



# **A+ Series™**

## **Refrigeration Air Coolers**

*"The Heat Transfer Experts"*

# A+ Series™

Colmac Coil is pleased to introduce A+ Series™ air coolers for industrial refrigeration applications. Compared to previously available designs, this all new product line offers unsurpassed levels of:

Food Safety	Worker Safety
Energy Efficiency	Reliability

A wide range of cabinet construction materials are available with cleanability features built-in as standard. A+ Series™ coil construction materials are available to suit any working fluid or environment:

- Copper tubes/aluminum fins
- Aluminum tubes/aluminum fins
- Stainless steel tubes/aluminum fins
- Stainless steel tubes/stainless steel fins
- Stainless steel tubes/anti-microbial alloy fins
- Galvanized steel tubes and fins

Three unique tube and fin patterns are used to optimize the cooling performance of Colmac Coil A+ Series™ air coolers depending on the capacity, working fluid, and operating temperature specific to your application. Other manufacturers use a single tube and fin pattern for their air cooler product lines, forcing you to accept “one-size-fits-all” and a less than optimum selection. Not with Colmac Coil!

A number of Colmac innovations have been incorporated into the A+ Series™ line as optional features, including:

- ▶ Anti-microbial Coil Construction
  - Aggressive anti-microbial fin alloy kills pathogens
  - Corrosion resistance equivalent to all stainless construction
  - Thermal performance equivalent to aluminum fins
- ▶ Low Temp Low Charge DX Ammonia
  - Reduces system ammonia charge by 10 lbs/TR
  - Operates down to -40°F suction temperature
- ▶ Smart Hanger System
  - Reduces suspended load time by as much as 75%
  - Improved safety during installation
- ▶ High Performance Glycol Technology
  - Proprietary heat transfer technology boosts performance
  - Reduces pumping power by 30%
  - Reduces fan power by 30%
  - Reduces defrost energy by 30%
- ▶ Smart Hot Gas Defrost
  - Reduces defrost time to as short as 10 minutes
  - Saves energy and reduces operating costs

Online software accurately selects, rates, prices, and specifies A+ Series™ air coolers. No more downloading and installing software onto your computer. A+ Series™ software runs on your internet browser. Another first from Colmac Coil!

Read on to learn more about the new A+ Series™ air coolers from Colmac Coil!



# REFRIGERATION AIR COOLERS



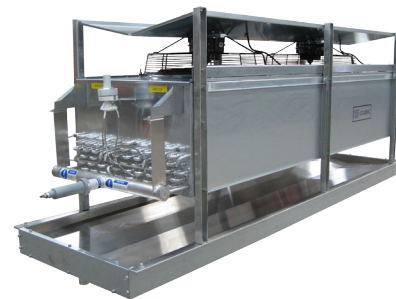
**A+L** High Profile



**A+M** Medium Profile



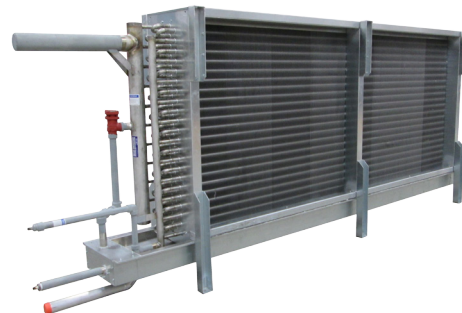
**A+S** Low Profile



**A+R** Process Rooms



**A+D** Low Profile Dual Discharge



**A+B** Coil Block with Drainpan

## UNCRATING AND RIGGING MADE SAFE AND EASY

The new Colmac Coil A+ Series™ air coolers are crated and designed for fast and safe installation.

**Cradle Crating System:** The unique cradle crating system from Colmac Coil supports the full weight of the air cooler while withstanding the rigors of shipment. The cradle crate also safely supports the weight of the air cooler while it is lifted into position from below. Then after the air cooler is secured to the ceiling, the crate easily comes away from the unit by gravity allowing it to be safely lowered to the ground. See Figure 1.

