evapco

PHC

EVAPORATIVE CONDENSERS

Optional Water Treatment Systems Available

evapco SMART SHIELD

Pulse Pure PLUS

PARALLEL HYBRID CONDENSER

*Available in Capacities from **208** to **2,050** Ammonia Tons!*

U.S. Green Building Council Member

IARW International Association of Refrigerated Warehouses

Member of iiar International Institute of Ammonia Refrigeration www.iiar.org

AHRI Air-Conditioning, Heating, and Refrigeration Institute

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 9 countries around the world and supplied through a sales network consisting of over 180 offices.

Proven Performance and Design Flexibility

The PHC Parallel Hybrid Condenser offers more system design and layout flexibility than ever before. This Induced Draft condenser design enhances EVAPCO's already extensive line of evaporative condensing technology. The PHC offers more selections for large industrial refrigeration projects: more capacity with a smaller plan area, fewer motors, less weight and lower refrigerant charge. More equipment choices and more design flexibility mean greater value for the End-User.

The PHC combines high efficiency PVC crossflow fill with EVAPCO's patented coil designs featuring the exclusive ***CROSS***Cool™ tube enhancement for superior induced draft, parallel flow, hybrid condenser performance. The PHC evaporative condenser was designed in EVAPCO's state-of-the-art research and development center as part of the company's ongoing product development program. The PHC has undergone thermal testing to ensure each condenser will perform as specified. As with all EVAPCO products, each PHC condenser is supplied with a written Thermal Performance Guarantee.

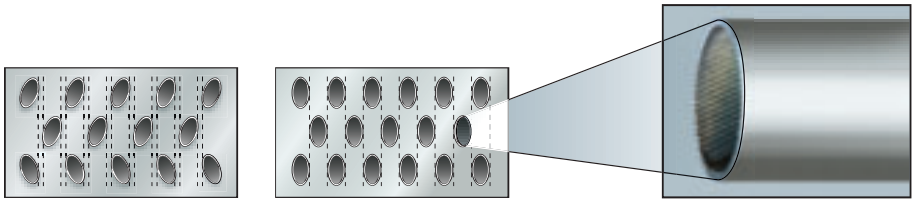
PHC-S & L Models

PHC-D Models

Design Features

Coil Technology

The PHC incorporates EVAPCO's Thermal-Pak® II or patented *Sensi*-**Coil**® technologies featuring EVAPCO's exclusive **CROSSCOOL**™ internal tube enhancement! The Thermal-Pak® II coil technology features EVAPCO's elliptical tubes positioned in a staggered pattern. The *Sensi*-**Coil**® technology features EVAPCO's elliptical tubes assembled in a high density coil tube arrangement. The combination of these coil technologies with **CROSSCOOL**™ tube enhancement provides more internal and external heat transfer surface area as well as greater air and water loading over the coil versus other designs. The result is superior heat transfer performance in parallel-flow heat transfer!

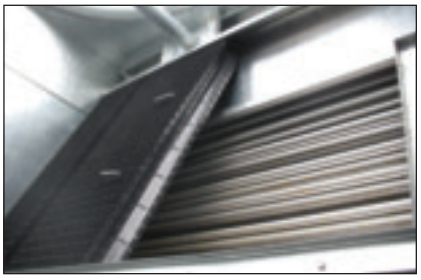


Thermal-Pak® II | ***Sensi*-Coil®** (US Patent #7,296,620) | **CROSS COOL™**

Condensing Coil

The coils are manufactured from high quality steel tubing following the most stringent quality control procedures. Each circuit is inspected to assure the material quality prior to coil assembly. The assembled coil is tested at 390 P.S.I.G. air pressure under water to make sure it is leak free.

To protect the coil against corrosion, it is placed in a heavy duty steel frame and the entire assembly is dipped in molten zinc (hot dip galvanized) at a temperature of approximately 800°F.



Crossflow Fill

The PVC crossflow fill used in the PHC Evaporative Condenser is specially designed and manufactured by EVAPCO to induce highly turbulent mixing of the air and water for superior heat transfer. The fill is constructed of inert polyvinyl chloride. It will not rot or decay and is formulated to withstand water temperatures of 130˚F (55°C).

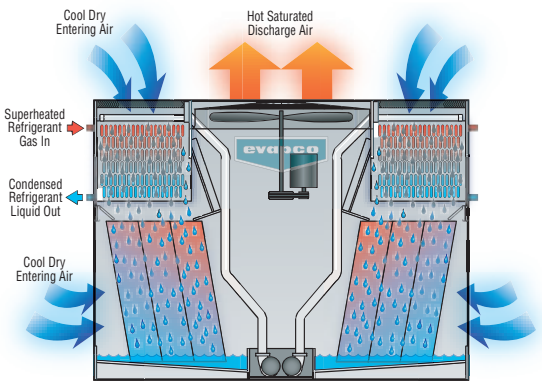
The individual crossflow fill sheets are bonded together and supported at the bottom to enhance the structural integrity of the fill section. The assembled fill sheets form an integral inlet louver to prevent debris from entering the heat transfer fill. Each fill sheet has an integral multi-pass drift eliminator to strip the entrained water droplets from the discharge air. The fill material selected for the PHC Evaporative Condenser has a flame rating of 5 per ASTM-E84-81a.

Principle of Operation

Hot gas discharged from the compressor enters the condenser coil inlet(s) at the top of the unit. Cooled water from the unit basin is pumped through spray distribution nozzles and floods over the condenser coil(s). Ambient air is simultaneously drawn into the unit at the top in parallel flow with the water through the coil. A portion of the recirculated water evaporates into the air stream. This evaporation process and the cooled water flowing over the tubes removes heat from the refrigerant causing it to condense. The saturated refrigerant liquid drains out of the sloped coil tubes into a receiver for return to the system.

The recirculated water that was not evaporated falls through a crossflow fill section located below the coil. Air is drawn through the side of the unit and fill section removing additional heat from the water through evaporation. The cooled water collects in the basin for recirculation over the coil.

The hot, saturated air from both the coil and fill sections pass through internal drift eliminators to strip water droplets entrained in the air stream. The unit fan(s) then discharge the saturated air out of the top of the unit at a high velocity, where it dissipates into the atmosphere.



Principle of Operation

PHC Design and Construction Features–S & L Models

The PHC line of evaporative condensers reflect EVAPCO's committment to product development. The advanced design provides owners with many operational and performance advantages. These parallel-flow hybrid condensers are designed for easy maintenance and long, trouble-free operation.

Sun~Blocker System (optional)

- Blocks sun light to minimize potential algae formation
- Prevents debris from entering the unit
- Eliminates water splash out

CROSScool™ Coil Design

- Internally enhanced coil for maximum heat transfer
- Lower refrigerant charge
- Unique header design for free drainage
- ASME B31.5 compliant
- Tested to 390psi

PVC Spray Distribution Header with ZM® II Nozzles

- Large orifice nozzles prevent clogging (no moving parts).
- Redesigned nozzles for superior water distribution.
- Threaded nozzles eliminate troublesome grommets.
- Fixed position nozzles require zero maintenance.
- Threaded end caps for ease of cleaning.
- Guaranteed for life.

Double-Brake Flange Joints

- Stronger than single brake designs
- Minimizes water leaks at field joints
- Greater structural rigidity

Unit Access

- Oversized access door for enhanced accessability
- Internal walkway for safe and easy basin access

Totally Enclosed Pump Motors

- Help assure long, trouble-free operation

Stainless Steel Strainer

- Resists corrosion better than other materials

G-235 Mill Hot-Dip Galvanized Steel Construction

(Stainless steel available as affordable option)

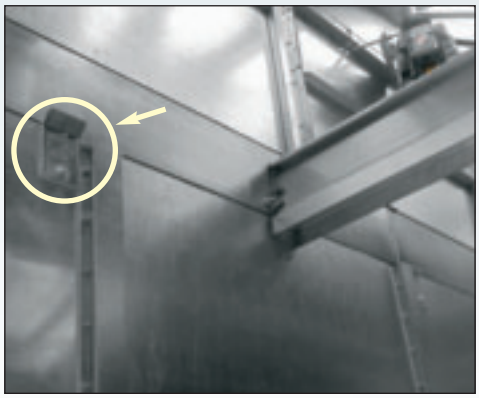
Drive System

- Totally enclosed fan motors assures long life
- Power-Band belts for better lateral rigidity
- Aluminum fan blades
- Non-corroding cast aluminum sheaves
- Heavy-Duty fan shaft bearings with L-10 life of 75,000 - 135,000 hrs.
- All other components corrosion resistant materials
- All components covered by 5 year warranty

MOTOR AND DRIVE 5 Year WARRANTY

External Platform w/Ladder *(optional)*

- Safety cage
- Self supporting
- Modular design for easy field installation



Easy Rig Field Seam

- Self guiding channels improve the quality of the field seam to eliminate leaks
- Easy to install
- Lower installation cost

IBC COMPLIANT DESIGNS

IBC 2012 Compliant
(standard)

Other PHC–S & L Options

- Internal ladder
- Individual fan drives
- *Pulse*~Pure® PLUS & Smart Shield® Water Treatment
- Low Sound Fan
- Super Low Sound Fan

Unique Fill Material

- Cross fluted PVC bonded block fill
- Superior heat transfer
- Impervious to rot and decay

PHC Design and Construction Features–D Models

PVC Spray Distribution Header with ZM® II Nozzles

- Large orifice nozzles prevent clogging (no moving parts).
- Redesigned nozzles for superior water distribution.
- Threaded nozzles eliminate troublesome grommets.
- Fixed position nozzles require zero maintenance.
- Threaded end caps for ease of cleaning.
- Guaranteed for life.

