



Mr. GoodTower®



Bulletin 1110A-E Metric

# Installation, Operation and Maintenance Instructions

## AIR COOLED & ADIABATIC FLUID COOLERS AND CONDENSERS



EAFWD/EAFCD  
Flat Air Cooled



EAVWD/EAVCD  
V Coil Air Cooled



EAVWA/EAVCA  
V Coil Adiabatic

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## Introduction

Congratulations on the purchase of your EVAPCO air cooled unit. EVAPCO equipment is constructed of the highest quality materials and designed to provide years of reliable service when properly maintained.

Thoroughly clean road salt, dirt and debris from unit immediately after delivery. Residue left on product surfaces can cause damage that is not covered by any warranty. All new cooling equipment and associated piping should be pre-cleaned and flushed to remove grease, oil, dirt, debris and other suspended solids prior to operation. Any pre-cleaning chemistry should be compatible with the cooling equipment's materials of construction. Alkaline formulations should be avoided for systems which include galvanized materials of construction.

Closed hydronic systems connected to a dry fluid cooler should be pre-cleaned and flushed to remove debris, grease, flash rust, oil, and other suspended solids prior to operation. EVAPCO recommends the use of inhibitor chemistry or inhibited glycol to minimize corrosion and scale during normal operation.

Air cooled equipment is often remotely located and periodic maintenance checks are often overlooked. It is important to establish a regular maintenance program and be sure that the program is followed. This bulletin should be used as a guide to establish a program. A clean and properly serviced unit will provide a long service life and operate at peak efficiency.

This bulletin includes recommended maintenance and maintenance intervals for unit start up, unit operation and unit shutdown. Please note: the maintenance intervals are minimums. Maintenance should be performed more often when operating conditions necessitate.

Become familiar with your air cooled equipment. Refer to the isometric drawings located on pages 18-20 for information on the arrangement of components in your equipment.

If you should require any additional information about the installation, operation or maintenance of this equipment, contact your local EVAPCO representative. You may also visit [www.evapco.com](http://www.evapco.com) or [www.mrgoodtower.com](http://www.mrgoodtower.com) for more information.

## Safety Precautions

Qualified personnel should use proper care, procedures and tools when operating, maintaining or repairing this equipment in order to prevent personal injury and/or property damage. The warnings listed below are to be used as guidelines only.

-  **WARNING:** Air cooled and adiabatic cooling equipment is considered as “Partly completed machinery”. “Partly completed machinery” is a totality which almost forms a machinery but in itself cannot fulfil any particular function. The considered cooling equipment is missing the components to safely connect it to the source of energy and motion in a controlled way. The considered cooling equipment is custom made but is not designed to address the specific needs and safety measures for a specific application. Each application requires a unique designed and integrated operational, control and safety strategy that links all components of the installation and eventually a back-up system in a safe and controlled way.
-  **WARNING:** Never operate this equipment without fan screens and access panels properly secured and in place.
-  **WARNING:** During maintenance operations, the worker must use adequate personal protection equipment (PPE - A minimum, but not limited list of PPE are safety shoes, glasses, gloves, respiration protection, helmet) as prescribed by local authorities.
-  **WARNING:** For any exceptional, non routine work to be carried out, protection and adequate safety measures should be considered and a Last Minute Risks Assessment (LMRA) must be made by an authorized person in accordance with safety requirements of the country.
-  **WARNING:** A lock-out / tag-out procedure, integrated with the Process Control System, must be foreseen by the customer. Before performing any type of service or inspection of the unit, make certain that all power has been disconnected and locked in the “OFF” position.
-  **WARNING:** The top horizontal surface of any unit is not intended to be used as a working platform. No routine service work is required from this area. For any exceptional, non routine work to be carried out on top of the unit, use ladders, PPE and adequate safety measures against the risk of a fall, in accordance with safety requirements of the country in question.
-  **WARNING:** Sound reducing options are available. In case these options are not taken in consideration, the customer must design the installation to comply with local sound requirements and legislation.
-  **WARNING:** In order to avoid excessive pressure, proper safety valves should be foreseen in the cooling installation. These safety measures are not delivered by Evapco and are the responsibility of the customer/contractor. The application of these safety measures has to be evaluated for the cooling system as a whole and not limited to the partly completed machinery.
-  **WARNING:** Closed hydronic systems connected to either a closed-circuit cooler or dry cooler should be pre-cleaned and flushed to remove debris, grease, flash rust, oil, and other suspended solids prior to operation. EVAPCO recommends the use of inhibitor chemistry or inhibited glycol to minimize corrosion and scale during normal operation.

- ⚠ WARNING:** Atmospheric corrosion and corrosion due to the use of corrosive media at the inside/or outside of the coils is forbidden and voids the PED certification.
- ⚠ WARNING:** Every handling that effects the integrity of the pressure vessel (example, but not limited to, welding, grinding, drilling, ... ) is forbidden and voids the PED certification.
- ⚠ WARNING:** EVAPCO requires that all external piping and fittings be externally supported, the supplied connections are not designed to support external piping or fitting weights. Additional weight to the connections or coil in any way could cause damage to the unit not covered under warranty.
- ⚠ WARNING:** Never use plastic sheets or tarps to protect a unit during storage. This practice can trap heat inside the unit and could potentially cause damage.
- ⚠ WARNING:** Do not operate the pressure vessel at service conditions outside of the PED nameplate located at the coil connection.
- ⚠ WARNING:** Maximum working temperature of the pressure vessel as mentioned on the PED nameplate exceeds the nominal operating temperature of the unit. Never apply pressure vessel temperatures above 60°C or consult the factory for approval.
- ⚠ WARNING:** Legal periodic controls of the pressure vessel need to be performed according to the legal requirements of the country.

## Terminology

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Throughout this manual, the terms “Flat” and “V Coil” are used. Below is a list of EVAPCO eco-Air Dry Fluid Cooler and Air Cooled Condenser product offerings and associated terminology.

eco-Air Series equipment includes the following product models:

- **Flat Air Cooled:**
  - EAFWD - Dry Fluid Cooler
  - EAFCD - Air Cooled Condenser
- **V Coil Air Cooled:**
  - EAVWD - Dry Fluid Cooler
  - EAVCD - Air Cooled Condenser
- **V Coil Adiabatic:**
  - EAVWA - Adiabatic Fluid Cooler
  - EAVCA - Adiabatic Air Cooled Condenser

## Receiving

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Carefully inspect all units upon arrival to assure that no damage has occurred during shipment. This includes searching for dirt and debris caused by shipping, as well as inspecting all components and accessories for physical damage. If any units have been damaged during transit, immediately notify the carrier and file a claim with that carrier.

## Structural Steel Support

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Two structural “I” beams running the length of the unit are required for supporting the eco-Air series units. These beams should be located underneath the outer flanges of the unit as shown in Figure 1. See Table 1 for Steel Support Dimensions.

Mounting holes, 19 mm in diameter, are provided for bolting the unit to the structural steel. Refer to the recommended structural steel support drawing and certified print for exact bolt hole location.

Beams should be sized in accordance with accepted structural practices. Maximum deflection of the beam under the unit should be 1/360 of the unit length, not to exceed 13 mm.

The supporting “I” beams should be level before setting the unit in place. Do not level the unit by shimming between it and the beams as this will not provide proper longitudinal support.

Support beams and anchor bolts are to be provided by others.

eco-Air Series Supporting Steel Dimensions		
V Models	Dry Unit Base Width (W)	Adiabatic Unit Base Width (W)
1,2 m	1270 mm	1778 mm
2,2 m	2197 mm	2680 mm
2,4 m	2229 mm	2762 mm
F Models	Base Width (W)	-
1,8 m	1711 mm	-
2,2 m	2111 mm	-
2,4 m	2311 mm	-

Table 1 – Structural Steel Support Dimensions

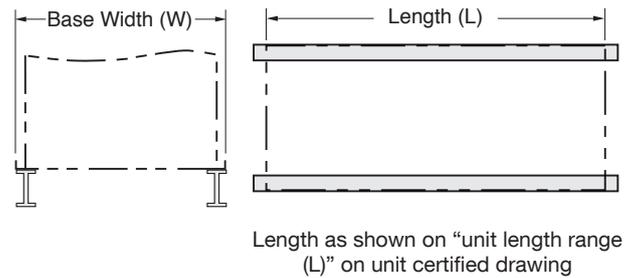


Figure 1 – Supporting Steel Diagram

## Rigging

All eco-Air Series air cooled units covered in this manual are designed to be removed from the truck via crane. Smaller units that are less than 8.2 m in length also have provisions for removal from the truck via forklift. These units can be installed onto the structural steel in the same manner as removed from the truck.

Ensure that the crane operator and/or the truck driver lift the unit securely. Always consider the weight of the unit with regard to crane or forklift.