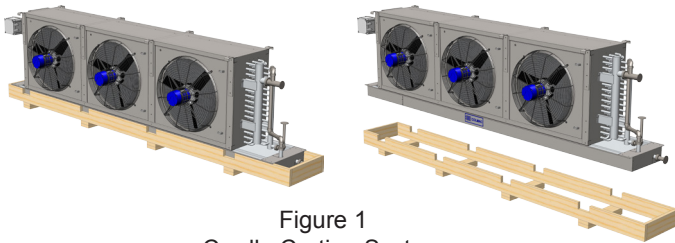


Figure 1  
Cradle Crating System

**Smart Hanger System:** This optional patented design was developed to make the process of mounting ceiling-hung air coolers faster and safer. Smart hanger brackets and rails allow air cooler units to be hung from the ceiling without any personnel leaving the floor level. The time consuming process of aligning threaded rods into mounting holes while the unit is being lifted into position is eliminated, reducing suspended load time by as much as 75%. Side to side placement of the air cooler on the Smart Hanger rails is non-critical and therefore faster. See Figure 2.

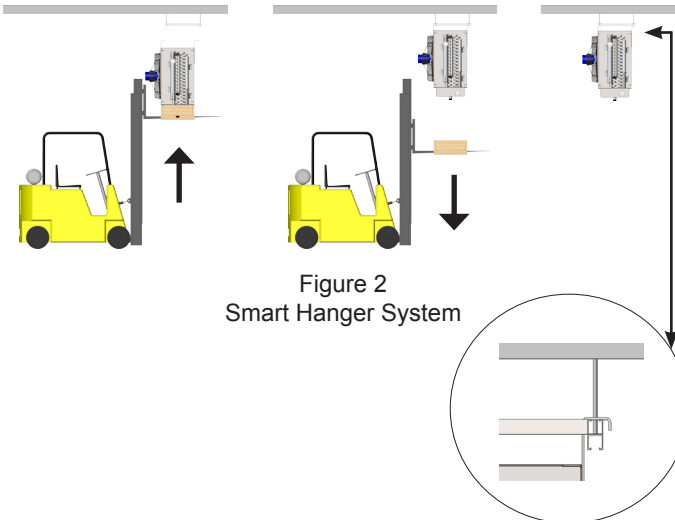


Figure 2  
Smart Hanger System

## QUIET AND EFFICIENT

### Fans

Other manufacturers use stamped steel or aluminum sheetmetal fan blades. While this type of fan is low cost, it is inefficient and costly to operate. All Colmac Coil A+ Series™ air coolers use only high efficiency fan blades having a true airfoil shape profile as standard equipment. See Figure 3.

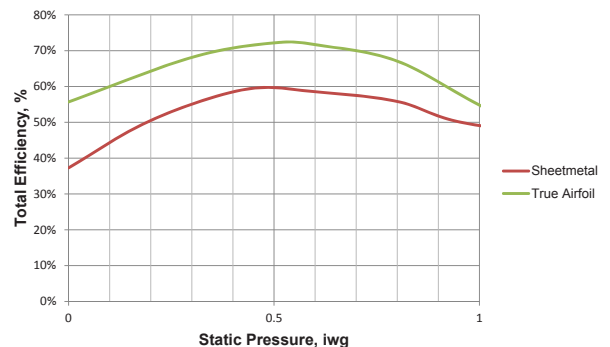


Figure 3  
True Airfoil Blade Profile

This type of fan offers several advantages over stamped steel or aluminum blades:

**High Efficiency:** The true airfoil blade shape can achieve mechanical efficiencies of 70%+. The best a stamped steel or aluminum sheetmetal blade can achieve is approximately 60%. This means Colmac Coil A+ Series™ air coolers will operate with 10% less fan power for the same cooling load, which not only translates to lower operating costs, but also lower first cost for power cabling and transforming. See Figure 4.

FIGURE 4  
36" Diameter Prop Fans @ 1140 RPM  
Total Efficiency vs Static Press

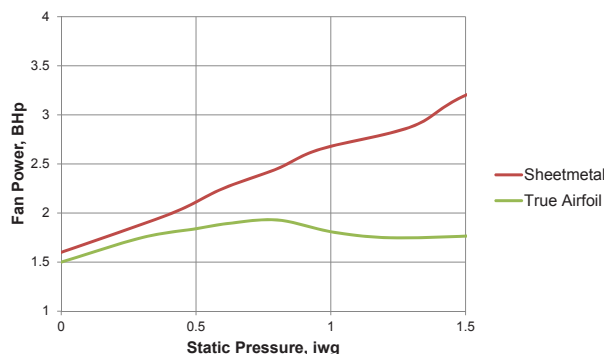


**Low Noise:** The higher efficiency of the A+ Series™ fans also results in lower sound levels during operation. A wide range of fan diameters and speeds are available to allow the selection of the appropriate sound level for the application and customer requirements.