CROSScool™ Coil Design

- Lower refrigerant charge
- Unique header design for free drainage
- ASME B31.5 compliant.
- Tested to 390psi

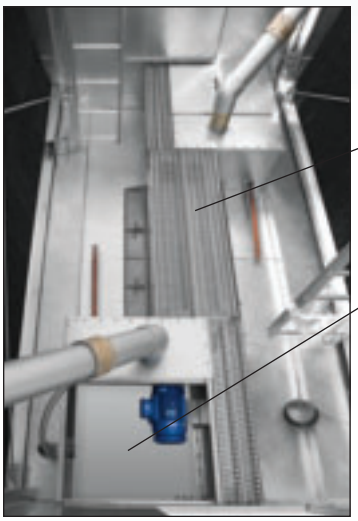
Efficient Drift Eliminators

- Patented design reduces drift rate
- Made from corrosion resistant PVC for long life

U.S. Patent No. 6315804

Double-Brake Flange Joints

- Stronger than single brake design
- Minimizes water leaks at field joints
- Greater structural rigidity



Internal Walkway *(optional)*

- For safe easy access to entire basin

Large Access Door

- Oversized access door for enhanced accessibility
- Standard on all models

Pump House Access

- Easy access to pump and pump motor
- Oversized for easy addition of accessories, i.e. pan heaters

Totally Enclosed Pump Motors

- Long, trouble-free operation

Stainless Steel Strainer

- Resists corrosion better than other materials

G-235 Mill Hot-Dip Galvanized Steel Construction

(Stainless steel available as affordable option)

Advanced Design Smooth Flow Fan System

- Totally enclosed fan motors assures long life
- Power-Band belts for better lateral rigidity
- Advanced Design aluminum fan blades
- Non-corroding cast aluminum sheaves
- Heavy-Duty fan shaft bearings with L-10 life of 75,000 - 135,000 hrs.
- All other components corrosion resistant material
- All components covered by 5 year warranty

MOTOR AND DRIVE 5 Year WARRANTY

Sun~Blocker System *(optional)*

- Blocks sun light to minimize potential algae formation
- Prevents debris from entering the unit
- Eliminates water splash out

External Service Platform w/Ladder *(optional)*

- Safe access to coil
- Self supporting
- Modular design for easy field installation

IBC COMPLIANT DESIGNS

IBC 2012 Compliant
(standard)

Easy Rig Field Seam

- Self guiding channels improve the quality of the field seam to eliminate leaks
- Easy to install
- Lower installation cost

Unique Fill Material

- Superior heat transfer
- Crossflow PVC bonded fill
- Greater structural integrity
- Impervious to rot and decay

Other Options

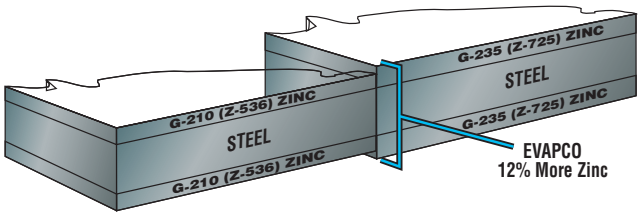
- Internal motor davit
- Internal upper access ladder & platform
- Pony motor
- Low Sound Fan
- Super Low Sound Fan

PHC Construction Features

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

G-235 Mill Hot-Dip Galvanized Steel Construction

Mill hot-dip galvanized steel has been successfully used for over 40 years for the protection of evaporative condensers against corrosion. There are various grades of mill galvanized steel each with differing amounts of zinc protection. EVAPCO has been a leader in the industry in developing heavier galvanizing, and was the first to standardize on G-235 mill hot-dip galvanized steel. G-235 designation means there is a minimum of 2.35 ounces of zinc per square foot of surface area as measured in a triple spot test. G-235 is the heaviest level of galvanizing suitable for manufacturing evaporative condensers and has a minimum of 12% more zinc protection than competitive designs using G-210 steel.



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

ZM® II Spray Nozzle Water Distribution System

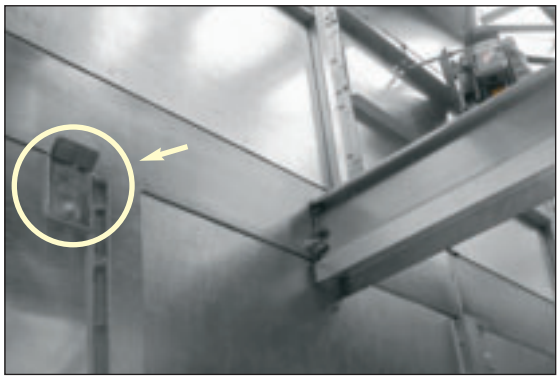
ZM® II Nozzle

Uniform and constant water distribution are paramount for reliable, scale-free evaporative condensing. EVAPCO'S Zero Maintenance ZM® II Spray Nozzle remains clog-free under the toughest conditions.

The heavy-duty ABS ZM® II Spray Nozzles have a 1-1/4" diameter opening and a 1-1/4" splash plate clearance. The fixed position ZM® II Spray Nozzles are mounted in corrosion-free PVC water distribution pipes that have threaded end caps. Together, these elements combine to provide enhanced water dispersion over the coil resulting in superior thermal performance and a virtually maintenance free water distribution system.

Fewer Fasteners Lower Installed Cost

The PHC condensers feature a field seam design which ensures easier assembly and fewer field seam leaks. The field seam incorporates self-guiding channels (shown below) which direct the coil casing section into position at the proper location on the bottom section of the condenser. In addition, the new design eliminates up to 85% of the fasteners typically used to join condenser sections in the field. This significantly reduces the amount of contractor labor cost to install the condenser.

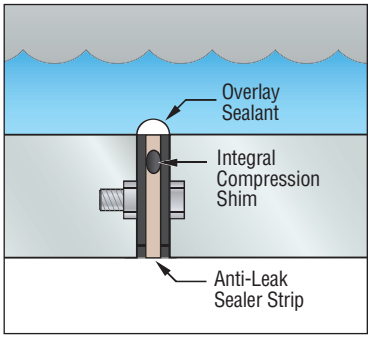


Type 304 Stainless Steel Strainers

Subjected to excessive wear and corrosion, the sump strainer is critical to the successful operation of the condenser. EVAPCO uses only Type 304 Stainless Steel for this very important component.

Unique Seam Design–Eliminate Field Leaks

The PHC features Evapco's unique panel construction design which includes a special butyl tape sealer with an integral sealing gasket. Each joint is then backed with a secondary caulking compound and encased in a double-brake flange for added strength and structural integrity. This unique sealing system has been proven effective in laboratory tests and years of field application.



Efficient Water Drift Eliminators

An efficient drift eliminator system removes entrained water droplets from the air stream to limit the drift loss from the condenser. With a low drift rate, EVAPCO condensers save valuable water and water treatment chemicals. The drift eliminators are constructed of an inert polyvinyl chloride (PVC) plastic material which effectively eliminates corrosion of these vital components. They are assembled in sections to facilitate easy removal for inspection of the coil.

Mechanical Drive System

PHC-S&L Fan Motor Mount – Evapco's tandem TEAO motor mount assembly allows for two fans to efficiently operate with one motor for simplicity. Routine maintenance is easily performed. If redundancy is a concern, individual fan motor drives are available as an option.

PHC-D Fan Motor Mount – Units are equipped with TEAO motor mount assembly on each fan. If motor redundancy or capacity control is a concern, the PHC-D models can be equipped with a pony motor option on each fan. The pony motor option features a smaller fan motor and drive combination to provide an additional step of capacity control and reduced energy requirements.

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

Fan Shaft Bearings: The fan shaft bearings in PHC units are specially selected for long, trouble-free life. They are rated for an L-10 life of 75,000 to 135,000 hours and are the heaviest pillow block bearing available.

Aluminum Alloy Sheaves: Fan sheaves are constructed of corrosion resistant aluminum for long life, eliminating the corrosion that exists on cast steel sheaves, thereby extending belt life.

Five Year Drive Warranty: All drive components on PHC units are covered by Evapco's exclusive 5 year drive warranty -including fan motors and belts!

Large Access Door

For enhanced basin accessibility that enables maintenance personnel to quickly and easily enter the basin for float valve adjustment and unit inspection. This is provided standard on all PHC models.

Internal Walkway

PHC-S208 to PHC-S1182
PHC-L464 to PHC-L842

Once inside these model condensers, maintenance personnel can safely move throughout the unit by way of a non-slip walkway. This walkway comes standard on single coil units and is an option on double coil units.

Optional Equipment

Motor Options

All PHC condensers utilize Totally Enclosed Air Over (TEAO) fan motors designed specifically for evaporative cooling application. In addition to the standard, premium efficient, inverter ready motors, the following motor options are available:

- Two speed single winding
- Two speed two winding
- Mill and chemical duty
- Explosion proof
- Pony motor(s) (PHC-D only)

Self Supporting External Service Platforms

PHC Condensers are available with self-supporting service platforms that include access ladders which are designed for easy field installation. This option offers significant savings in comparison to field constructed, externally supported catwalks. The Evapco service platform option is for the air inlet end(s) of the unit.

PHC-D Model Shown

Stainless Steel Basin and Casing

In addition to the EVAPCOAT Corrosion Protection System, EVAPCO offers optional Type 304 or Type 316 stainless steel construction for superior corrosion resistance. EVAPCO induced draft condensers have a modular design which allows for specific areas to be enhanced for increased corrosion protection. The basin area of a condenser is often subjected to high concentrations of impurities and silt. EVAPCO's stainless steel basin option includes welded seam construction as standard. For particularly corrosive environments, stainless steel construction is also available for the coil casing / fan section.

Stainless Steel Coils

The heat exchanger coil is the heart of the evaporative condenser. For this critical component, EVAPCO offers the option of Type 304L stainless steel construction, the ultimate corrosion protection for evaporative cooling applications.

