysis.

If the seismic "g force" or wind load kPa requirements for the project site are known, please contact your local EVAPCO Representative 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 or visit www.evapco.com and www.evapcoasia.com.

A sample of the certificate of compliance and unit label is presented below.

When using the EVAPCO selection software to make a selection, these calculations are already incorporated into the selection process. Simply enter the required seismic factors and the Seismic Design Force and Wind Load will be calculated automatically!!

evapco

Certificate of Compliance

AT, USS, UAT, UT Cooling Towers
eco-ATW/WE, ATWB 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 2006
ASCE-7
NFPA 5000

Referenced Report:
VMA-43387

Approval Agency:
VMC Seismic Consulting Group

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

ID IBC COC 001

Notes

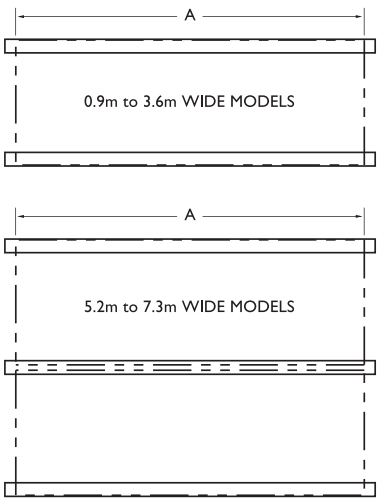
Recommended Steel Support

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, 19mm 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.)

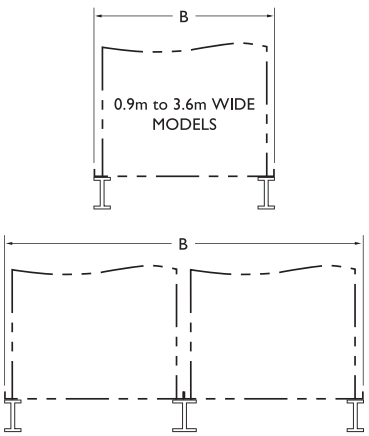
Beams should be level before setting the unit in place. Do not level the unit by shimming between the unit and the structural steel. Dimensions, weights, and data are subject to change without notice. Refer to the factory certified drawings for exact dimensions.

NOTE: Consult IBC 2006 for required steel support layout and structural design.

Plan Views



End Elevations



5.2m to 7.3m WIDE MODELS

ATWB SUPPORTING STEEL DIMENSIONS		
0.9m Wide Models	**A**	**B**
eco-ATW 3x3	908	927
1.2m Wide Models	**A**	**B**
eco-ATW 4x4	1213	1232
eco-ATW 4x6	1823	1232
eco-ATW 4x9	2737	1232
eco-ATW 4x12	3651	1232
2.5m Wide Models	**A**	**B**
†eco-ATW 9x8	2578	2283
†eco-ATW 9x9	2731	2578
†eco-ATW 9x11	3188	2578
†eco-ATW 9x12	3651	2578
†eco-ATW 9x14	4261	2578
†eco-ATW 9x18	5486	2578
†eco-ATW 9x21	6401	2578
3m Wide Models	**A**	**B**
†eco-ATW 10x12	3651	2991
†eco-ATW 10x18	5486	2991
eco-ATW 10x24	7366	2991
eco-ATW 10x36	11036	2991
3.6m Wide Models	**A**	**B**
†eco-ATW 12x12	3651	3607
†eco-ATW 12x14	4261	3607
†eco-ATW 12x18	5486	3607
†eco-ATW 12x20	6096	3607
eco-ATW 12x24	7366	3607
eco-ATW 12x28	8585	3607
eco-ATW 12x36	11036	3607
eco-ATW 12x40	12256	3607
5.2m Wide Models	**A**	**B**
eco-ATW 17x12	3651	5286
eco-ATW 17x14	4261	5286
6.1m Wide Models	**A**	**B**
eco-ATW 20x12	3651	6112
eco-ATW 20x18	5486	6112
eco-ATW 20x24	7366	6112
eco-ATW 20x36	11036	6112
7.3m Wide Models	**A**	**B**
eco-ATW 24x12	3651	7344
eco-ATW 24x14	4261	7344
eco-ATW 24x18	5486	7344
eco-ATW 24x20	6096	7344
eco-ATW 24x24	7366	7344
eco-ATW 24x28	8585	7344
eco-ATW 24x36	11036	7344
eco-ATW 24x40	12256	7344

†Also has eco-ATWE model

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, 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 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. 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. 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.