Tubes, return bends, coil connections and headers are never to be used for lifting.

Remove any packaging material and verify that no damage, has occurred. Slightly bent fins can be repaired easily using a fin comb or needle nose pliers.

Damaged tubes are only to be repaired by a qualified welder. If the damage of the tubes cannot be repaired by your welder contact your local EVAPCO representative to arrange for inspection and/or repairs.

### Flat Coil Configuration Products (EAFWD/EAFCD):

Flat coil units are typically shipped with legs attached. However there could be instances when flat coil units are strapped to a wooden pallet or enclosed in an open slatted or fully enclosed crate. To avoid handling damage, EVAPCO recommends that the product is off-loaded from the vehicle while still attached to its pallet or in its crate if provided.

When flat units are shipped crated with the legs removed, the legs will need to be attached before placing the unit on the structural steel. Below is a drawing showing proper attachment of the legs to the unit.

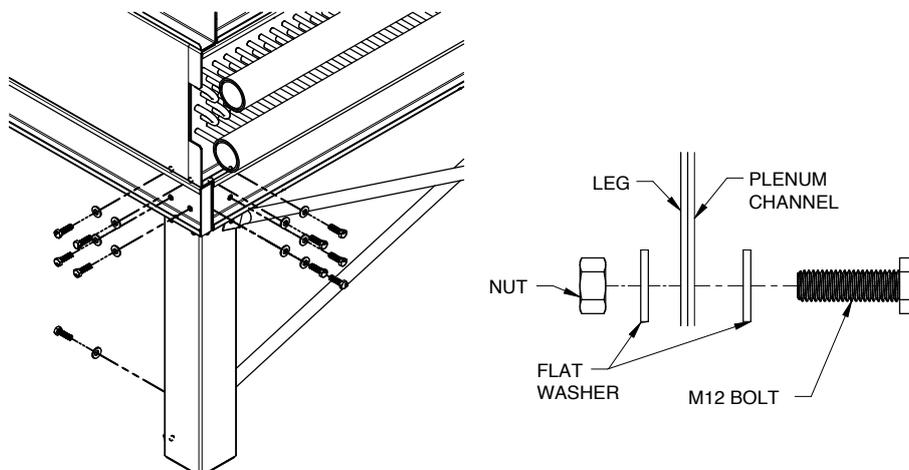
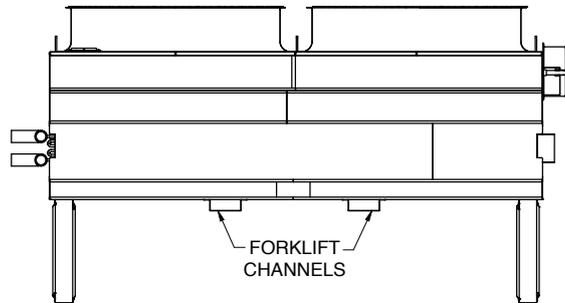


Figure 2 – Flat Unit Leg Attachment

## Forklift Lift:

Ensure that the forklift truck is large enough to handle the size and weight of the product required to be off-loaded. Unit weights can be found on the unit certified drawing. Units with a length less than 8,2 m are provided with standard EVAPCO steel forklift channels positioned under the unit. Forklift channels will be identified by a label on the unit. If labels and forklift channels are not present, **STOP!**, the unit will need to be rigged via a crane. Forklift channels are only provided on all units that are capable of being rigged via forklift. Larger units will need to be lifted via a crane or else unit and coil damage may occur.

Below is a diagram representing the location of the forklift channels on flat units.



**Figure 3 – Flat Coil Forklift Channel Locations**

The forks must be long enough to protrude at least 30 cm beyond the width of the product.



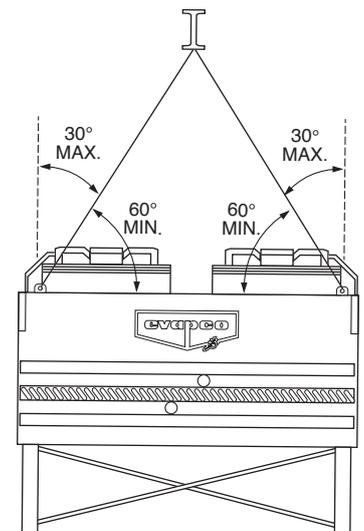
**Figure 4 – Flat Coil Units Forklift Lifting Requirements**

Under no circumstances, even if forklift channels are fitted, should 'short forks' be used as this will result in damage to the unit casing and/or coil of the unit. Ensure that the weight is evenly distributed before attempting to lift the product. Follow industry standard forklift recommendations and guidelines.

## Crane Lift:

Ensure that the crane operator uses adequate straps, chains, spreader bars etc., to safely and securely handle the weight of the product. The minimum angles for lifting by crane, when viewed from the unit end, must NEVER be less than a 60° angle from horizontal as shown in Figure 5. When viewed from the side of the unit the lifting angle must always be perpendicular to the unit; any angle could cause damage to the unit and coil.

To achieve a minimum 60° angle, the chains attached to the lifting device must be a minimum dimension "H" above the unit casing to prevent undue strain on the lifting ears. See Table 2 for the minimum "H" dimension. These lifting devices should not be used for extended lifts or where any hazard exists unless safety slings are employed under the unit.



**Figure 5 – Minimum Crane Lifting Angles**

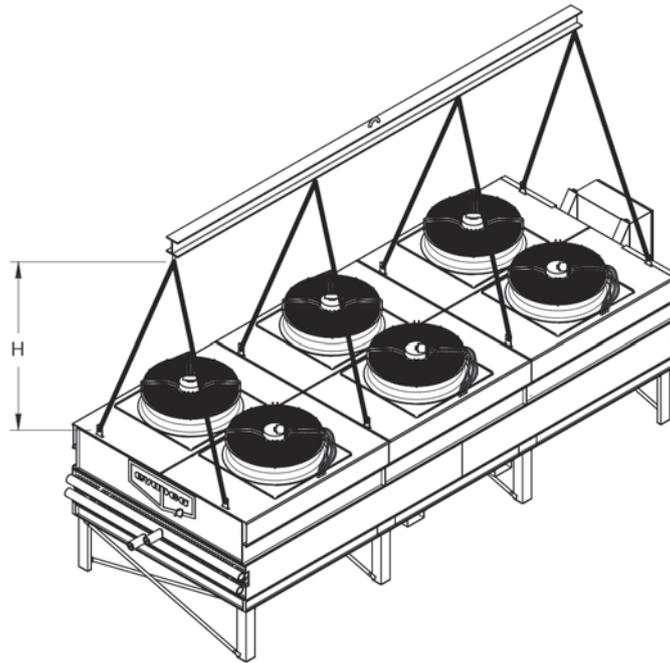


Figure 6 – Rigging Beam Height Requirements

Unit Width	Minimum Height (H) Dimension (m)
1,8 m	1,1
2,2 m	1,6
2,4 m	1,6

Table 2 – Minimum “H” Dimensions

Carefully and securely attach chains to unit lifting ears based on the below information. Lifting ears are provided on the top of the fan sections for lifting the unit into final position. The unit will only be supplied with the lifting ears required, **THEREFORE USE ALL LIFTING EARS THAT ARE PROVIDED.** The lifting ear requirements vary depending on incremental fin length, or distance between tube sheets and lifting ears, therefore you will need to refer to the unit model number to accurately determine which of the below details describes your unit.

The 6th digit after the first hyphen in the model number depicts incremental fin length. For example in the model number: EAVCD-15S2Z**K**4-xxxxxxxxx the **K** depicts the incremental fin length. Possible incremental fin length characters are **B**, **K**, and **I**. This can be further broken down by the type of fans.

Below is a table for a quick reference guide, showing which unit type applies to which lifting ear requirement figure.