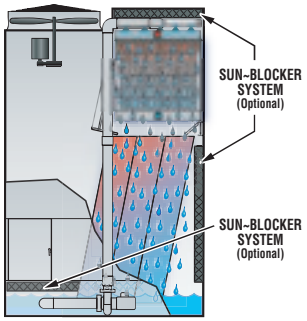
ASME Coils

Evaporative condensers can be furnished with condensing coils manufactured in accordance with the ASME Pressure Vessel Code Section VIII, Division I. Coils built with this option will bear a U-stamp indicating their compliance with the ASME code.

Optional Equipment (cont.)

Coil, Air Inlet & Sump Sun~Blocker System

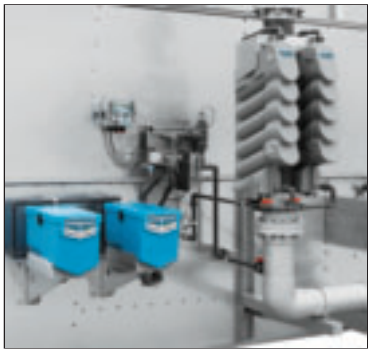
EVAPCO's Sun~Blocker System is designed to prevent sunlight from entering the condenser at the coil inlet, at the fill/air intake, and through the fan cylinder. As standard, these areas are open and exposed to sunlight which may promote algae growth. The Sun~Blocker System will help minimize algae, water splash out, and may reduce water treatment chemistry costs.



Pulse~Pure® PLUS and Smart Shield® Water Treatment Systems

EVAPCO's patented ***Pulse*~Pure® PLUS** factory mounted, water treatment system combines pulse powered non-chemical water treatment with a supplemental bio-control feeder. The result is a safe and effective water treatment system engineered to protect and extend the life of PHC-S and L evaporative condensers. The ***Pulse*~Pure® PLUS** system includes EVAPCO's unique water purification chamber, control panel with integrated conductivity controller, bio-control feeder, and pre-piped, self-draining, blowdown valve. The system eliminates the cost of inhibitor chemistry and saves water usage.

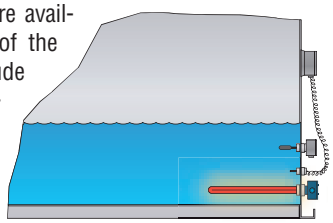
EVAPCO's **Smart Shield®** is a unique solid chemistry water treatment system that is factory mounted to deliver consistent water treatment for evaporative condensers. The patented technology releases the correct amount of scale and corrosion inhibitor as well as biocide over a 30 day period. The solid chemistry is uniquely packaged for safe no-touch handling and eliminates the need for liquid chemical drums and metering pumps. **Smart Shield®** includes the factory mounted inhibitor feeder, bio-control feeder, EVAPCO conductivity controller, and blow-down valve - all pre-wired and pre-piped using EVAPCO's patented self draining design.



Note: Refer to pages 20-21, Pulse~Pure® PLUS and Smart Shield® Application for more details.

Basin Heater Package

Electric basin heater packages are available to help prevent freeze-up of the basin water. The packages include electric heater elements, thermostat and low water cutoff. *Note: External pumps should be heat traced and insulated in the field to prevent freezing.*



Model Number	HTC Heater Sizes (kW)		
	0°F	-20°F	-40°F
PHC-S208 to PHC-S411	(2) 5	(2) 8	(2) 10
PHC-S373 to PHC-S591	(2) 7	(2) 12	(3) 10
PHC-L463 to PHC-L842	(2) 10	(3) 10	(3) 12
PHC-S416 to PHC-S822	(4) 5	(4) 8	(4) 10
PHC-S746 to PHC-S1182	(4) 7	(4) 12	(6) 10
PHC-D621 to PHC-D858	(2) 12	(3) 12	(3) 15
PHC-D790 to PHC-D1025	(2) 15	(3) 15	(3) 18
PHC-D1242 to PHC-D1716	(4) 12	(6) 12	(6) 15
PHC-D1580 to PHC-D2050	(4) 15	(6) 15	(6) 18

Electric Water Level Control

EVAPCO evaporative condensers are available with an optional electric water level control system in place of the standard mechanical makeup valve and float assembly. This package provides very accurate control of the basin water level and does not require field adjustment, even under varying operating conditions.

Electric Water Level Control

It consists of multiple heavy duty stainless steel electrodes. On PHC-S & L Models, these electrodes are mounted external to the unit in a vertical stand pipe. For winter operation, the stand pipe must be wrapped with electric heating cable and insulated to protect it from freezing. On PHC-D Models, the electrodes are mounted internally on the basin of the condenser

The weather protected slow closing solenoid valve(s) for the makeup water connection is factory supplied and is ready for piping to a water supply with a pressure between 25 and 50 psig (172 and 345 kPa).

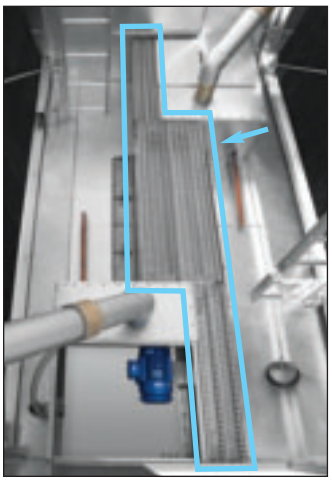
Water Level Indicator

Condensers may be supplied with a water level indicator to provide a visual indication of basin water level without opening access doors. The level indicator can be furnished with an optional low and high level alarm switches or a transmitter for continuous level monitoring.

Optional Equipment (cont.)

Internal Walkway & Elevated Service Platform

(Model No. PHC-D621 to PHC-D2050)



The PHC-D models are available with an optional internal walkway package. The walkway package is constructed of non-slip expanded galvanized steel and provides an easy method for service personnel to walk from the access door to the opposite side of each cell.

An elevated internal service platform option can also be provided on the larger PHC-D models to provide easy access to the unit drive components. The elevated internal service platform system provides an aluminum ladder that extends from the walkway to the service platform located directly below the drive system. The service platform is constructed of aluminum bar grid and provides easy access to lubricate fan bearings and service the motor and drive components.

Internal Motor Davit

In order to provide for easy motor removal, the PHC condensers can be provided with an internal motor davit system. The internal motor davit is constructed of galvanized steel and provides an easy method to lower the fan motor to the basin of the unit for removal through the side access door.

Steel Support

EVAPCO PHC condensers are designed to be supported with structural "I" beams located under the outer flanges and running the entire length of the unit. Mounting holes, 3/4" in diameter are located in the bottom channels 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 to within 1/8" in 6' before setting the unit in place. Do not level the unit by shimming between it and the "I" beams as this will not provide proper longitudinal support.

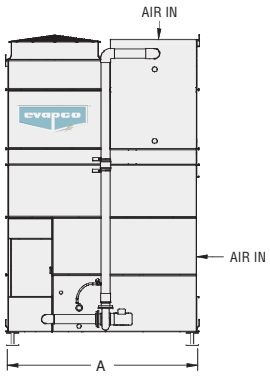
Consult IBC 2012 for required steel support layout and structural design.

PHC Pan Footprint Dimensions

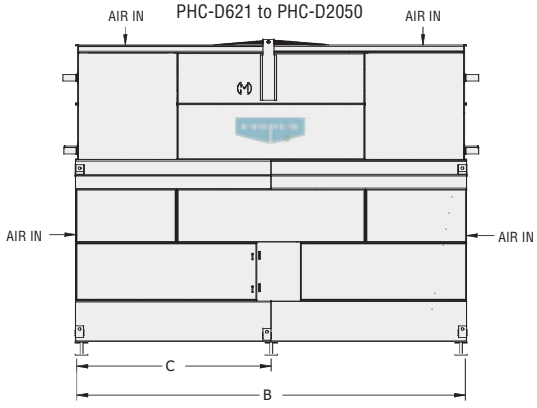
Model	A	B	C
PHC-S208 to PHC-S411	142	-	-
PHC-S373 to PHC-S591	142	-	-
PHC-L463 to PHC-L842	142	-	-
PHC-S416 to PHC-S822	142	-	-
PHC-S746 to PHC-S1182	142	-	-
PHC-D621 to PHC-D858	-	288	144
PHC-D790 to PHC-D1025	-	288	144
PHC-D1242 to PHC-D1716	-	312	156
PHC-D1580 to PHC-D2050	-	312	156

Note: Unit dimensions shown for reference only. Consult the PHC unit steel support drawings for specific beam dimensions and bolt locations.

PHC-S208 to PHC-S1182
PHC-L463 to PHC-L842



PHC-D621 to PHC-D2050



Typical Steel Support

IBC Compliance

IBC Compliance

EVAPCO has been applying advanced structural technology to evaporative condensers for many years. Following seismic events in the mid 1990's EVAPCO introduced the UB Series of induced draft cooling towers, fluid coolers and evaporative condensers. These products were designed, built and independently certified for extreme seismic and wind forces. With the advent of the International Building Code, EVAPCO is now offering PHC Evaporative Condensers that are IBC compliant.

International Building Code

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. As of June 2008, all 50 states plus Washington D.C have adopted the International Building Code. Compared to previous building codes that solely examined anchorage, the earthquake provisions contained within the International Building Code address anchorage, structural integrity, and operational capability of a component following a seismic event. The goal of the IBC is to minimize the loss of life and improve the capability of essential facilities to operate after a seismic event.

The International Building Code (IBC) was developed to replace the *BOCA National Building Code*, ICBO's *Uniform Building Code* and SBCCI's *Standard Building Code*. The International Building Code specifies that all components be designed to resist the equivalent seismic forces as the structure to which they are installed whereas previous building codes focused exclusively on the structure of the building to provide resistance against seismic forces. These components include all aspects of the building architectural, electrical and mechanical systems. The failure of these components during a seismic event has been a common occurrence in recent history. Although the structure of the building may be relatively undamaged from an earthquake, the damage to the nonstructural components could be significant and result in considerable secondary damage to the building (ie. flooding, fire, structural damage).