**Non-overloading:** Another benefit of standard A+ Series™ fans with airfoil shape profile is the non-overloading power vs. pressure characteristic curve. The power vs pressure

curve is very flat which means that as frost accumulates on the air cooler and static pressure through the coil block increases, the brake power load imposed on the fan motor remains constant. Stamped steel and aluminum sheetmetal fan blades used by other manufacturers have a steep power vs. pressure curve which results in brake power (and amperage) continuing to rise as frost accumulates and static pressure increases. See Figure 5.

**FIGURE 5**  
36" Diameter Prop Fans @ 1140 RPM  
Power vs Static Press



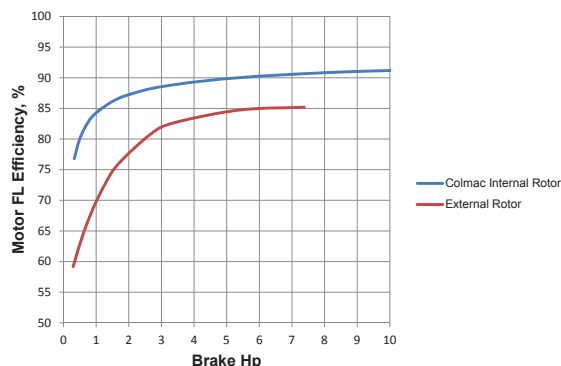
## Motors

All standard fan and motor combinations on A+ Series™ air coolers are optimized for maximum total efficiency. This is different from the integral external rotor fan motor units supplied by other manufacturers. While certain airflow and pressure conditions may result in total efficiencies approaching the A+ Series™ efficiency, in many cases the total efficiency for integral external rotor fan motor units is inferior. See Figure 6.

All standard fan motors supplied with A+ Series™ air coolers are high efficiency, internal rotor, totally enclosed, and *VFD compatible*. Integral horsepower motors (greater than 1 Hp) are supplied standard as NEMA Premium Efficiency. See the NEMA definition of Premium Efficiency for actual motor efficiencies. Fractional horsepower motors (1 Hp and less) are supplied standard as 80% minimum efficiency.

The A+ Series™ offer both 1140 rpm (6 pole) motors for high capacity applications and 850 rpm (8 pole) for low noise applications. Motors are suitable for either 50 or 60 Hz supply voltage.

**FIGURE 6**  
Motor Efficiency vs Brake Power  
Internal vs External Rotor



## OPTIMIZED HEAT TRANSFER

Unlike other manufacturers who offer a single “one-size-fits-all” tube pattern in their air coolers, Colmac Coil A+ Series™ air coolers feature optimized tube patterns to precisely match the operating conditions:

5/8" diameter x 1.5" staggered

- Enhanced plate fins
- Compact pattern for highest heat transfer efficiency in high heat flux applications
- Best for high temperature wet fin applications with large TD



5/8" diameter x 2" inline

- Enhanced plate fins
- Lowest fan power
- Large secondary (fin) surface area for maximum frost carrying capacity and extended runtime between defrosts
- Best for low temperature frosted fin applications



7/8" diameter x 2.25" staggered

- Enhanced plate fins
- Low fan power
- Large secondary (fin) surface area for maximum frost carrying capacity and extended runtime between defrosts
- Best for:
  - Gravity flooded ammonia
  - Large capacity pumped ammonia
  - Low temperature DX ammonia



## Available For Any Working Fluid

Colmac Coil A+ Series™ air coolers can be supplied to utilize any working fluid (refrigerant), either volatile or non-volatile, primary or secondary. This includes (but is not limited to):

### Volatile

- Ammonia
- CO<sub>2</sub>
- Propene (Propylene)
- Halocarbons
- Liquid Nitrogen

### Non-Volatile

- Glycols
- Calcium or Potassium Chloride
- Dynalene
- d-Limonene
- Potassium Formate

Circuiting is matched to each application and optimized for highest heat transfer with lowest tubeside pressure drop.