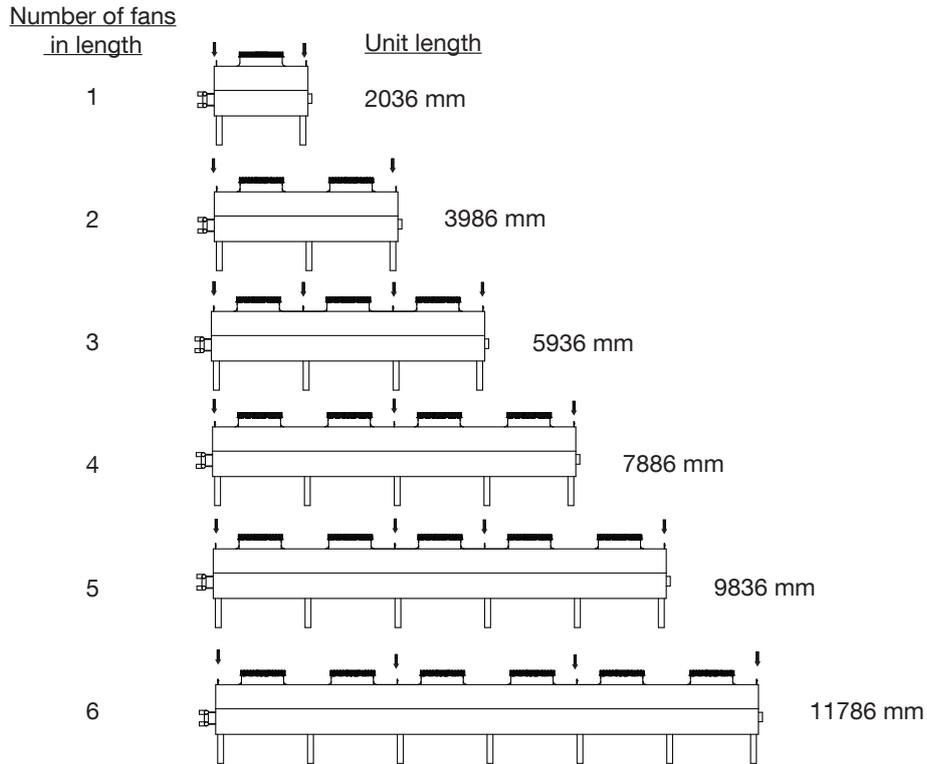
Incremental Fin Length Designator	Incremental Fin Length	Fan Type	Figure Number
B	1755 mm	EC	N/A
		AC	9
K	1950 mm	EC	7
		AC	N/A
I	2340 mm	EC	8
		AC	10

Table 3 – Lifting Ear Requirement Reference

**Required Lifting Requirements – Flat EC Fan Models**

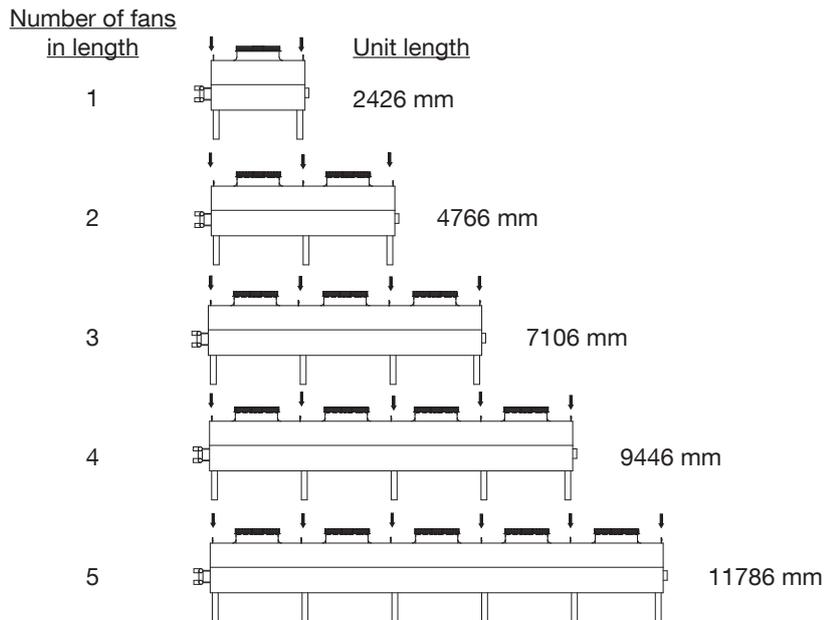
Units with EC Fans will have either a **K** 1950 mm, or **I** 2340 mm incremental fin length designator.

Below are the **K** unit lifting requirements.



**Figure 7 – Lifting Ear Requirements for 1950 mm Incremental Fin Length**

Below are **I** 2340 mm incremental fin length units rigging requirements:

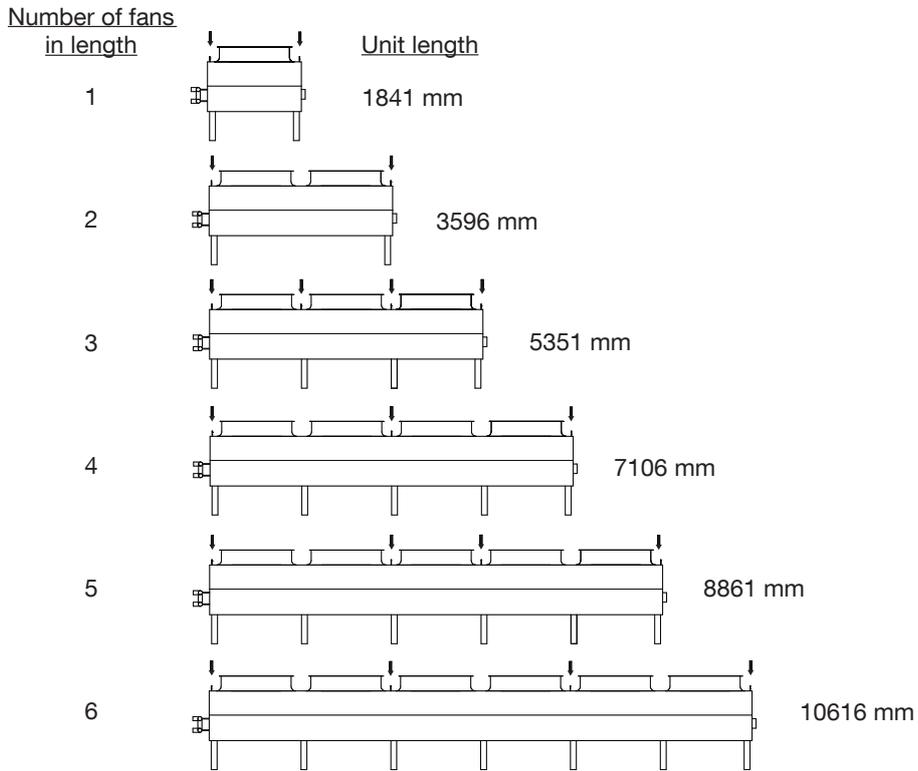


**Figure 8 – Lifting Ear Requirements for 2340 mm Incremental Fin Length**

**Required Lifting Requirements – Flat AC Fan Models**

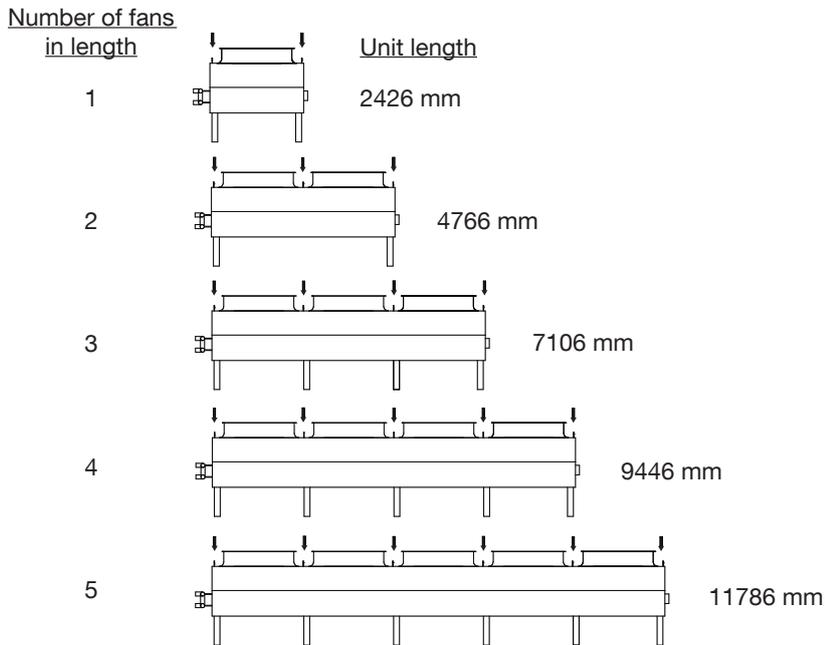
Units with AC Fans will have either a **B** 1755 mm or **I** 2340 mm incremental fin length designator.

Below are the **B** unit lifting requirements.