Seismic Design

The IBC specifies that all installed components must meet the requirements of ASCE 7-10 (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 7-10 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.

The seismic design force, utilized for component design, represents an equivalent static force that is applied to the components' center of gravity as described in the following equation:

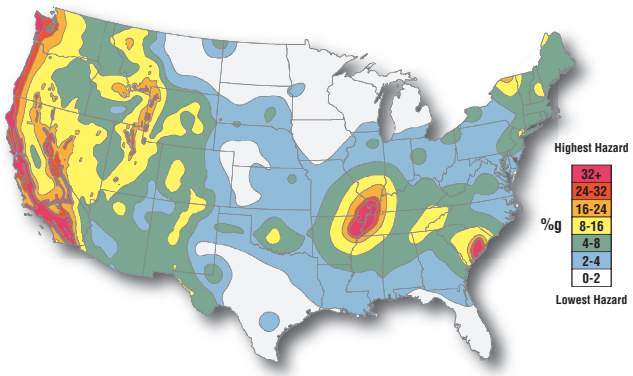
$$F_p = [(0.4 * (a_p) * (S_{DS}) * (W_p)) / (R_p / I_p)] * (1 + 2 * (z / h))$$

- F_p = Seismic Design Force centered at the component's center of gravity
- S_{DS} = Design spectral response acceleration, short period
- a_p = Component amplification factor
- I_p = Component importance factor
- W_p = Component operating weight
- R_p = Component response modification factor
- z = Height in structure of point of attachment of component with respect to the base
- h = Average roof height of structure with respect to the base

The minimum and maximum design force limits are specified as:

$$F_p\text{-min} = 0.3\ S_{DS}\ I_p\ W_p$$
$$F_p\text{-max} = 1.6\ S_{DS}\ I_p\ W_p$$

A series of charts and graphs are used to determine the appropriate factors based on the location of the installation and ultimately the "importance" of the facility. A chart of the potential seismic activity in the United States is shown below.



Map courtesy US Geological Survey website

IBC Compliance

Importance Factor (I_p)

A major parameter that must be determined prior to calculating the seismic design force is the component importance factor (I_p). ASCE 7-10 defines the component importance factor as:

Importance Factor, I_p	Classification
1.5	• Life safety component required to function after seismic event. • Component containing hazardous content where the quantity, if released, exceeds a threshold limit that is sufficient to pose a threat to the public. • Components installed at Risk Category IV (essential) facilities
1.0	All other components

According to ASCE 7-10, Section 13.1.3, components containing hazardous contents that could release an amount in excess of code limits require an importance factor of 1.5. However, per ASCE 7-10, Section 1.5.3, the importance factor may be reduced to 1.0 should the authority having jurisdiction deem an acceptable Risk Management Program (RMP) would limit a release such that the release would not pose a threat to the public. The importance factor has significant impact on the design of the equipment necessary for the application. Please contact the factory for assistance in understanding your needs.

Design Implementation

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 and provide those in construction documents. 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 condenser to meet IBC regulations. The standard PHC design is independently certified to meet IBC. For applications that require a more severe seismic duty, EVAPCO offers optional construction designs–please consult the factory. 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 should demonstrate that the equipment/unit has been independently tested and analyzed in accordance with the IBC program. Evapco has worked closely with Tobolski Watkins Engineering, Inc., a Certified Seismic Qualification Agency, to complete the independent equipment testing and analysis. A sample of the certificate of compliance and unit label is presented below:

evapco

Certificate of Compliance

AT, USS, UAT, UT Cooling Towers
eco-ATWB/WB-E, ATWB and ESWA Closed Circuit Coolers
eco-ATCA, ATC-E and PHC Evaporative Condensers

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

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

Applicable Building Codes:
IBC 2012
ASCE-7
NFPA 5000

Approval Agency:
Tobolski Watkins Engineering, Inc.

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

evapco

Seismic and Wind Load Certification

AT, USS, UAT, UT Cooling Towers
eco-ATWB/WB-E, ATWB and ESWA Closed Circuit Coolers
eco-ATCA, ATC-E and PHC Evaporative Condensers

Units Designed and Manufactured to Meet the Seismic & Wind Load Requirements of:
IBC 2012 ASCE-7 NFPA 5000

Independent Certification By:
Tobolski Watkins Engineering, Inc.

Selection Procedure

Two methods of selection are presented, the first is based on the total heat of rejection as described immediately below. The second and more simple method is based on evaporator tons. The evaporator ton method is only applicable to systems with open type reciprocating compressors.

The heat of rejection method is applicable to all but centrifugal compressor applications and is normally used for selecting evaporative condensers for use with hermetic compressors and screw compressors. It can also be used for standard open type reciprocating compressors as an alternate to the evaporator ton method.

The evaporator ton method is based on the estimated heat of compression. **The heat of rejection method of selection is more accurate and should be used whenever possible.**

Refer to the factory for selections on systems with centrifugal compressors.

Heat of Rejection Method

In the heat of rejection method, a factor for the specified operating conditions (condensing temperature and wet bulb) is obtained from Table 1 and multiplied times the heat of rejection.
The resultant figure is used to select a unit from Table 2. Unit capacities are given in Table 1 in thousands of BTU/Hr or MBH.

If the heat of rejection is not known, it can be determined by one of the following formulas:

Open Compressors:
Heat of Rejection = Evaporator Load (BTU/Hr) + Compressor BHP x 2545

Hermetic Compressors:
Heat of Rejection = Evaporator Load (BTU/Hr) + K.W. Compressor Input x 3415

EXAMPLE

Given: 450 ton load, ammonia refrigerant 96.3° condensing temperature, 78° W.B. temperature and 500 compressor BHP.

Selection: Heat of Rejection

450 tons x 12000	=	5,400,000 BTU/Hr
500 BHP x 2545	=	1,272,500 BTU/Hr
Total		6,672,500 BTU/Hr

From Table 1 the capacity factor for 96.3° condensing and 78° W.B. = 1.37, 6,672,500 x 1.37 = 9,141,325 BTU/Hr or 9142 MBH. Therefore, select model PHC-S448.

Note: For screw compressor selections employing water cooled oil cooling, select a condenser for the total MBH as in the example. The condenser can then function in one of two ways:

(1) Recirculating water from the water sump can be used for oil cooling. A separate pump should be employed and the return water should be directed into the water sump at the opposite end from the pump suction.

(2) The condenser coil can be circuited so that water or a glycol-water mixture for the oil cooler can be cooled in a separate section of the coil. Specify load and water flow required.

For refrigerant injection cooled screw compressors, select the condenser in the same manner as shown in the example.

If the oil cooler is supplied by water from a separate source, then the oil cooling load should be deducted from the heat of rejection before making the selection.

Table 1 - Ammonia (R-717) Heat Rejection Factors

Condensing Pres. psig	Cond. Temp. °F	Wet Bulb Temperature, (°F)																	
		50	55	60	62	64	66	68	70	72	74	75	76	77	78	80	82	84	86
152	85	.98	1.09	1.24	1.34	1.44	1.56	1.72	1.90	2.16	2.48	2.70	2.94	3.25	3.57	-	-	-	-
166	90	.83	.91	1.02	1.08	1.14	1.21	1.29	1.40	1.53	1.69	1.79	1.89	2.01	2.12	2.54	3.12	-	-
181	95	.71	.78	.85	.89	.94	.98	1.03	1.09	1.17	1.25	1.29	1.34	1.39	1.47	1.63	1.85	2.12	2.47
185	96.3	.69	.75	.82	.86	.90	.94	.98	1.03	1.10	1.18	1.22	1.26	1.31	1.37	1.51	1.71	1.94	2.25
197	100	.63	.68	.73	.76	.79	.81	.84	.87	.92	.97	1.00	1.03	1.07	1.11	1.20	1.30	1.46	1.63
214	105	.56	.59	.62	.64	.67	.69	.71	.74	.78	.81	.83	.85	.87	.89	.95	1.01	1.10	1.21
232	110	.50	.53	.55	.57	.58	.60	.62	.63	.66	.69	.70	.71	.73	.75	.79	.83	.87	.93