- Pumped bottom feed
- Pumped top feed
- Gravity flooded
- Direct expansion
- CPR feed

## DX AMMONIA TO -40°F, NO PROBLEM

The industrial refrigeration industry has always used the old rule of thumb: "Don't use DX Ammonia below 0 degrees F, it won't work!". Now with patented Colmac Coil technology, DX with ammonia is finally possible down to blast freezing temperatures (-40°F). The benefits of Colmac Coil Low Temp DX ammonia compared to pumped ammonia include:

- Dry suction – no wet suction risers to worry about
- Reduces system ammonia charge by 10lbs/TR
- Lower first cost – no recirculator pumps, smaller line sizes, simpler controls
- Lower operating costs – liquid pumping power is eliminated

Colmac Coil low temp DX ammonia is available on all A+ Series™ air coolers.

## FINALLY, HIGH PERFORMANCE GLYCOL COOLERS!

Secondary refrigerants (glycols and brines) are being widely used in industrial refrigeration systems as a means of (a) reducing the total ammonia charge on site, and (b) removing ammonia from occupied spaces (i.e. process rooms) and other areas highly sensitive to the risk of ammonia leaks. Unfortunately, these benefits are accompanied by a number of disadvantages including:

- Added complexity
- Increased first cost
- Increased power consumption

To minimize air cooler power consumption (added pumping power and fan power) with secondary refrigerants, Colmac Coil A+ Series™ air coolers have been redesigned with a unique revolutionary new heat transfer technology which significantly boosts performance. Compared to traditional cooler designs offered by other manufacturers, A+ Series™ air coolers have:

- 30% less pumping power
- 30% less fan power
- 30% less defrost energy
- 30% less piping and insulation costs

## MATERIALS OF CONSTRUCTION

Colmac Coil A+ Series™ air coolers are offered in a variety of construction materials to match the operating environment and provide the most cost effective solution to the customer.

*Aluminum tube and fins:* Colmac Coil has specialized in all aluminum construction for ammonia air coolers for over 30 years. All aluminum construction offers:

- Lightest weight
- Best performance
- Fastest defrost
- Good corrosion resistance
- Lowest cost
- Patented bi-metallic couplers

*Stainless steel tube and aluminum fins:* The stainless steel tubes used in this popular type of construction offers some added corrosion resistance and resistance to mechanical damage compared to all aluminum construction. However, the poor conductivity and higher cost of stainless steel tubes means relatively lower performance and higher cost compared to all aluminum.

A variety of fin materials are available with stainless steel tube A+ Series™ air coolers.

- Aluminum fins
- Stainless steel fins
- AM (anti-microbial) fins
- 304 or 316 SST

**Galvanized steel tube and fins:** In certain limited cases where highly alkaline cleaners are used directly on coil surfaces, galvanized steel construction may be desirable. This type of construction is significantly heavier (2 to 3 times), has significantly lower performance (12 to 15% less), and is costlier when compared to all aluminum construction.

More detailed information on the subject of coil construction can be found in the online Colmac Coil Technical Bulletin “Comparing Ammonia Evaporator Construction: “Which one is best?”

## BREAKTHROUGH IN HYGIENIC DESIGN

Colmac Coil specializes in hygienic coil designs for the food processing industry. A+ Series™ air coolers can be supplied with the following types of coil construction to match more demanding cleaning and sanitizing requirements:

**All Stainless:** Both tubes and fins can be made of type 304 or type 316 stainless steel.

**Anti-Microbial:** Stainless steel tubes with proprietary anti-microbial fin alloy provides:

- Equivalent corrosion resistance to stainless steel tubes and fins
- Equivalent performance to stainless steel tube and aluminum fins
- Active anti-microbial action. Pathogen colony counts approach zero after just 2-3 hours exposure to this fin alloy
- Not a coating which can chip or peel off and contaminate food products

**3-A Sanitary Design:** The only design USDA approved for direct contact with food. Only available from Colmac Coil.

## CLEANABILITY IS STANDARD

**Cabinet Materials:** Cabinet sheet metal is offered in galvanized steel, aluminum, or stainless steel.

**Hinged Fan Panels:** All fan panels on all A+ Series™ air coolers are hinged as standard for ease of inspection, cleaning, and service. See Figure 7.