**Figure 9 – Lifting Ear Requirements for 1755 mm Incremental Fin Length**

Below are **I** 2340 mm incremental fin length units rigging requirements:



**Figure 10 – Lifting Ear Requirements for 2340 mm Incremental Fin Length**

## V Coil Configuration Products (EAVWD/EAVCD and EAVWA/EAVCD)

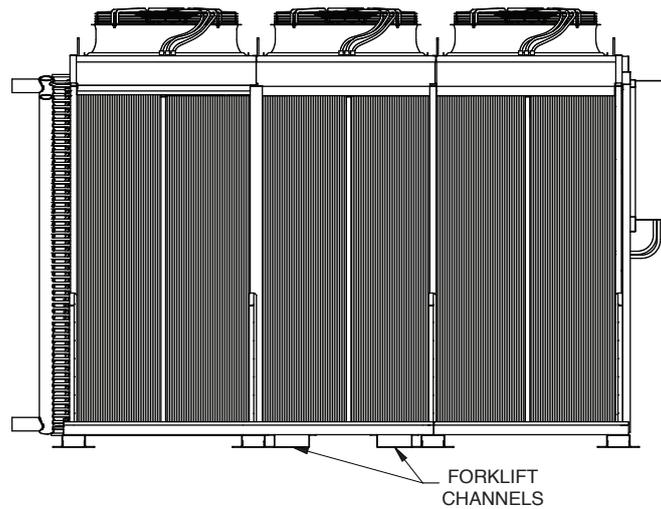
EVAPCO eco-Air V Coil units utilize a skidless design allowing for ease of installation and transportation.

### Forklift Lift:

Ensure that the forklift truck is large enough to handle the size and weight of the product required to be off-loaded. Unit Weights can be found on the unit certified drawing.

Units with a length less than 8,2 m are provided with standard EVAPCO steel forklift channels positioned under the unit. Forklift channels will be identified by a label on the unit. If labels and forklift channels are not present, STOP!, the unit will need to be rigged via a crane. Forklift channels are provided on all units that are capable of being rigged via forklift. Larger units will need to be lifted via a crane or unit and coil damage may occur.

Below is a diagram representing the location of the forklift channels on flat units.



**Figure 11 – V Coil Forklift Channel Locations**

The forks must be long enough to protrude at least 30 cm beyond the width of the product.



**Figure 12 – V Coil Unit Forklift Lifting Requirements**

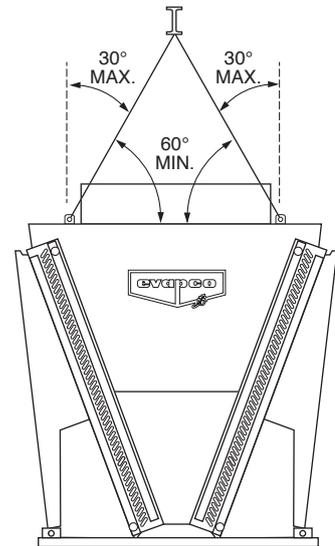
Under no circumstances, even using forklift channels, should 'short forks' be used as this will result in damage to either the unit casing or coil of the unit.

Ensure that the weight is evenly distributed before attempting to lift the product. Follow industry standard forklift recommendations and guidelines.

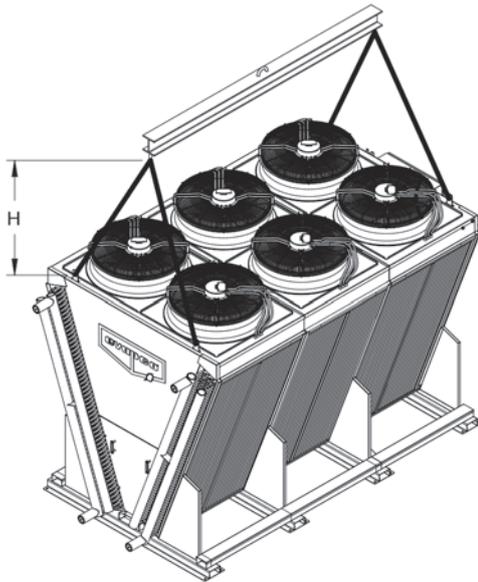
**Crane Lift:**

Ensure that the crane operator uses adequate lifting straps, chains, spreader bars etc., to safely and securely handle the weight of the product. The minimum angles for lifting by crane when viewed from the unit end, must **NEVER** be less than a 60° angle from horizontal as shown in Fig 13. When viewed from the side of the unit the lifting angle must always be perpendicular to the unit; any angle could cause damage to the unit and coil.

To achieve a minimum 60° angle, the chains attached to the lifting device must be a minimum dimension “H” above the unit casing to prevent undue strain on the lifting ears. See Table 4 for the minimum “H” dimension. These lifting devices should not be used for extended lifts or where any hazard exists unless safety slings are employed under the unit.



**Figure 13 – Minimum Crane Lifting Angles**



**Figure 14 – Rigging Beam Height Requirements**

Unit Width	Minimum Height (H) Dimension (m)
1,2 m	0,8
2,2 m	1,6
2,4 m	1,6

**Table 4 – Minimum “H” Dimensions**

Carefully and securely attach chains to unit lifting ears based on the below information. Lifting ears are provided on the top of the fan sections for lifting the unit into final position. Unit will only be supplied with the lifting ears required, **THEREFORE USE ALL LIFTING EARS THAT ARE PROVIDED.** The lifting ear requirements vary depending on incremental fin length, or distance between tube sheets and lifting ears, therefore you will need to refer to the unit model number to accurately determine which of the below details describes your unit.

The 6th digit after the first hyphen in the model number depicts incremental fin length. For example in the model number: EAVCD-15S2Z**K**4-xxxxxxxx the **K** depicts the incremental fin length. Possible incremental fin length characters are **A, J, B, K,** and **I**. This can be further broken down by the type of fans.

Below is a table for a quick reference guide, showing which unit type applies to which lifting ear requirement figure.

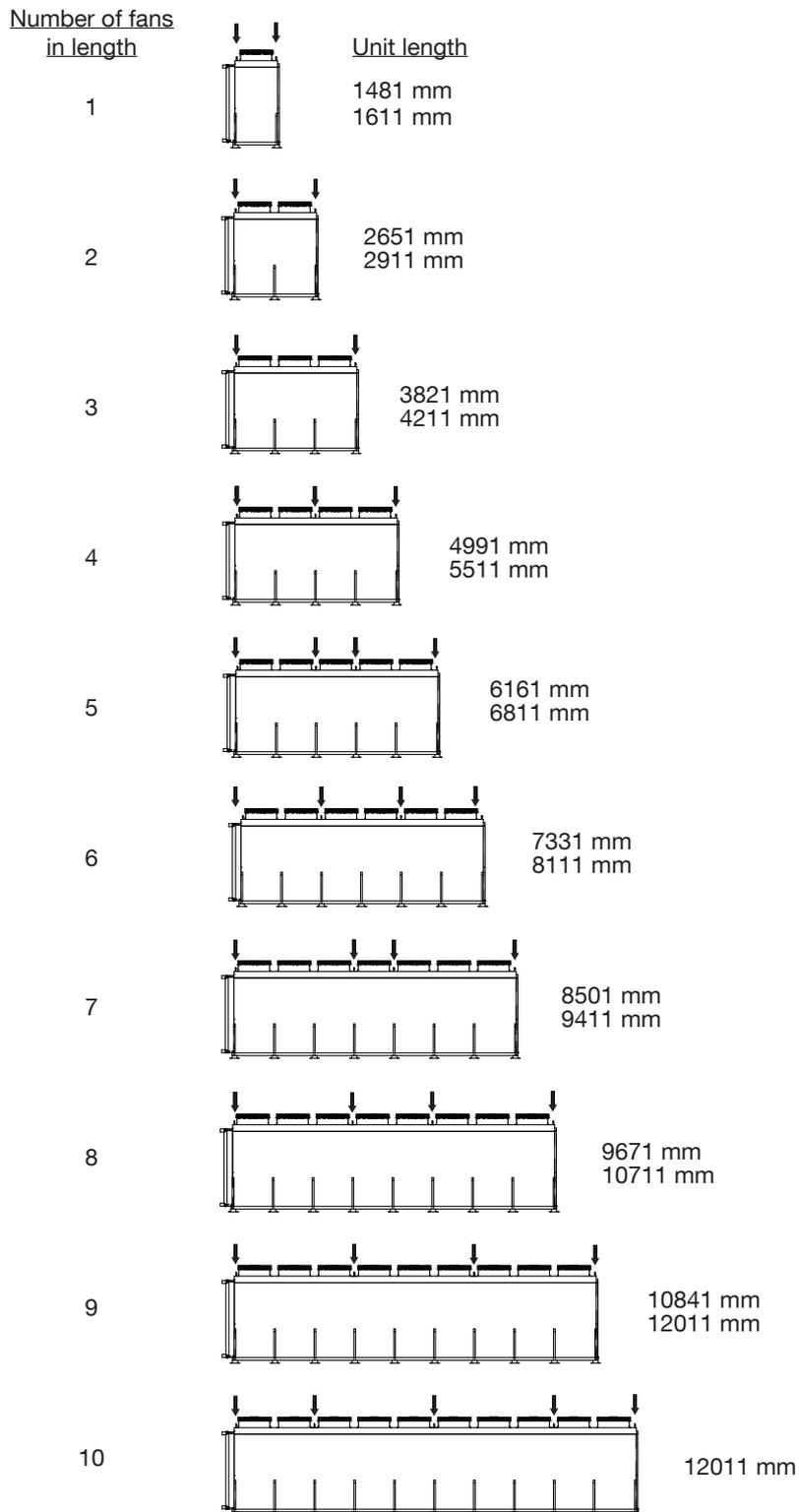
Incremental Fin Length Designator	Incremental Fin Length	Fan Type	Figure Number
<b>A</b>	1170 mm	EC	15
<b>J</b>	1300 mm	EC	15
<b>B</b>	1755 mm	AC	16
<b>K</b>	1950 mm	AC	16
<b>I</b>	2340 mm	AC	17

**Table 5 – Lifting Ear Requirement Reference**

## Required Lifting Requirements – V Coil EC Fan Models

Units with EC fan assemblies will have either an **A** 1170 mm or **J** 1300 mm incremental fin length designator.