Table 2 - Unit Heat Rejection

Model	MBH Base	Model	MBH Base	Model	MBH Base	Model	MBH Base	Model	MBH Base	Model	MBH Base
PHC-S208	4,311	PHC-S449	9,306	PHC-D621	12,871	PHC-D762	15,794	PHC-S896	18,571	PHC-D1456	30,179
PHC-S251	5,202	PHC-L463	9,597	PHC-L625	12,954	PHC-L769	15,939	PHC-S898	18,613	PHC-D1518	31,464
PHC-S282	5,845	PHC-S478	9,908	PHC-S644	13,348	PHC-S776	16,084	PHC-D905	18,758	PHC-D1524	31,588
PHC-S286	5,928	PHC-S497	10,301	PHC-D645	13,369	PHC-S790	16,374	PHC-D912	18,903	PHC-D1580	32,749
PHC-S303	6,280	PHC-L501	10,384	PHC-S647	13,410	PHC-D790	16,374	PHC-D945	19,587	PHC-D1582	32,790
PHC-S304	6,301	PHC-S503	10,426	PHC-L650	13,473	PHC-D791	16,395	PHC-D948	19,649	PHC-D1588	32,914
PHC-S322	6,674	PHC-S521	10,799	PHC-S673	13,949	PHC-D794	16,457	PHC-S956	19,815	PHC-D1590	32,956
PHC-S323	6,695	PHC-L525	10,882	PHC-L674	13,970	PHC-D795	16,478	PHC-D982	20,354	PHC-D1647	34,137
PHC-S335	6,944	PHC-S539	11,172	PHC-L683	14,157	PHC-L799	16,561	PHC-D987	20,458	PHC-D1648	34,158
PHC-S344	7,130	PHC-S542	11,234	PHC-D687	14,239	PHC-L809	16,768	PHC-S994	20,603	PHC-D1652	34,241
PHC-S357	7,400	PHC-S560	11,607	PHC-S688	14,260	PHC-S822	17,038	PHC-D1025	21,245	PHC-D1654	34,282
PHC-S359	7,441	PHC-S564	11,690	PHC-L701	14,530	PHC-D823	17,058	PHC-S1042	21,598	PHC-D1706	35,360
PHC-S373	7,731	PHC-L566	11,731	PHC-L712	14,758	PHC-D824	17,079	PHC-S1078	22,344	PHC-D1716	35,568
PHC-S375	7,773	PHC-S568	11,773	PHC-S715	14,820	PHC-D826	17,121	PHC-S1084	22,468	PHC-D1748	36,231
PHC-S388	8,042	PHC-L569	11,794	PHC-D717	14,861	PHC-D827	17,141	PHC-S1120	23,214	PHC-D1810	37,516
PHC-S395	8,187	PHC-S572	11,856	PHC-S718	14,882	PHC-S830	17,203	PHC-S1136	23,546	PHC-D1824	37,806
PHC-S411	8,519	PHC-S591	12,250	PHC-D728	15,089	PHC-L842	17,452	PHC-S1182	24,499	PHC-D1890	39,174
PHC-S415	8,602	PHC-L599	12,415	PHC-L743	15,400	PHC-S852	17,659	PHC-D1242	25,743	PHC-D1896	39,298
PHC-S416	8,622	PHC-S607	12,581	PHC-S746	15,462	PHC-D853	17,680	PHC-D1290	26,738	PHC-D1964	40,708
PHC-S426	8,830	PHC-S608	12,602	PHC-S750	15,545	PHC-D858	17,784	PHC-D1374	28,479	PHC-D1974	40,915
PHC-S448	9,286	PHC-L614	12,726	PHC-D759	15,732	PHC-D874	18,115	PHC-D1434	29,723	PHC-D2050	42,490

Note: Table 2 presents only the standard model selections. Other models exist for special horsepower or layout applications. Please consult the factory or EVAPCO Representative for the special situations.

Selection Procedure

Evaporator Ton Method

In the evaporator ton method, factors for the specified operating conditions (suction temperature, condensing temperature and wet bulb) are obtained from Table 4 and multiplied times the heat load in tons. The resultant figure is used to select a unit from Table 3. The condenser model in Table 4 is equal to the unit capacity in evaporator tons for NH3 conditions of 96.3°F condensing, 20°F suction and 78° wet bulb.

EXAMPLE

Given: 600 ton evaporator load, R-717, condensing at 95° F, with +10° F suction and 78° F wet bulb temperatures.

Selection: The capacity factor from Table 4 for the given condensing and wet bulb conditions is 1.07, and the capacity factor for the suction temperature of +10° F is 1.03, so the corrected capacity required may be determined as:

600 X 1.07 X 1.03 = 661 corrected tons. Therefore, select a model PHC-S673 or greater depending on the unit type desired, and any layout or horsepower considerations.

Table 3 - Ammonia (R-717) Evaporator Capacity Factors

Condensing Pres. psig	Cond. Temp. °F	Wet Bulb Temperature, (°F)																	
		50	55	60	62	64	66	68	70	72	74	75	76	77	78	80	82	84	86
152	85	0.70	0.77	0.88	0.95	1.02	1.11	1.22	1.35	1.53	1.76	1.92	2.09	2.31	2.54	-	-	-	-
166	90	0.59	0.65	0.73	0.78	0.82	0.87	0.93	1.00	1.09	1.21	1.28	1.36	1.44	1.53	1.83	2.24	-	-
181	95	0.52	0.56	0.61	0.65	0.68	0.71	0.75	0.79	0.85	0.91	0.94	0.97	1.02	1.07	1.19	1.35	1.54	1.80
185	96.3	0.51	0.55	0.60	0.63	0.65	0.68	0.71	0.75	0.80	0.86	0.89	0.92	0.95	1.00	1.10	1.24	1.42	1.65
197	100	0.46	0.50	0.53	0.56	0.58	0.60	0.61	0.64	0.68	0.71	0.73	0.75	0.79	0.81	0.88	0.96	1.07	1.19
214	105	0.41	0.43	0.46	0.48	0.50	0.51	0.53	0.55	0.58	0.60	0.62	0.63	0.64	0.66	0.70	0.75	0.82	0.90
232	110	0.37	0.39	0.41	0.43	0.43	0.45	0.46	0.48	0.50	0.51	0.52	0.53	0.55	0.56	0.59	0.63	0.65	0.70

Suction Temp. °F	-30°	-20°	-10°	0°	+10°	+20°	+30°	+40°
Suction Press. (psig)	-1.6	3.6	9.0	15.7	23.8	33.5	45.0	58.6
Capacity Factor	1.18	1.14	1.10	1.07	1.03	1.00	0.97	0.95

Note: Table 3 presents only the standard model selections. Other models exist for special horsepower or layout applications. Please consult the factory or EVAPCO Representative for the special situations.

Table 4 - Unit Sizes

Model	Model	Model	Model	Model	Model
PHC-S208	PHC-S449	PHC-D621	PHC-D762	PHC-S896	PHC-D1456
PHC-S251	PHC-L463	PHC-L625	PHC-L769	PHC-S898	PHC-D1518
PHC-S282	PHC-S478	PHC-S644	PHC-S776	PHC-D905	PHC-D1524
PHC-S286	PHC-S497	PHC-D645	PHC-S790	PHC-D912	PHC-D1580
PHC-S303	PHC-L501	PHC-S647	PHC-D790	PHC-D945	PHC-D1582
PHC-S304	PHC-S503	PHC-L650	PHC-D791	PHC-D948	PHC-D1588
PHC-S322	PHC-S521	PHC-S673	PHC-D794	PHC-S956	PHC-D1590
PHC-S323	PHC-L525	PHC-L674	PHC-D795	PHC-D982	PHC-D1647
PHC-S335	PHC-S539	PHC-L683	PHC-L799	PHC-D987	PHC-D1648
PHC-S344	PHC-S542	PHC-D687	PHC-L809	PHC-S994	PHC-D1652
PHC-S357	PHC-S560	PHC-S688	PHC-S822	PHC-D1025	PHC-D1654
PHC-S359	PHC-S564	PHC-L701	PHC-D823	PHC-S1042	PHC-D1706
PHC-S373	PHC-L566	PHC-L712	PHC-D824	PHC-S1078	PHC-D1716
PHC-S375	PHC-S568	PHC-S715	PHC-D826	PHC-S1084	PHC-D1748
PHC-S388	PHC-L569	PHC-D717	PHC-D827	PHC-S1120	PHC-D1810
PHC-S395	PHC-S572	PHC-S718	PHC-S830	PHC-S1136	PHC-D1824
PHC-S411	PHC-S591	PHC-D728	PHC-L842	PHC-S1182	PHC-D1890
PHC-S415	PHC-L599	PHC-L743	PHC-S852	PHC-D1242	PHC-D1896
PHC-S416	PHC-S607	PHC-S746	PHC-D853	PHC-D1290	PHC-D1964
PHC-S426	PHC-S608	PHC-S750	PHC-D858	PHC-D1374	PHC-D1974
PHC-S448	PHC-L614	PHC-D759	PHC-D874	PHC-D1434	PHC-D2050