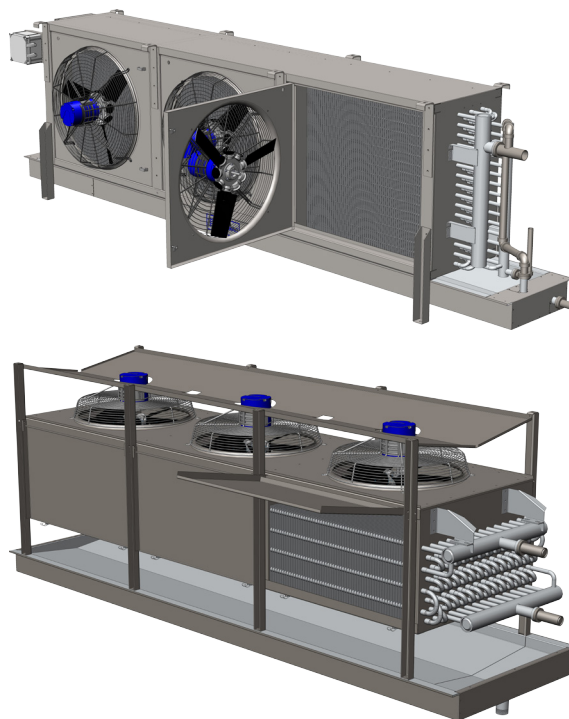


Figure 7  
Hinged Access Panels

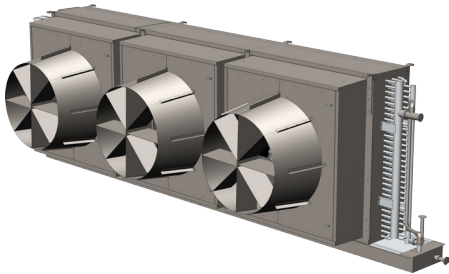
**Cleaning Clearance:** Care has been taken to eliminate difficult to inspect and clean areas on top of the fins and between the bottom of the fins and the drain pan. The “Triple Pitch” drain pan is designed to be easily cleaned, drain quickly, and leave no standing water after a defrost or cleaning cycle.



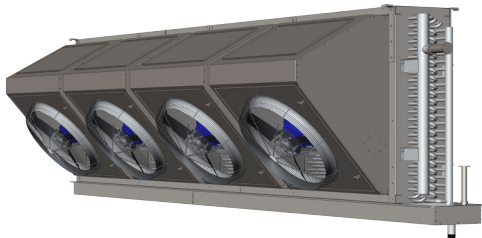
## AIR DISCHARGE ARRANGEMENTS:

On applicable models, air discharge alternatives include:

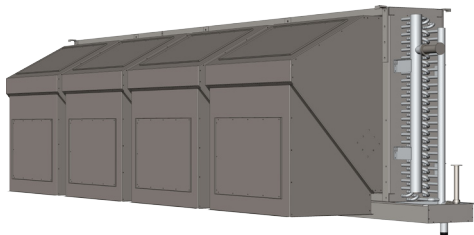
- Long throw adapters



- 45° down discharge

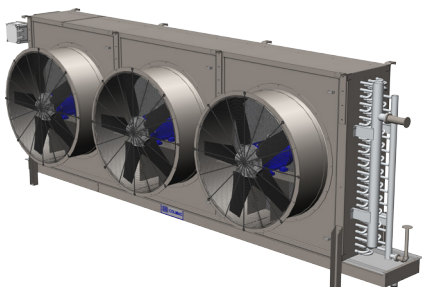


- 90° down discharge (penthouse adapters)



45° and 90° penthouse options feature heavy-duty discharge housings that tilt the fans 45° down from the vertical plane. These housings ship installed for ease of installation. Access panels are provided on penthouse adapters to permit service access.

- Fans selected for external static pressure (ESP)



## FACTORY ELECTRICAL WIRING OPTIONS:

- All motors wired to a common fused or non-fused disconnect switch located in a NEMA 4X box
- Each motor wired to an individual fused or non-fused disconnect switch located in a NEMA 4X box
- All motors wired to a control panel with a common fused disconnect switch and individual IEC motor starters. All located in a NEMA 4X box.
- Customized UL508 listed control panels available for all units



## OTHER OPTIONS

### Re-heat coil

- Installed to re-heat air leaving the air cooler coil

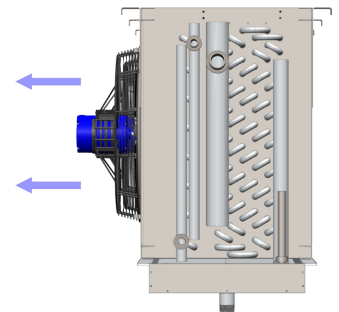


Figure 8  
A+S Air Cooler With Re-Heat Coil

### Variable fin spacing

- For severe frost applications, fins on the air inlet face of the coil have wider fin spacing than the remainder of the coil. The wider spacing allows for more frost build-up before defrosting becomes necessary, resulting in fewer defrosts compared to a coil without variable fin spacing.