Below are the lifting requirements for these units.

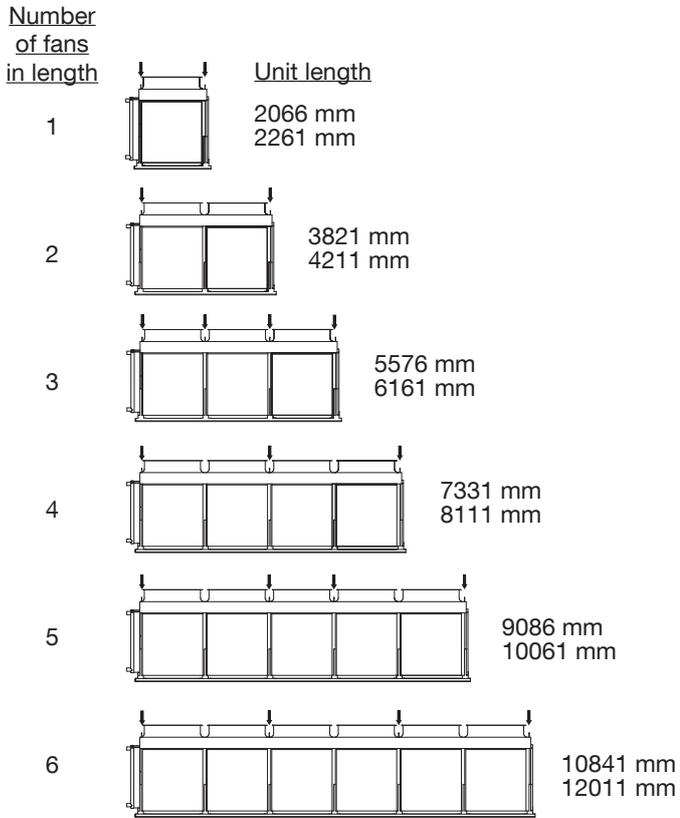


**Figure 15** – Lifting Ear Requirement for 1170 mm and 1300 mm Incremental Fin Lengths

**Required Lifting Requirements – V Coil AC Fan Models**

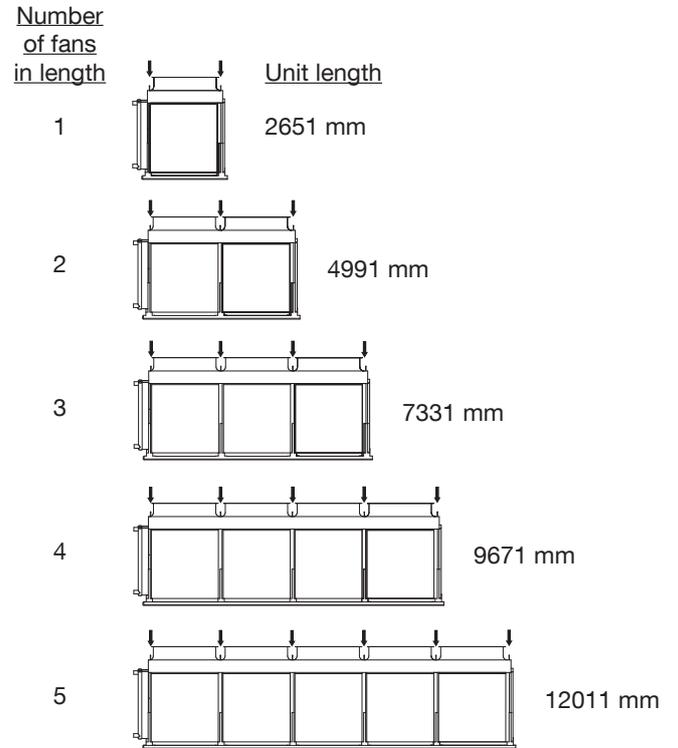
Units with AC Fans will have either a **B** 1755 mm, **K** 1950 mm or **I** 2340 mm incremental fin length designator.

Below are the **B** and **K** unit lifting requirements.



**Figure 16** – Lifting Ear Requirement for 1755 mm and 1950 mm Incremental Fin Lengths

Below are **I** unit lifting requirements:



**Figure 17** – Lifting Ear Requirement for 2340 mm Incremental Fin Lengths

**Initial Storage and/or Idle Period Recommendations**

If the unit will remain inactive for an extended period of time prior to installation it is recommended that the following be performed in addition to all component manufacturers recommended maintenance instructions.

- The fans must be turned by hand at least once every three months. This can be accomplished by tagging and locking out the unit’s disconnect, grasping the fan assembly and rotating it several turns.
- If unit remains inactive longer than one month, insulation test motor windings semi-annually.
- See fan manufacturer maintenance and long term storage instructions for more detailed instructions.
- Thoroughly clean road salt, dirt and debris from unit immediately after delivery. Residue left on product surfaces can cause damage that is not covered by any warranty.

## **International Building Code Provisions** (Only applicable for IBC certified equipment)

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The International Building Code (IBC) is a comprehensive set of regulations addressing the structural design and installation requirements for building systems – including HVAC and industrial refrigeration equipment. The code provisions require that dry and adiabatic cooling equipment and all other components permanently installed on a structure must meet the same seismic design criteria as the building.

All items attached to EVAPCO eco-Air Series coolers and condensers must be independently reviewed and isolated to meet applicable wind and seismic loads. This includes piping, ductwork, conduit, and electrical connections. These items must be attached to the EVAPCO unit so as not to transmit additional loads to the equipment as a result of seismic or wind forces. EVAPCO requires that all external piping and fittings be externally supported, the supplied connections are not designed to support external piping or fitting loads. Additional forces to the connections or coil in any way could cause damage to the unit not covered under warranty.

## **Initial and Seasonal Start-Up and Shut-Down**

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### **General**

1. Verify that the overall installation reflects the requirements of the installation guidelines found in EVAPCO Bulletin #320-E Metric. – Equipment Layout Manual available at [www.evapco.eu](http://www.evapco.eu).
2. Verify all safety interlocks work properly.
3. Examine wiring for loose connections or other obvious damage (quarterly).
4. For units supplied with an EVAPCO controls system see the Controls Operating Manual for motor and controls startup. For units not supplied with controls see motor manufacture's and controls manufacture's start up recommendations.
5. If the unit is going to remain inactive for an extended period of time, follow all manufacturers' fan motor for long term storage. Properly ventilated plastic sheets or tarps can be used to protect a unit during storage. See your local EVAPCO representative for additional information on unit storage.

**BEFORE BEGINNING ANY MAINTENANCE, BE CERTAIN THAT THE POWER IS TURNED OFF AND THE UNIT IS PROPERLY LOCKED AND TAGGED OUT!**

### **Initial and Seasonal Start-Up**

1. Clean and remove any debris, such as leaves and dirt from the coil face, adiabatic pads (if equipped), and fan screens. Flush the adiabatic pads to remove any sediment or dirt.
2. If equipped, the factory set flow setter devices on the adiabatic system piping may need to be adjusted to maintain equal distribution of water flow on both sides of the unit.
3. Fins can be brushed clean with a soft bristle brush or pressurized water, not aimed at an angle, but directly onto the fins to clean accumulated deposits. A fin comb or needle nose pliers can be used to straighten any fins that have become bent. Fins that had been damaged and straightened with a fin comb may not look like new but will function normally if air spaces remain open.
4. Turn the fan(s) by hand to insure it turns freely without obstructions.
5. Visually inspect the fan blades. Blade clearance should be approximately 6 mm from tip of blade to the fan cowl.
6. For fluid coolers only, fill the heat exchanger coil with the specified heat transfer fluid and purge air from the system before pressurizing, using factory supplied coil vents.

**NOTE: Dry fluid coolers should only be used on sealed, pressurized systems. Continual aeration of the heat transfer fluid in an open system can cause corrosion inside the tubes of the cooler leading to premature failure.**

For fluid coolers or condensers with optional controls, see EVAPCO Controls Operating Manual for proper start up procedure.