Engineering & Dimensions Data *PHC-S208 to L842*

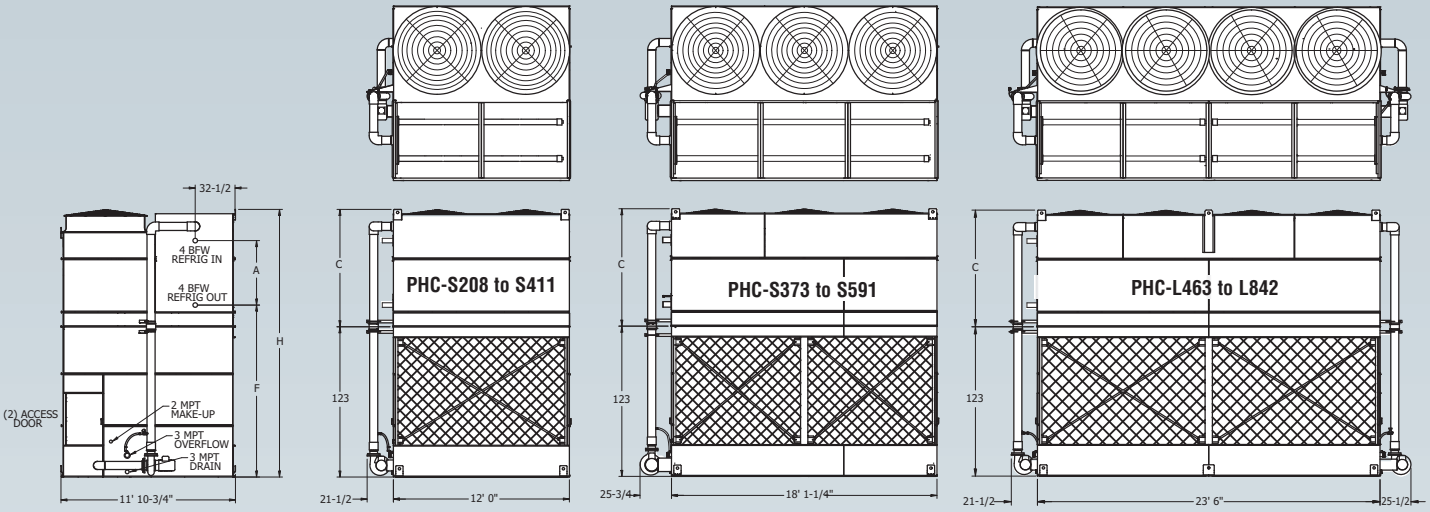


Table 5 Engineering Data

Model Number	R-717 Capacity Tons†	Fans		Weights (lbs.)			Operating Charge (lbs.)	NH3 Coil Volume (ft3)	Spray Pump		Remote Pump			Dimensions (in.)			
		HP	CFM	Shipping	Operating	Heaviest Section††			HP	GPM	Gallons Req'd	Conn. Size (in.)	Operating Weight (lbs.)	A	F	C	H
PHC-S208	208	10	71,600	11,910	17,260	6,750	140	18	5	700	590	10	15,510	25-3/4	167-3/4	96	219
PHC-S251	251	10	70,600	12,780	18,170	7,620	180	24	5	700	590	10	16,420	34-3/4	158-3/4	96	219
PHC-S282	282	10	68,200	13,610	19,040	8,450	220	30	5	700	590	10	17,290	43-3/4	149-3/4	96	219
PHC-S286	286	20	88,700	12,880	18,270	7,720	180	24	5	700	590	10	16,520	34-3/4	158-3/4	96	219
PHC-S303	303	10	62,800	16,510	22,120	11,350	400	55	5	700	590	10	20,370	52-3/4	140-3/4	105	219
PHC-S304	304	15	78,000	13,670	19,100	8,510	220	30	5	700	590	10	17,350	43-3/4	149-3/4	96	219
PHC-S322	322	20	85,700	13,710	19,140	8,550	220	30	5	700	590	10	17,390	43-3/4	149-3/4	96	219
PHC-S323	323	15	73,300	15,530	21,090	10,370	350	47	5	700	590	10	19,340	52-3/4	140-3/4	96	219
PHC-S335	335	15	71,800	16,580	22,190	11,420	400	55	5	700	590	10	20,440	52-3/4	140-3/4	105	219
PHC-S344	344	20	80,600	15,570	21,130	10,410	350	47	5	700	590	10	19,380	52-3/4	140-3/4	96	219
PHC-S357	357	20	79,000	16,620	22,230	11,460	400	55	5	700	590	10	20,480	52-3/4	140-3/4	105	219
PHC-S359	359	25	86,700	15,620	21,180	10,460	350	47	5	700	590	10	19,430	52-3/4	140-3/4	96	219
PHC-S375	375	25	85,000	16,670	22,280	11,510	400	55	5	700	590	10	20,530	52-3/4	140-3/4	105	219
PHC-S388	388	30	90,300	16,680	22,290	11,520	400	55	5	700	590	10	20,540	52-3/4	140-3/4	105	219
PHC-S395	395	40	101,400	16,300	21,860	11,140	350	47	5	700	590	10	20,340	52-3/4	140-3/4	110-5/8	233-5/8
PHC-S411	411	40	99,400	17,350	22,960	12,190	400	55	5	700	590	10	21,440	52-3/4	140-3/4	119-5/8	233-5/8
PHC-S373	373	10 & 5	106,800	18,440	26,330	11,450	260	36	7 1/2	920	900	10	23,840	34-3/4	158-3/4	96	219
PHC-S415	415	10 & 5	103,200	19,700	27,660	12,710	330	45	7 1/2	920	900	10	25,170	43-3/4	149-3/4	96	219
PHC-S426	426	10 & 5	101,100	20,880	28,900	13,890	390	53	7 1/2	920	900	10	26,410	52-3/4	140-3/4	96	219
PHC-S448	448	15 & 7.5	118,000	19,750	27,710	12,760	330	45	7 1/2	920	900	10	25,220	43-3/4	149-3/4	96	219
PHC-S449	449	10 & 5	95,100	24,060	32,290	17,070	600	82	7 1/2	920	900	10	29,800	61-3/4	140-3/4	105	228
PHC-S478	478	15 & 7.5	111,000	22,530	30,680	15,540	520	70	7 1/2	920	900	10	28,190	52-3/4	140-3/4	96	219
PHC-S497	497	15 & 7.5	108,700	24,110	32,340	17,120	600	82	7 1/2	920	900	10	29,850	61-3/4	140-3/4	105	228
PHC-S521	521	20 & 10	119,600	24,160	32,390	17,170	600	82	7 1/2	920	900	10	29,900	61-3/4	140-3/4	105	228
PHC-S539	539	30 & 15	139,500	22,700	30,850	15,710	520	70	7 1/2	920	900	10	28,360	52-3/4	140-3/4	96	219
PHC-S542	542	25 & 15	131,600	24,270	32,500	17,280	600	82	7 1/2	920	900	10	30,010	61-3/4	140-3/4	105	228
PHC-S560	560	30 & 15	136,900	24,280	32,510	17,290	600	82	7 1/2	920	900	10	30,020	61-3/4	140-3/4	105	228
PHC-S568	568	40 & 20	153,500	23,650	31,800	16,660	520	70	7 1/2	920	900	10	29,650	52-3/4	140-3/4	110-5/8	233-5/8
PHC-S591	591	40 & 20	150,600	25,230	33,460	18,240	600	82	7 1/2	920	900	10	31,310	61-3/4	140-3/4	119-5/8	242-5/8
PHC-L463	463	(2) 10	159,300	22,000	32,620	13,200	260	36	(2) 5	1400	1200	14	29,420	25-3/4	167-3/4	96	219
PHC-L501	501	(2) 15	182,100	22,120	32,740	13,320	260	36	(2) 5	1400	1200	14	29,540	25-3/4	167-3/4	96	219
PHC-L525	525	(2) 10	157,100	23,720	34,430	14,920	350	48	(2) 5	1400	1200	14	31,230	34-3/4	158-3/4	96	219
PHC-L566	566	(2) 15	179,600	23,850	34,560	15,050	350	48	(2) 5	1400	1200	14	31,360	34-3/4	158-3/4	96	219
PHC-L569	569	(2) 10	155,500	25,420	36,210	16,620	430	59	(2) 5	1400	1200	14	33,010	43-3/4	149-3/4	96	219
PHC-L599	599	(2) 10	152,900	27,200	38,080	18,400	520	71	(2) 5	1400	1200	14	34,880	52-3/4	140-3/4	96	219
PHC-L614	614	(2) 15	177,800	25,540	36,330	16,740	430	59	(2) 5	1400	1200	14	33,130	43-3/4	149-3/4	96	219
PHC-L625	625	(2) 10	146,800	29,140	40,190	20,340	690	94	(2) 5	1400	1200	14	36,990	52-3/4	140-3/4	96	219
PHC-L650	650	(2) 10	143,900	31,240	42,400	22,440	800	109	(2) 5	1400	1200	14	39,200	61-3/4	140-3/4	105	228
PHC-L674	674	(2) 15	167,800	29,260	40,310	20,460	690	94	(2) 5	1400	1200	14	37,110	52-3/4	140-3/4	96	219
PHC-L683	683	(2) 20	192,200	27,410	38,290	18,610	520	71	(2) 5	1400	1200	14	35,090	52-3/4	140-3/4	96	219
PHC-L701	701	(2) 15	164,500	31,360	42,520	22,560	800	109	(2) 5	1400	1200	14	39,320	61-3/4	140-3/4	105	228
PHC-L712	712	(2) 20	184,600	29,350	40,400	20,550	690	94	(2) 5	1400	1200	14	37,200	52-3/4	140-3/4	96	219
PHC-L743	743	(2) 25	198,700	29,440	40,490	20,640	690	94	(2) 5	1400	1200	14	37,290	52-3/4	140-3/4	96	219
PHC-L769	769	(2) 30	211,000	29,460	40,510	20,660	690	94	(2) 5	1400	1200	14	37,310	52-3/4	140-3/4	96	219
PHC-L799	799	(2) 30	206,800	31,560	42,720	22,760	800	109	(2) 5	1400	1200	14	39,520	61-3/4	140-3/4	105	228
PHC-L809	809	(2) 40	232,200	30,810	41,860	22,010	690	94	(2) 5	1400	1200	14	39,120	52-3/4	140-3/4	110-5/8	233-5/8
PHC-L842	842	(2) 40	227,600	32,920	44,080	24,120	800	109	(2) 5	1400	1200	14	41,340	61-3/4	140-3/4	119-5/8	242-5/8

NOTE: Dimensions and weights are subject to change. The coil connection quantity and locations are subject to change due to refrigerant loading. Refer to project certified print drawings for specific weights, dimensions and all piping connections.

† Tons at standard conditions for ammonia 96.3°F, 20°F suction and 78°F E.W.B.

†† Heaviest section is the casing/fan section.