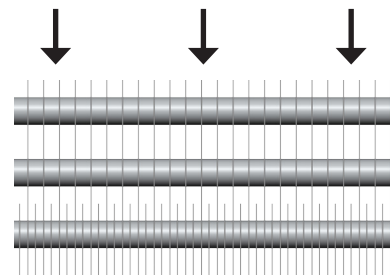


Figure 9  
Variable Fin Spacing



#### *Electric heat trace in the drain pan cover*

- Use this option for conditions where the room temperature is above freezing and the drain pan cover temperature may drop below the dew point temperature of the room air, resulting in condensate forming on the cover and dripping. The heat trace keeps the drain pan cover above the room dew point temperature, and eliminates the possibility of condensation.

#### *Extended legs*

- For applications where a floor mounted coil must be elevated

#### *Alternate voltages and 50 Hz fan motors*

- Units can be designed and manufactured to be compatible with power supplies anywhere in the world.

### **NEW DEFROST TECHNOLOGY FROM COLMAC COIL**

Colmac Coil A+ Series™ air coolers are designed to:

1. Defrost faster
2. Use less energy during defrost
3. Eliminate drain pan icing problems

### **SMART HOT GAS DEFROST™**

Colmac Coil A+ Series™ air coolers equipped with Smart Hot Gas Defrost™ save you money!

### **“Triple Pitch” Drain Pan**

Colmac Coil’s innovative “Triple Pitch” V-bottom drain pan design provides for rapid and complete drainage of melted frost and ice. The drain pan is conveniently pitched to a single drain connection on one end of the unit, simplifying drain piping. The “V” shape acts to quickly move melted frost to the center of the pan where it flows to the end of the pan and the drain. Low spots and “pooling” of melted frost in the pan are completely eliminated. Pitching the drain pan in three directions (front to center, rear to center, and end-to-end) combined with continuous hot gas loop contact has resulted in “the perfect pan”! See Figure 10.

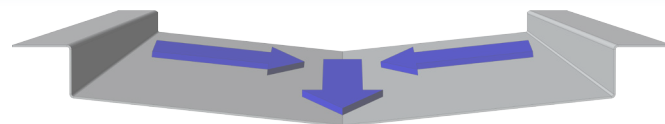


Figure 10  
Triple Pitch Drain Pan

Drain connections found in other manufacturers’ drain pans are typically made of pipe nipples cut at 90 degrees and welded onto a flat hole in the drain pan sheet metal. This type of construction distorts the drain pan and can cause incomplete drainage because of high spots around the drain outlet. Colmac Coil has solved this problem with a full radius drain outlet formed into the drain pan to eliminate the possibility of water pooling around the drain after a defrost. The Colmac Coil A+ Series™ drain pan drains completely. No more time and money wasted de-icing drain pans! See Figure 11.

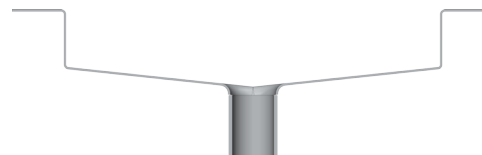


Figure 11  
Full Radius Drain Outlet

### **Continuous Contact Pan Loop**

Other manufacturers attach the hot gas pan loop (tubes and headers) underneath the drain pan in such a way that complete contact over the length of the pan is not possible. The tubes in the drain pan loop on Colmac Coil A+ Series™ air coolers are held tightly in contact along the entire length of the underside of the drain pan by means of special spring tension clips. No thermal mastic paste is used or needed with the Colmac Coil A+ design. Pan loop headers are held outside the ends of the drain pan to allow full contact of the tubes with the pan. Defrost heat is transferred to the pan surface not only by the tubes themselves, but also through the metal of the full length clips. See Figure 12.