## After the unit has been energized, check the following:

1. Verify fans are rotating in proper direction based on arrow sticker affixed to fan housing.
2. Measure voltage and current on all three power leads of fan motors. The current should not exceed the motor nameplate full load amp rating.
3. Start the EVAPCO Air Pre-Cooling System if equipped and check for proper pad wetting. If pad is not completely wetted refer to troubleshooting guide in this manual.

## Seasonal Shutdown

Steps should be taken to ensure that when the equipment is shut down for prolonged periods, the unit is managed in the correct fashion.

## Dry Fluid Coolers

1. Ensure the process is shut down and the system temperature has reached safe shut down condition.
2. If unit is equipped with an adiabatic air pre-cooling system ensure that all valves are open and system is completely drained.
3. Switch off the fans and power to the unit.
4. Close the isolating valves by others, if equipped.
5. If the cooler will be subjected to sub-zero temperatures and is not filled with a suitable antifreeze, open the air vent and drain connection(s) and drain the heat transfer fluid. Applying a positive pressure to the air vent connection(s) will help ensure that there is no heat transfer fluid retention, which could lead to frost damage.

## Air Cooled Condensers

1. Ensure that the refrigeration load is removed.
2. If unit is equipped with an adiabatic air pre-cooling system ensure that all valves are open and system is completely drained.
3. Switch off the fans and power to the product.

## Basic eco-Air Series Sequence of Operation

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**Note:** For units with an EVAPCO Controls system refer to the EVAPCO Controls Operating Manual for detailed sequence of operation.

### System Off / No Load

The unit's fans are off. Adiabatic air pre-cooling systems should be off, if equipped.

### System/Condensing Temperature Rises

The fans turn on. For a variable speed controller, the fans are turned on to minimum speed, all fans maintaining the same speed. If the system temperature continues to rise, then the fan speed is increased as required, up to full speed.

If temperatures continues to rise and an adiabatic air pre-cooling system is equipped then the water solenoid valve should open and completely wet adiabatic pads. Fan speeds are increased and decreased as needed after adiabatic air pre-cooling system is initiated.

### System Temperature Stabilizes

Control the leaving fluid temperature (fluid coolers) or condensing temperature (condensers) by modulating the fan speeds with equipped controls system.

### System/Condensing Temperature Drops

Decrease the fan speed, as required. If equipped, shut off adiabatic air pre-cooling system and continue to modulate fan speed.

## System Off / No Load

The system fans turn off. The adiabatic system should not be used as a means of capacity control, and should not be cycled frequently. Excessive cycling can lead to scale build-up on the pads, and reduce pad life.

**NOTE: MINIMUM CONTROL POINT FOR PROCESS FLUID SHOULD NEVER BE LOWER THAN 3,5°C ABOVE PROCESS FLUID FREEZING TEMPERATURE.**

## Maintenance Instructions

It is essential to understand that fouled or dirty fins reduce heat transfer.

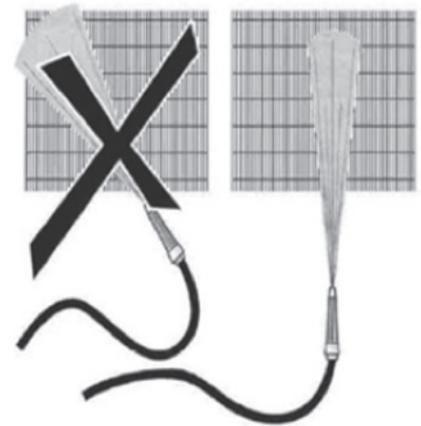
1. After operation for a month, check for fouling of the fins. Inspect with a light between the fins to observe the accumulations of dirt and dust.
2. Dry dust can normally be removed by compressed air, a soft brush, or by a suitable industrial vacuum cleaner. Sweep along the fins and under no circumstances across the fins.
3. Moist or sticky blemishes or grease should be removed by means of hot water or steam jet cleaning appliances (against the air direction).
4. Keep the jet of the cleaning appliance at an angle of no more than 15° from vertical position, to avoid bending the fin edges.

### Cleaning Hydraulically

When cleaning the coil hydraulically, EVAPCO recommends using water only. If cleaning products are used ensure that they are compatible with the unit materials of construction. When cleaning with water under pressure, use a power washing device designed for a maximum of 41 barg or less.

Always clean in the vertical direction. Never across the fins, as this will damage the fins. And always from the top down to avoid the water spray entering the fans (this can short circuit the fans).

For oily or otherwise difficult to remove dirt, it is possible to add a chemical cleaning agent to the water used in the power washer. Ensure that the cleaning agent is compatible with the materials used in the unit and that it is an environmentally friendly agent.



**Figure 16** – Always Clean Fins in Vertical Direction

### Cleaning with Compressed Air

When cleaning with compressed air, use a compressor designed for a maximum of 68 barg or less. For the purpose of removing dirt and debris, please ensure that the air stream is COMPLETELY VERTICAL to the fins as the compressed air stream can damage the fins.

### Cleaning with Brushes

Dry dust and some dirt can be removed with brushes, possibly in conjunction with compressed air or an industrial vacuum cleaner.

However, ensure that soft brushes are used and when possible all cleaning should be from the top down. **ALWAYS** brush along the fins. **NEVER** across the fins, as this will damage the fins.

### Cleaning the Fans

**ALWAYS** ensure that the power to fans has been locked and tagged out prior to cleaning and ensure that the fans cannot be accidentally started during maintenance.

It is recommended to clean the fans either by means of brushes or with compressed air. When cleaning with compressed air, use a compressor designed for a maximum discharge air pressure of 8 barg or less.

## Adiabatic Water System – If Equipped

Adiabatic air pre-cooling systems are supplied with many dry fluid coolers and air cooled condensers to enhance the performance of the unit. The below figure shows the major components of the adiabatic water system.

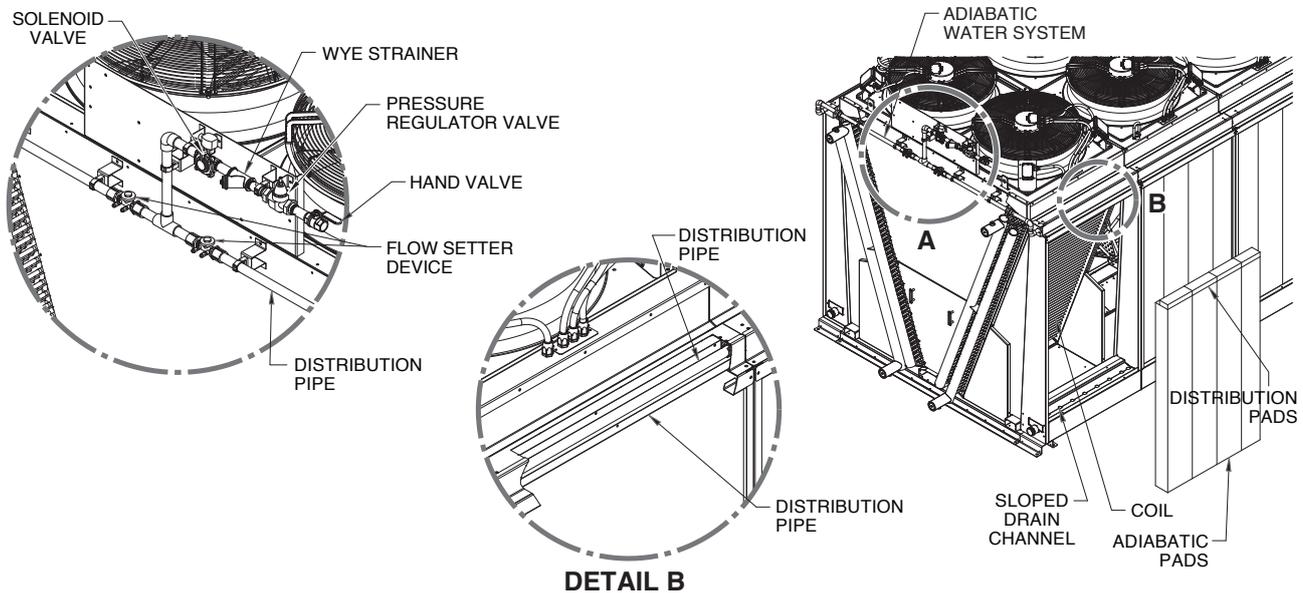


Figure 17 – Adiabatic Air Pre-Cooling System Components

### Operation

All connecting piping to the unit **MUST** be externally supported. The piping on the unit is not designed to bear additional piping weight.

EVAPCO recommends visually inspecting adiabatic pads and the distribution system regularly during operation and before seasonal startup. When in operation the pads should be completely wetted (there will be a noticeable color difference). If portions of the pad are not wetted, inspect the water distribution system for clogs.

Allow the pads to completely dry once every 24 hours with the fans running.