Engineering & Dimensions Data *PHC-S416 to S1182*

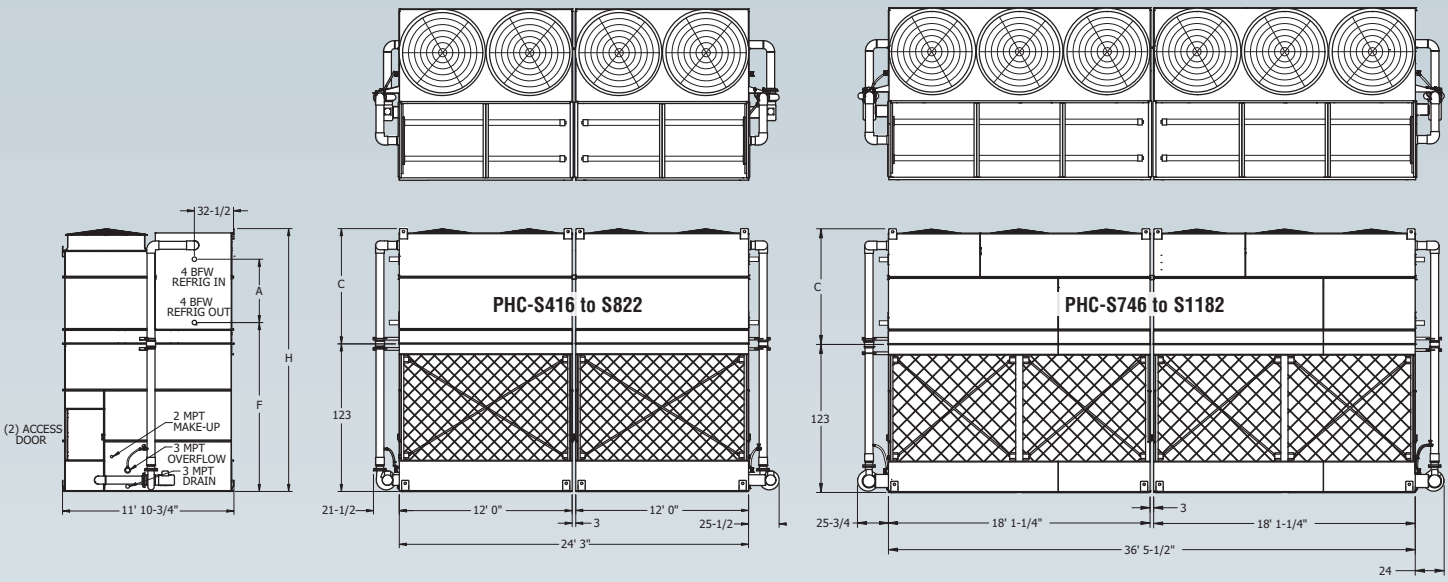


Table 6 Engineering Data

Model Number	R-717 Capacity Tons†	Fans		Weights (lbs.)			Operating Charge (lbs.)	NH_3 Coil Volume (ft^3)	Spray Pump		Remote Pump			Dimensions (in.)			
		HP	CFM	Shipping	Operating	Heaviest Section††			HP	GPM	Gallons Req'd	Conn. Size (in.)	Operating Weight (lbs.)	A	F	C	H
PHC-S416	416	(2) 10	143,100	23,820	34,520	6,750	280	36	(2) 5	1400	1180	(2) 10	31,020	25-3/4	167-3/4	96	219
PHC-S503	503	(2) 10	141,100	25,560	36,340	7,620	360	48	(2) 5	1400	1180	(2) 10	32,840	34-3/4	158-3/4	96	219
PHC-S564	564	(2) 10	136,400	27,220	38,080	8,450	440	60	(2) 5	1400	1180	(2) 10	34,580	43-3/4	149-3/4	96	219
PHC-S572	572	(2) 20	177,400	25,760	36,540	7,720	360	48	(2) 5	1400	1180	(2) 10	33,040	34-3/4	158-3/4	96	219
PHC-S607	607	(2) 10	125,700	33,020	44,240	11,350	800	110	(2) 5	1400	1180	(2) 10	40,740	52-3/4	140-3/4	105	219
PHC-S608	608	(2) 15	155,900	27,340	38,200	8,510	440	60	(2) 5	1400	1180	(2) 10	34,700	43-3/4	149-3/4	96	219
PHC-S644	644	(2) 20	171,400	27,420	38,280	8,550	440	60	(2) 5	1400	1180	(2) 10	34,780	43-3/4	149-3/4	96	219
PHC-S647	647	(2) 15	146,600	31,060	42,180	10,370	700	94	(2) 5	1400	1180	(2) 10	38,680	52-3/4	140-3/4	96	219
PHC-S673	673	(2) 15	143,700	33,160	44,380	11,420	800	110	(2) 5	1400	1180	(2) 10	40,880	52-3/4	140-3/4	105	219
PHC-S688	688	(2) 20	161,200	31,140	42,260	10,410	700	94	(2) 5	1400	1180	(2) 10	38,760	52-3/4	140-3/4	96	219
PHC-S715	715	(2) 20	158,000	33,240	44,460	11,460	800	110	(2) 5	1400	1180	(2) 10	40,960	52-3/4	140-3/4	105	219
PHC-S718	718	(2) 25	173,500	31,240	42,360	10,460	700	94	(2) 5	1400	1180	(2) 10	38,860	52-3/4	140-3/4	96	219
PHC-S750	750	(2) 25	170,000	33,340	44,560	11,510	800	110	(2) 5	1400	1180	(2) 10	41,060	52-3/4	140-3/4	105	219
PHC-S776	776	(2) 30	180,600	33,360	44,580	11,520	800	110	(2) 5	1400	1180	(2) 10	41,080	52-3/4	140-3/4	105	219
PHC-S790	790	(2) 40	202,800	32,600	43,720	11,140	700	94	(2) 5	1400	1180	(2) 10	40,680	52-3/4	140-3/4	110-5/8	233-5/8
PHC-S822	822	(2) 40	198,800	34,700	45,920	12,190	800	110	(2) 5	1400	1180	(2) 10	42,880	52-3/4	140-3/4	119-5/8	233-5/8
PHC-S746	746	(2) 10 & (2) 5	213,700	36,880	52,660	11,450	520	72	(2) 7.5	1840	1800	(2) 10	47,680	34-3/4	158-3/4	96	219
PHC-S830	830	(2) 10 & (2) 5	206,500	39,400	55,320	12,710	660	90	(2) 7.5	1840	1800	(2) 10	50,340	43-3/4	149-3/4	96	219
PHC-S852	852	(2) 10 & (2) 5	202,200	41,760	57,800	13,890	780	106	(2) 7.5	1840	1800	(2) 10	52,820	52-3/4	140-3/4	96	219
PHC-S896	896	(2) 15 & (2) 7.5	236,000	39,500	55,420	12,760	660	90	(2) 7.5	1840	1800	(2) 10	50,440	43-3/4	149-3/4	96	219
PHC-S898	898	(2) 10 & (2) 5	190,300	48,120	64,580	17,070	1200	164	(2) 7.5	1840	1800	(2) 10	59,600	61-3/4	140-3/4	105	228
PHC-S956	956	(2) 15 & (2) 7.5	221,900	45,060	61,360	15,540	1040	140	(2) 7.5	1840	1800	(2) 10	56,380	52-3/4	140-3/4	96	219
PHC-S994	994	(2) 15 & (2) 7.5	217,500	48,220	64,680	17,120	1200	164	(2) 7.5	1840	1800	(2) 10	59,700	61-3/4	140-3/4	105	228
PHC-S1042	1042	(2) 20 & (2) 10	239,100	48,320	64,780	17,170	1200	164	(2) 7.5	1840	1800	(2) 10	59,800	61-3/4	140-3/4	105	228
PHC-S1078	1078	(2) 30 & (2) 15	279,000	45,400	61,700	15,710	1040	140	(2) 7.5	1840	1800	(2) 10	56,720	52-3/4	140-3/4	96	219
PHC-S1084	1084	(2) 25 & (2) 15	263,200	48,540	65,000	17,280	1200	164	(2) 7.5	1840	1800	(2) 10	60,020	61-3/4	140-3/4	105	228
PHC-S1120	1120	(2) 30 & (2) 15	273,400	48,560	65,020	17,290	1200	164	(2) 7.5	1840	1800	(2) 10	60,040	61-3/4	140-3/4	105	228
PHC-S1136	1136	(2) 40 & (2) 20	307,000	47,300	63,600	16,660	1040	140	(2) 7.5	1840	1800	(2) 10	59,300	52-3/4	140-3/4	110-5/8	233-5/8
PHC-S1182	1182	(2) 40 & (2) 20	300,900	50,460	66,920	18,240	1200	164	(2) 7.5	1840	1800	(2) 10	62,620	61-3/4	140-3/4	119-5/8	242-5/8

NOTE: Dimensions and weights are subject to change. The coil connection quantity and locations are subject to change due to refrigerant loading. Refer to project certified print drawings for specific weights, dimensions and all piping connections.

† Tons at standard conditions for ammonia 96.3°F, 20°F suction and 78°F E.W.B.

†† Heaviest section is the casing/fan section.