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.

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.

Other freeze protection methods are available when a remote sump is not feasible. Electric pan heaters or 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.

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.

Minimum Flows	Standard Flow lps	Series Flow lps
0.9m Wide Models		
eco-ATW 3x3	–	1.7
1.2m Wide Models		
eco-ATW 4x4 to 4x12	–	2.4
2.5m Wide Models		
†eco-ATW 9x8 to 9x21	10.1	5.1
3m Wide Models		
†eco-ATW 10x12 to 10x18	11.9	6.0
eco-ATW 10x24 to 10x36	23.8	11.9
3.6m Wide Models		
†eco-ATW 12x12 to 12x20	14.7	7.4
eco-ATW 12x24 to 12x40	29.3	14.7
5.2m Wide Models		
eco-ATW 17x12 to 17x14	20.2	10.1
6.1m Wide Models		
eco-ATW 20x12 to 20x18	23.8	11.9
ATWB 20x24 to 20x36	47.5	23.8
7.3m Wide Models		
eco-ATW 24x12 to 24x20	29.3	14.7
eco-ATW 24x24 to 24x40	58.6	29.3

†Also has eco-ATWE model

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.

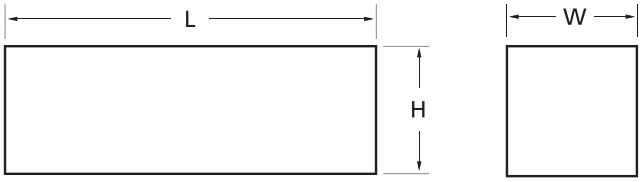
The system control sequence should allow for dampers to be fully open before the fans are running and closed when the fans are off; the damper actuator must be interlocked with the temperature control system for this purpose.

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).

Discharge Hood Dimensions

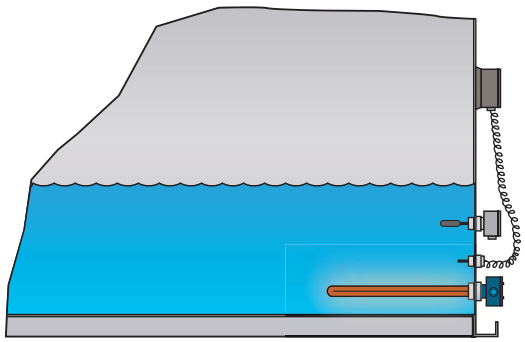
Model	L (mm)	H* (mm)	W (mm)	Weight (kg)	Number of Hoods
eco-ATW 3x3	911	457	921	418	1
eco-ATW 4x4	1216	457	1226	556	1
eco-ATW 4x6	1826	457	1226	556	1
eco-ATW 4x9	2731	457	1226	556	1
eco-ATW 4x12	3651	457	1226	556	1
†eco-ATW 9x8	2283	406	2578	1169	1
†eco-ATW 9x9	2727	406	2578	1169	1
†eco-ATW 9x11 †eco-ATW 9x12 †eco-ATW 9x14	3188	406	2578	1169	1
†eco-ATW 9x18	2731	406	2578	1169	2
†eco-ATW 9x21	3188	406	2578	1169	2
eco-ATW 17x12 eco-ATW 17x14	3188	406	2578	1169	2
†eco-ATW 10x12 †eco-ATW 10x18	3648	356	3105	1408	1
eco-ATW 10x24 eco-ATW 10x36 eco-ATW 20x12 eco-ATW 20x18	3648	356	3105	1408	2
eco-ATW 20x24 eco-ATW 20x36	3648	356	3105	1408	4
†eco-ATW 12x12 †eco-ATW 12x14 †eco-ATW 12x18 †eco-ATW 12x20	3651	356	3607	1636	1
eco-ATW 12x24 eco-ATW 12x28 eco-ATW 12x36 eco-ATW 12x40	3651	356	3607	1636	2
eco-ATW 24x12 eco-ATW 24x14 eco-ATW 24x18 eco-ATW 24x20	3651	356	3607	1636	2
eco-ATW 24x24 eco-ATW 24x28 eco-ATW 24x36 eco-ATW 24x40	3651	356	3607	1636	4