A pressure regulator valve (PRV) is located at the end of each unit as shown in Figure 17. The PRV must be set to 2.4 barg using the provided pressure gauge located between the discharge of the PRV and the inlet of the hand shut off valve.

The water distribution system comes preset from the factory with the correct water flow rate to ensure minimal but even water distribution. When the adiabatic system is in operation and the flow setters are set correctly a small amount of water will be present in the sloped drain channel. If it becomes necessary to adjust the water flow rate, adjust the percentage closed of the flow setter devices using a philips screw driver until only a small amount of water is in the sloped drain channel but ensuring that the adiabatic pads are completely wetted.

Note that on longer units there are two flow setter devices on each side of the unit and the flow setter percentage closed settings are different for each. The flow setter device that supplies the longest portion of the unit is designed to be as open as possible.

## Maintenance

Rinse the adiabatic pads to remove loose sediment or dirt. If further cleaning is required use only a mild and environmentally responsible cleaning agent that is compatible with the unit and pads materials of construction.

To remove the adiabatic pads use the following instructions. Installation is the reverse of removal.

1. Remove the bolts on the top of the distribution system cover. This allows the distribution cover to be repositioned revealing the water distribution tray, and the distribution pad.
2. Carefully remove the distribution pad, which is the 35 mm tall pad positioned between the distribution tray and the large vertical adiabatic pads.
3. Lift the large vertical adiabatic pad to clear the lower support (at the bottom) and remove. It is recommended to start with the center pad per module. This will allow for the pads adjacent to the tube sheets to clear metal brackets attached to the tube sheets.
4. Installation is reverse of removal.

Ensure the sloped drain channel and outlet connection are free of debris that would impede water flow by removing the adiabatic pads and then removing the slotted sloped drain channel cover.

The pad material is a bonded cellulose UV Resistant material. Refer to local codes and ordinances for disposal methods.

Remove and clean the Wye strainer annually to prevent the build up of debris and decreased water flow rate to the adiabatic pads.

## Inlet Water

The water supply temperature and pressure are typically around 10°C and 3,5 barg, respectively for standard city water main lines. The EVAPCO adiabatic pre-cooling systems requires a minimum water pressure of 3,5 barg at the inlet connection. The adiabatic system piping (see Figure 17) includes a water pressure reducing valve to enable the use of high pressure supply water, up to 10 barg, to be connected. The inlet connection is the highest point on the EVAPCO adiabatic pre-cooling system, allowing for free drainage of water, after the solenoid valve, upon system shutoff. Normal municipal and ground water supplies are suitable for use with the adiabatic pre-cooling system pads. If other water sources, cleaning agents, or treatments are to be used, ensure that they are compatible with all of the eco-Air product line materials of construction including PVC, brass, bonded cellulose, galvanized steel and 304L stainless steel.



## MAINTENANCE CHECKLIST



PROCEDURE	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC
1. Check fins for clogging or debris – <b>monthly</b>												
2. Check unit for damage – <b>quarterly</b>												
3. Check unit for leaks – <b>quarterly</b>												
4. Clean the coil(s) – <b>semi-annually</b>												
5. Check cooler coil connections for tightness – <b>annually</b>												
6. Check the fan blades for cracks, missing balancing weights, and vibration – <b>quarterly</b>												
7. Examine all wiring for signs of loose connections or obvious damage – <b>quarterly</b>												
8. Check unit control sequence and assure proper operation – <b>quarterly</b>												
9. Inspect and clean unit surfaces – <b>annually</b>												
a. Galvanized: scrape blemishes and coat with ZRC												
b. Stainless: clean and polish with a stainless steel cleaner.												



<b>Adiabatic Units (During Operation):</b>	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC
1. Check adiabatic pad and water distribution system for damage or incorrect pad wetting – <b>monthly</b>												
2. Confirm system water piping integrity including the flow setter adjustment. The flow setter can be used to adjust the amount of water distributed to the pad. Assure holes are unclogged. – <b>bi-monthly</b>												
3. Check pads for damage and sufficient wetting – <b>monthly</b>												

**Fan System**

Fan motors have permanently sealed bearings; therefore, no lubrication is required. Be sure to verify any instructions for special motors that have been ordered. A motor data sheet and specific motor instructions are shipped with each unit.

Please refer to EVAPCO’s Control Operations and Maintenance Manual for details about control systems.

**Cold Weather Operation**

EVAPCO eco-Air Series air cooled equipment is well suited to operate in cold weather conditions. The lack of required water makes air cooled equipment ideal for low ambient conditions. When the air cooled unit is going to be used during cold weather conditions, several items need to be considered including unit layout, adiabatic piping (if equipped), and unit heat transfer coils.

**Unit Layout**

Adequate unobstructed air flow must be provided for both the intake and discharge from the unit. For additional information on unit layout, please refer to EVAPCO’s Equipment Layout Manual Bulletin #320-E Metric.

**Freeze Protection**

EVAPCO is not responsible for ensuring that the product is adequately protected against the heat transfer fluid freezing. If the product has occasion to operate in close-to or sub-freezing temperatures then either the heat transfer fluid should be dosed with an adequate anti-freeze additive or provision has to be made to either manually or automatically drain the fluid from the cooler. Note: Opening the air vent and drain connections as a means to fully drain the fluid from the dry cooler is not sufficient to fully empty all the fluid and thus prevent freeze damage. In particular for large dry coolers, air pressure assisted drainage is recommended.

The sequence of control for a unit operating at low ambient conditions is much the same as a cooler or condenser operating under summer conditions provided that the ambient temperature is above freezing. When the ambient temperatures are below freezing, additional precautions must be taken to avoid the potential for damaging ice formation.

It is very important to maintain close control of the cooler or condenser during winter operation. EVAPCO recommends that the leaving heat transfer fluid temperature NEVER be less than 3,5°C above the fluids freezing temperature.

If the adiabatic (optional) fluid cooler or air cooled condenser is to be located in an area that experiences ice storms and freezing conditions EVAPCO recommends the removal and dry storage of the adiabatic pads (if equipped).

The factory installed portion of the adiabatic piping system is free draining after the solenoid valve. Heat tracing is not required unless the unit is to be operated adiabatically in low ambient conditions (this is not recommended), or incoming water supply lines are not intended to be drained during low ambient conditions.

## Troubleshooting

Problem	Possible Cause	Remedy
<b>Overramping Fan Motors</b>	Electrical issue	<ol style="list-style-type: none"> <li>1. Check voltage across all three legs of the motor.</li> <li>2. Verify that the motor is wired per the wiring diagram, and connections are tight.</li> <li>3. Refer to EVAPCO's control O&amp;M for further details</li> </ol>
	Fan rotation	Verify that the fan is rotating in the correct direction using visible arrow sticker on fan cowl. If not, switch the leads so it runs correctly.
	Mechanical failure	If fan motor does not turn freely by hand, replace fan/motor assembly.
	Motor running single-phase	Stop motor and attempt to start it. Motor will not start again if single-phased. Check wiring, controls and motor.
<b>Unusual Motor Noise</b>	Motor leads connected incorrectly	Check motor connections against wiring diagram on motor.
	Electrical unbalance	Check voltage and current of all three lines. Correct if required.
	Fan hitting cowl	Replace fan/motor or assembly.
	Defective motor	Replace fan motor or assembly.
<b>Capacity Not Reached</b>	Insufficient fluid flow	Check piping system and components.
	Heat transfer fluid change	Compare with design fluid and adjust if required
	De-energized fans	<ol style="list-style-type: none"> <li>1. Verify motor has power.</li> <li>2. If motor has power and is still de-energized, replace fan/motor assembly.</li> </ol>
	Adiabatic pads not wetted	Check for complete wetting of pads <ol style="list-style-type: none"> <li>1. If pads are only partially wetted, clean out water distribution pipe and check distribution holes for clogs.</li> <li>2. If pads have excessive scale they will need to be replaced.</li> </ol>
	Fouled heat Transfer surface	Carefully clean fins, see page 16 for more details.
<b>Fans Not Rotating</b>	Damaged or unbalanced fan blade or motor	Replace fan/motor assembly.
<b>Vibration</b>	Loosely attached fan/motor assembly	Tighten fan/ motor assembly.
	Unbalanced fan	(AC equipped units only) balance fan blade using spacers