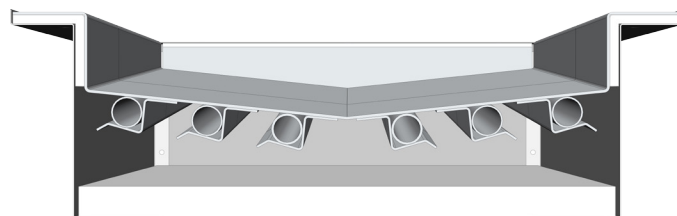


Figure 12  
Continuous Contact Pan Loop

## Simplified Control Valve Group with Shorter Defrost Duration

Colmac Coil Smart Hot Gas Defrost™:

- Costs less to install
- Costs less to operate

Conventional hot gas defrost controls use an expensive defrost pressure regulating valve on each air cooler to maintain hot gas pressure during defrost. Also, the pan loop is typically routed in series with the coil block. This piping arrangement forces the defrost duration to be longer (much longer in some cases) than needed to melt and remove frost from the coil fins and tubes. i.e. Defrost duration is extended purely to prevent ice from forming in the drain pan. While the extended defrost may clean the pan of ice, it is unnecessarily sending heated air into the refrigerated space, reducing defrost efficiency and wasting money.

The Colmac Coil Smart Hot Gas Defrost™ controls eliminate the defrost pressure regulating valve and instead uses a simple, inexpensive liquid drainer to maintain defrost pressure in the coil during defrost. The drain pan is piped and heated independently of the coil block, allowing the hot gas to flow to the coil for only 6-8 minutes. It has been shown that reducing the defrost duration from 30 minutes to 10 minutes in a zero degree room can reduce operating costs by as much as \$25,000 per year per 100 TR (Nelson 2011)! The amount of hot gas required to keep the drain pan sufficiently heated pre, during, and post defrost is relatively small such that pan loop piping can typically be done with a very simple 3/4" branch hot gas line, solenoid, and needle valve.

Colmac Coil Smart Hot Gas Defrost™ can be applied to bottom feed pumped, top feed pumped, or DX ammonia systems. More detailed information on how to design and specify Colmac Coil Smart Hot Gas Defrost™ can be found online in the Colmac Coil Engineering Design Guide on this subject.

### "It's All In The Piping"

**Liquid Seal Hot Gas Drain Pan Loop:** In conventional hot gas drain pan designs, liquid refrigerant can flood the lower tubes in the drain pan hot gas loop, rendering them much less effective in heating the pan, and resulting in slow and uneven drain pan defrosting. Colmac Coil's trapped outlet design ensures that condensed, liquid refrigerant is carried out of the pan ensuring fast, complete, and uniform heating of the pan during defrost. See Figure 13.

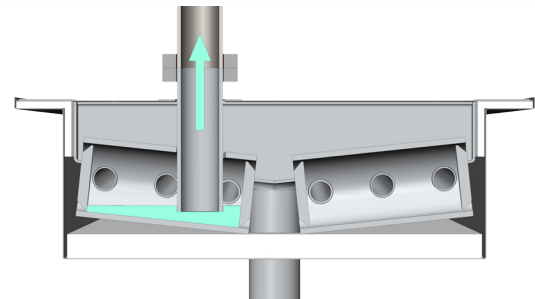


Figure 13  
Liquid Seal Loop Outlet

**Free Draining Liquid Connections:** With conventional coil designs, the liquid connection enters the liquid header in such a way that the bottom tubes in the coil stay flooded during defrost with condensed, liquid refrigerant. The result is slow, uneven (or incomplete) defrosting of the coil. Colmac Coil has solved this problem by extending the liquid header downward and placing the liquid connection below the level of the lowest tube in the coil. This design effectively traps all of the condensed liquid refrigerant and forces it out of the coil during defrost, resulting in a fast, complete and effective defrost of the entire coil. See Figure 14.

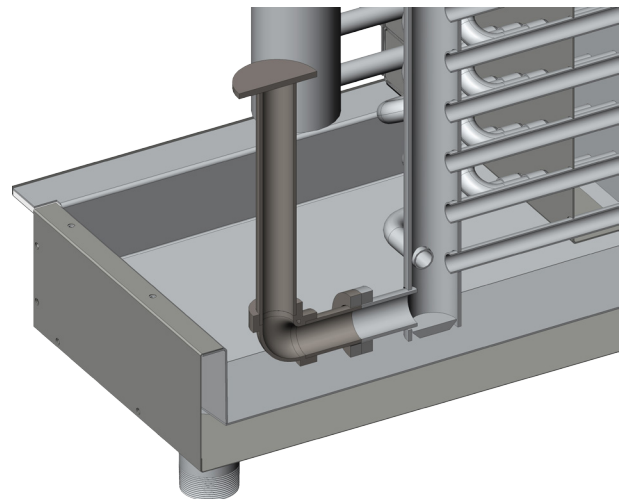


Figure 14  
Trapped Liquid Connection

**Vertical Liquid and Hot Gas Connections:** Since nearly all piping in a refrigerated warehouse runs along the ceiling, and then vertically down to the air cooler coil connections, Colmac Coil's vertical liquid and hot gas connections eliminates the need for field installed elbows and piping required to connect to horizontal connections. The result is time and money saved on the jobsite during installation.