*Overall unit height will be height of the base unit plus the H dimension.
†Also has eco-ATWE model



Electric Basin Heaters

Electric immersion heaters are available factory-installed in the basin of the cooler. Standard Heaters are sized to maintain a +4°C or +5°C pan water temperature with the fans and pumps off and an ambient air temperature of -18°C. The heater option includes a thermostat and low-water protection device to control the heater and to prevent it from energizing unless they are completely submerged. All components are in weather proof enclosures for outdoor use. The heater power contactors and electric wiring are not included as standard.



eco-ATW Heater Sizes*

Unit No.	-18°C kW	-29°C kW	-40°C kW
eco-ATW 3x3	2	2	3
eco-ATW 4x4	2	3	4
eco-ATW 4x6	3	4	5
eco-ATW 4x9	4	5	7
eco-ATW 4x12	5	7	9
†eco-ATW 9x8	6	8	12
†eco-ATW 9x9	7	10	15
†eco-ATW 9x11	8	12	15
†eco-ATW 9x12	(2) 4	(2) 7	(2) 9
†eco-ATW 9x14	(2) 5	(2) 7	(2) 10
†eco-ATW 9x18	(2) 6	(2) 9	(2) 12
†eco-ATW 9x21	(2) 7	(2) 12	(2) 15
eco-ATW 17x12	(4) 4	(4) 7	(4) 9
eco-ATW 17x14	(4) 5	(4) 7	(4) 10
†eco-ATW 10x12	(2) 5	(2) 8	(2) 10
†eco-ATW 10x18	(2) 7	(2) 12	(2) 15
eco-ATW 10x24	(4) 5	(4) 8	(4) 10
eco-ATW 10x36	(4) 7	(4) 12	(4) 15
eco-ATW 20x12	(4) 5	(4) 8	(4) 10
eco-ATW 20x18	(4) 7	(4) 12	(4) 15
eco-ATW 20x24	(4) 10	(4) 15	(4) 20
eco-ATW 20x36	(4) 15	(6) 15	(6) 20
†eco-ATW 12x12	(2) 6	(2) 9	(2) 12
†eco-ATW 12x14	(2) 7	(2) 10	(2) 15
†eco-ATW 12x18	(2) 9	(2) 15	(2) 18
†eco-ATW 12x20	(2) 10	(2) 15	(3) 15
eco-ATW 12x24	(4) 6	(4) 9	(4) 12
eco-ATW 12x28	(4) 7	(4) 10	(4) 15
eco-ATW 12x36	(4) 9	(4) 15	(4) 18
eco-ATW 12x40	(4) 10	(4) 15	(6) 15
eco-ATW 24x12	(4) 6	(4) 9	(4) 12
eco-ATW 24x14	(4) 7	(4) 10	(4) 15
eco-ATW 24x18	(4) 9	(4) 15	(4) 18
eco-ATW 24x20	(4) 10	(4) 15	(4) 20
eco-ATW 24x24	(4) 12	(4) 18	(6) 15
eco-ATW 24x28	(4) 15	(4) 20	(6) 18
eco-ATW 24x36	(4) 18	(6) 18	(8) 18
eco-ATW 24x40	(4) 20	(6) 20	(8) 20

*Electric heater selection based on ambient air temperature shown.
†Also has eco-ATWE model

NOTES

EVAPCO Products are Manufactured Worldwide

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1500/1110/YGS

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