## Replacement Parts

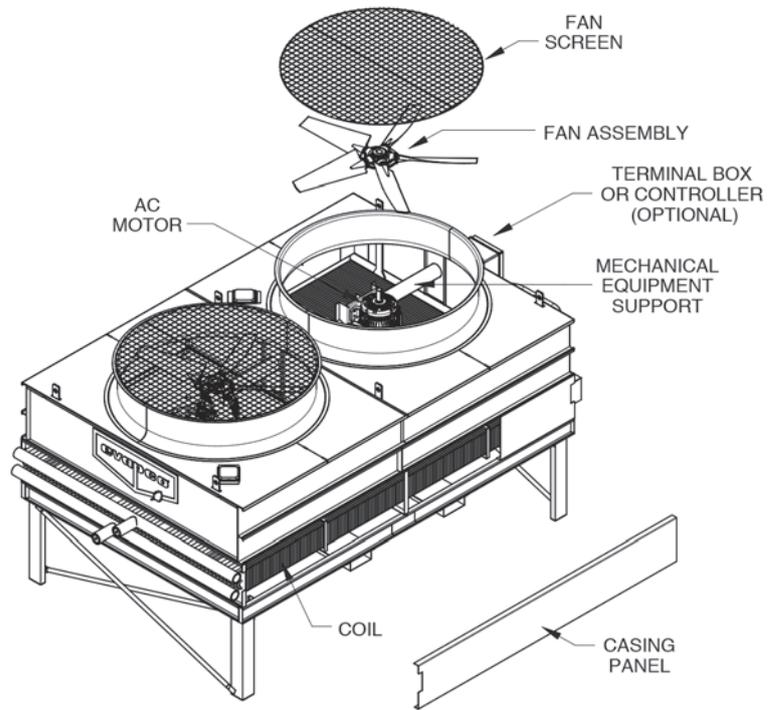
EVAPCO has replacement parts available for immediate shipment. Most orders ship within 24 hours from time of order!

The following pages contain exploded view drawings of all current EVAPCO eco-Air closed circuit coolers and condensers. Please use these drawings to help identify the major parts of your unit. To order replacement parts, please contact your local EVAPCO representative or Mr. GoodTower Service Center. The EVAPCO representative contact information is located on the unit's nameplate or can be found by visiting either [www.evapco.eu](http://www.evapco.eu) or [www.mrgoodtower.eu](http://www.mrgoodtower.eu).

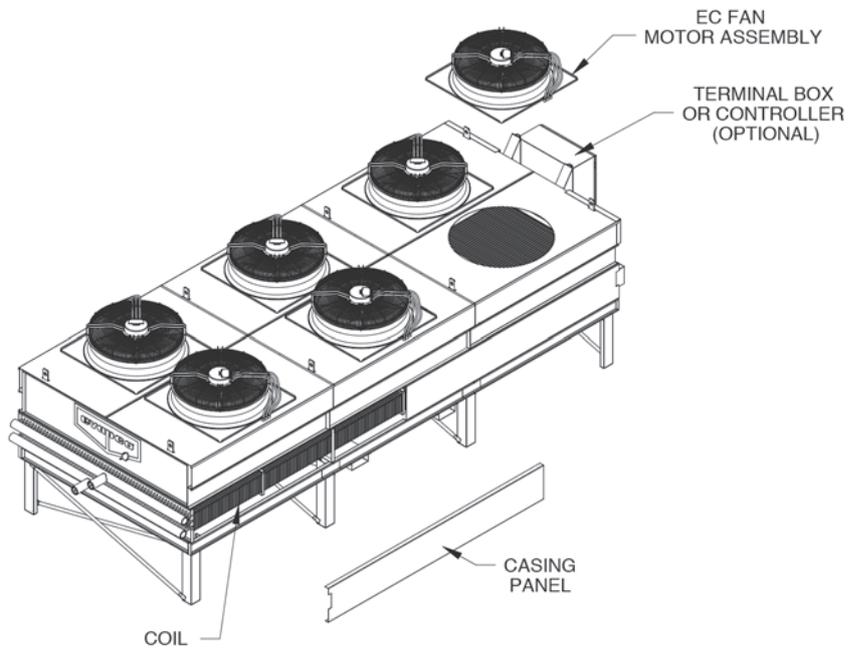
Additionally, your local EVAPCO representative or Mr. GoodTower Service Center can provide FREE unit inspections to help ensure your equipment operates at peak performance regardless of the original manufacturer!

Replacement Part Drawings

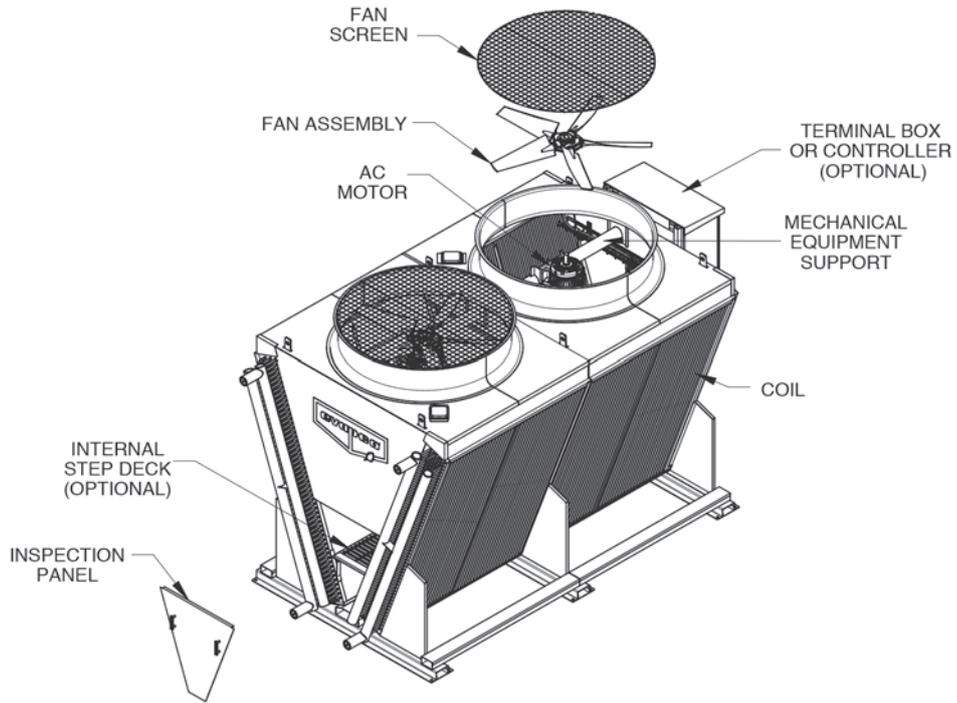
eco-Air Flat Coil Configuration with AC Fans



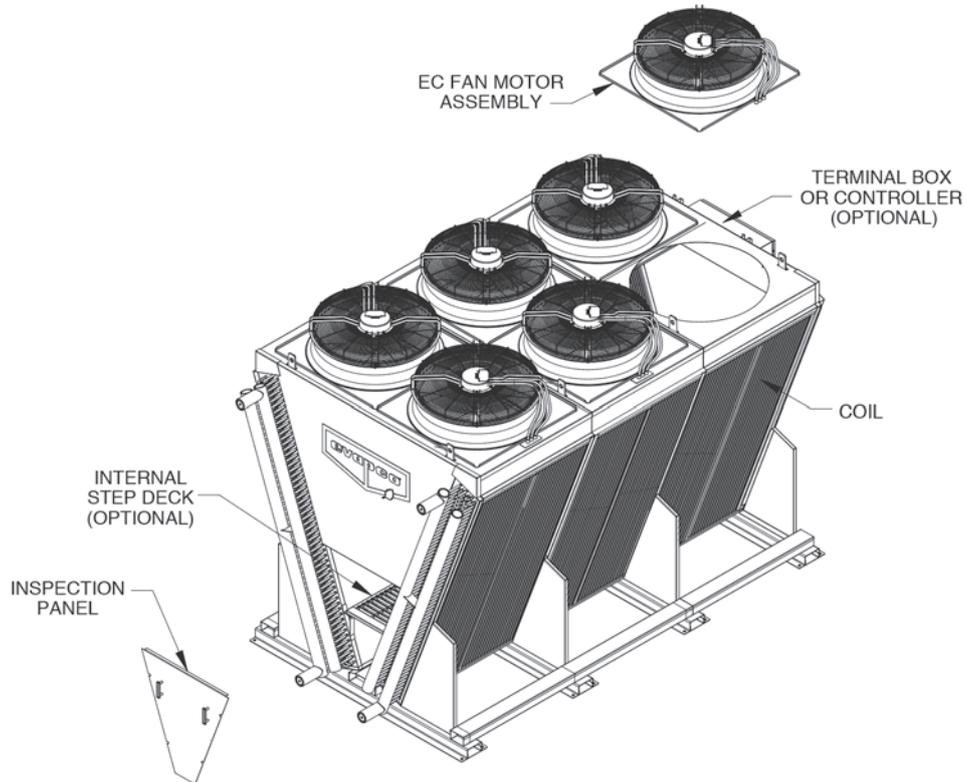
eco-Air Flat Coil Configuration with EC Fans



**eco-Air V Coil Configuration with AC Fans**



**eco-Air V Coil Configuration with EC Fans**



### eco-Air Adiabatic System Components