## THERMODYNAMIC WATER DEFROST™

Water defrost has many advantages:

- Fast – defrost duration is short
- Washes/cleans fin surfaces
- Energy efficient
- Simple

In spite of the benefits listed above water defrost has seen limited use, particularly at freezer temperatures, due to the perceived disadvantages of:

- Large water flowrate required
- Messy – frost and ice buildup from overspray
- Tendency of spray nozzles to foul and plug

Now Colmac Coil has introduced a new approach to water defrost addressing each of these challenges.

*Thermodynamically correct water flow rate:* Traditionally, the amount of defrost water shown by air cooler manufacturers has been based on rules of thumb such as “1-1/2 to 2 gpm per sq foot of face area”, or “3 gpm per sq foot of top area”. These rules of thumb are overly conservative and result in higher-than-needed defrost water flow rates and pumping power. Colmac Coil Thermodynamic Water Defrost™ limits the defrost water flow rate to only the amount needed to heat the mass of the coil metal and melt the frost, no more.

*No more overspray:* Colmac Coil engineers have solved the problem of splashing and overspray with a patented system combining a special fin design to limit water leaving the edges of fins, with a drain pan designed to fully contain defrost water.

*Removable, cleanable water distribution pans:* Fouling and plugging of spray nozzles is eliminated by the use of removable, cleanable water distribution pans. The distribution pans are designed to be easily removable for inspection and cleaning while the air cooler remains in place and undisturbed. See Figure 15.

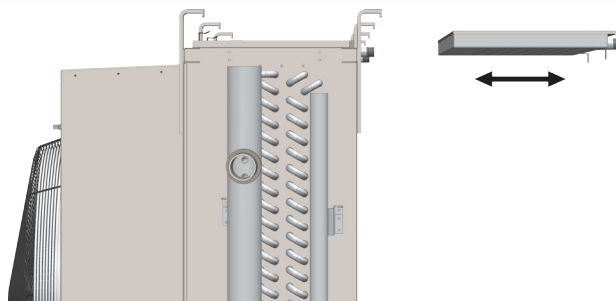


Figure 15  
Removable Water Defrost Pan

## FAIL-SAFE ELECTRIC DEFROST™

This patented electric defrost heater element design eliminates elements “creeping” or “walking” out of the heat exchanger, which can cause damage to elements and wiring. The new proprietary design extends heater element life and reduces the risk of damage and electrical failures. See Figure 16.

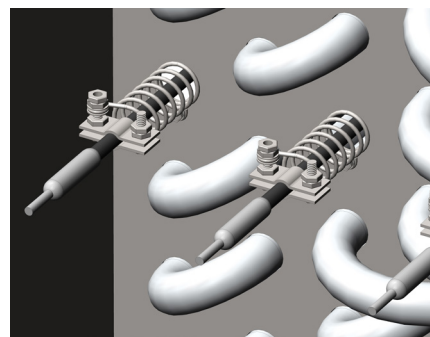


Figure 16  
Heater Element  
With Self Centering Spring

## ONLINE SELECTION SOFTWARE

Colmac Coil has made selection, specification, and pricing of A+ Series™ air coolers fast and accurate with new online software. Access to this new state-of-the-art software tool is available to Colmac Coil representatives, and qualified engineers and end-users.



## Other Quality Products From Colmac Coil



Heating and Cooling Coils



Heat Pipes for Heat Recovery



Dry Coolers for Glycol or Gas Cooling



Custom Evaporators & Baudelot Coolers



Air Cooled Condensers

CE(PED) Certification, ASME Sec. VIII, Canadian Registration Number, UL508, Canadian Standards Association



CRN



CSA

Visit [www.colmaccoil.com](http://www.colmaccoil.com) for more information and resources:

Product Information

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Sales Rep Locator

Product Videos

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*"The Heat Transfer Experts"*