Engineering & Dimensions Data *PHC-D621 to D1025*

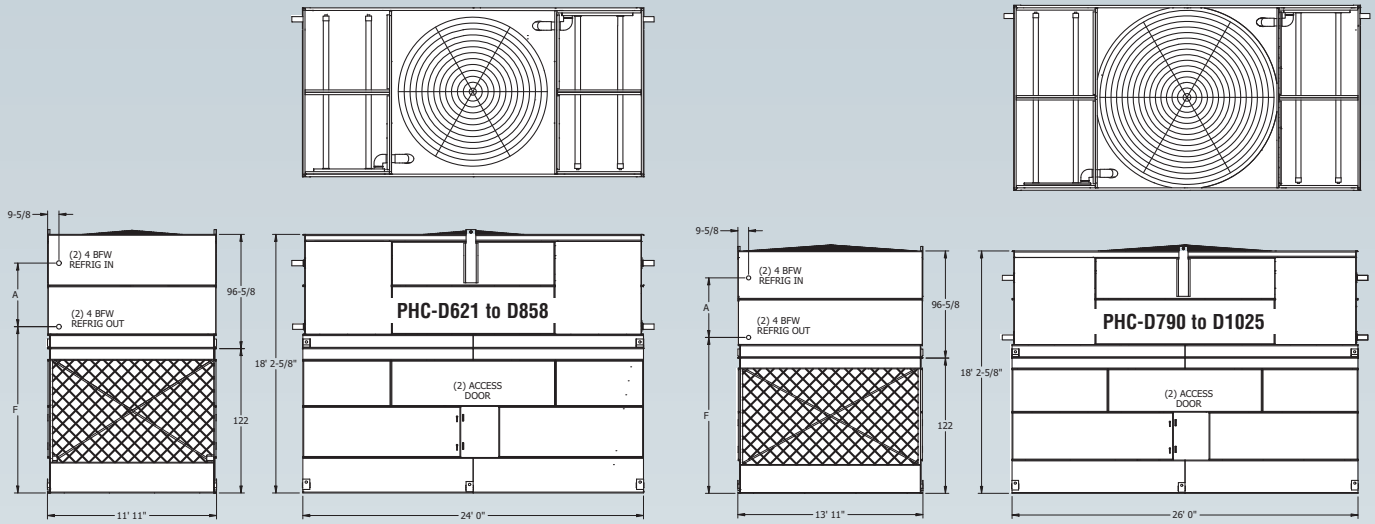


Table 7 Engineering Data

Model Number	R-717 Capacity Tons†	Fans		Weights (lbs.)			Operating Charge (lbs.)	NH_3 Coil Volume (ft^3)	Spray Pump		Remote Pump			Dimensions (in.)	
		HP	CFM	Shipping	Operating	Heaviest Section††			HP	GPM	Gallons Req'd	Conn. Size (in.)	Operating Weight (lbs.)	A	F
PHC-D621	621	25	176,200	28,350	43,380	18,600	500	68	(2) 7.5	1800	1580	14	39,320	44-3/4	149-5/8
PHC-D645	645	30	187,200	28,360	43,390	18,610	500	68	(2) 7.5	1800	1580	14	39,330	44-3/4	149-5/8
PHC-D687	687	30	185,000	30,230	45,360	20,480	600	82	(2) 7.5	1800	1580	14	41,300	53-3/4	140-5/8
PHC-D717	717	30	177,600	31,480	46,810	21,730	800	110	(2) 7.5	1800	1580	14	42,750	53-3/4	140-5/8
PHC-D728	728	40	203,400	30,450	45,580	20,700	600	82	(2) 7.5	1800	1580	14	41,520	53-3/4	140-5/8
PHC-D759	759	40	195,200	31,700	47,030	21,950	800	110	(2) 7.5	1800	1580	14	42,970	53-3/4	140-5/8
PHC-D762	762	50	218,900	30,460	45,590	20,710	600	82	(2) 7.5	1800	1580	14	41,530	53-3/4	140-5/8
PHC-D791	791	60	232,500	30,740	45,870	20,990	600	82	(2) 7.5	1800	1580	14	41,810	53-3/4	140-5/8
PHC-D795	795	50	210,200	31,700	47,030	21,950	800	110	(2) 7.5	1800	1580	14	42,970	53-3/4	140-5/8
PHC-D823	823	60	223,200	31,990	47,320	22,240	800	110	(2) 7.5	1800	1580	14	43,260	53-3/4	140-5/8
PHC-D826	826	50	206,000	33,940	49,410	24,190	940	126	(2) 7.5	1800	1580	14	45,350	53-3/4	140-5/8
PHC-D858	858	60	218,700	34,220	49,690	24,470	940	126	(2) 7.5	1800	1580	14	45,630	53-3/4	140-5/8
PHC-D790	790	40	239,600	33,160	53,720	21,660	580	80	(2) 7.5	1800	2110	14	48,070	44-3/4	149-5/8
PHC-D794	794	30	213,400	35,370	56,050	23,870	700	96	(2) 7.5	1800	2110	14	50,400	53-3/4	140-5/8
PHC-D824	824	50	257,900	33,170	53,730	21,670	580	80	(2) 7.5	1800	2110	14	48,080	44-3/4	149-5/8
PHC-D827	827	30	204,900	36,620	57,540	25,120	940	128	(2) 7.5	1800	2110	14	51,890	53-3/4	140-5/8
PHC-D853	853	60	273,900	33,450	54,010	21,950	580	80	(2) 7.5	1800	2110	14	48,360	44-3/4	149-5/8
PHC-D874	874	50	252,600	35,590	56,270	24,090	700	96	(2) 7.5	1800	2110	14	50,620	53-3/4	140-5/8
PHC-D905	905	60	268,300	35,880	56,560	24,380	700	96	(2) 7.5	1800	2110	14	50,910	53-3/4	140-5/8
PHC-D912	912	50	242,500	36,840	57,760	25,340	940	128	(2) 7.5	1800	2110	14	52,110	53-3/4	140-5/8
PHC-D945	945	75	288,800	35,910	56,590	24,410	700	96	(2) 7.5	1800	2110	14	50,940	53-3/4	140-5/8
PHC-D948	948	50	237,700	39,450	60,510	27,950	1080	148	(2) 7.5	1800	2110	14	54,860	53-3/4	140-5/8
PHC-D982	982	60	252,400	39,730	60,790	28,230	1080	148	(2) 7.5	1800	2110	14	55,140	53-3/4	140-5/8
PHC-D987	987	75	277,200	37,150	58,070	25,650	940	128	(2) 7.5	1800	2110	14	52,420	53-3/4	140-5/8
PHC-D1025	1025	75	271,700	39,770	60,830	28,270	1080	148	(2) 7.5	1800	2110	14	55,180	53-3/4	140-5/8

NOTE: Dimensions and weights are subject to change. The coil connection quantity and locations are subject to change due to refrigerant loading. Refer to project certified print drawings for specific weights, dimensions and all piping connections.

† Tons at standard conditions for ammonia 96.3°F, 20°F suction and 78°F E.W.B.

†† Heaviest section is the casing/fan section.

Engineering & Dimensions Data *PHC-D1242 to D2050*

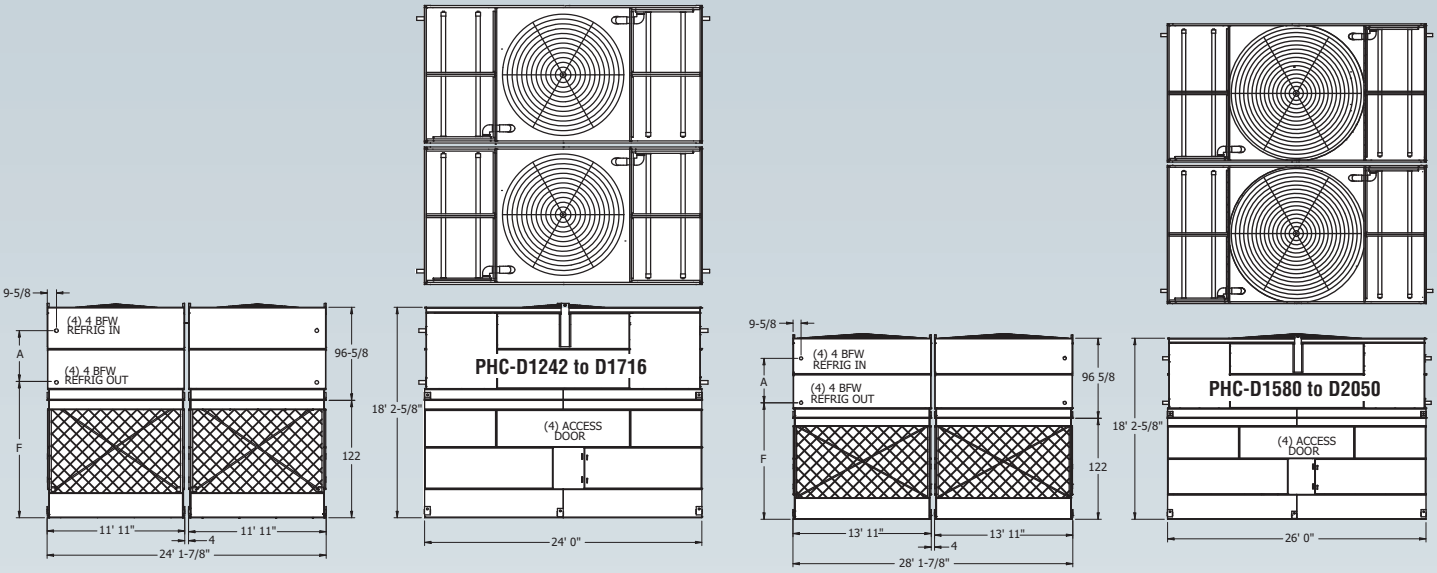


Table 8 Engineering Data

Model Number	R-717 Capacity Tons†	Fans		Weights (lbs.)			Operating Charge (lbs.)	NH_3 Coil Volume (ft^3)	Spray Pump		Remote Pump			Dimensions (in.)	
		HP	CFM	Shipping	Operating	Heaviest Section††			HP	GPM	Gallons Req'd	Conn. Size (in.)	Operating Weight (lbs.)	A	F
PHC-D1242	1242	(2) 25	352,500	56,700	86,760	18,600	1000	136	(4) 7.5	3600	3160	(2) 14	78,640	44-3/4	149-5/8
PHC-D1290	1290	(2) 30	374,300	56,720	86,780	18,610	1000	136	(4) 7.5	3600	3160	(2) 14	78,660	44-3/4	149-5/8
PHC-D1374	1374	(2) 30	369,900	60,460	90,720	20,480	1200	164	(4) 7.5	3600	3160	(2) 14	82,600	53-3/4	140-5/8
PHC-D1434	1434	(2) 30	355,100	62,960	93,620	21,730	1600	220	(4) 7.5	3600	3160	(2) 14	85,500	53-3/4	140-5/8
PHC-D1456	1456	(2) 40	406,700	60,900	91,160	20,700	1200	164	(4) 7.5	3600	3160	(2) 14	83,040	53-3/4	140-5/8
PHC-D1518	1518	(2) 40	390,500	63,400	94,060	21,950	1600	220	(4) 7.5	3600	3160	(2) 14	85,940	53-3/4	140-5/8
PHC-D1524	1524	(2) 50	437,800	60,920	91,180	20,710	1200	164	(4) 7.5	3600	3160	(2) 14	83,060	53-3/4	140-5/8
PHC-D1582	1582	(2) 60	465,000	61,480	91,740	20,990	1200	164	(4) 7.5	3600	3160	(2) 14	83,620	53-3/4	140-5/8
PHC-D1590	1590	(2) 50	420,300	63,400	94,060	21,950	1600	220	(4) 7.5	3600	3160	(2) 14	85,940	53-3/4	140-5/8
PHC-D1647	1647	(2) 60	446,400	63,980	94,640	22,240	1600	220	(4) 7.5	3600	3160	(2) 14	86,520	53-3/4	140-5/8
PHC-D1652	1652	(2) 50	411,900	67,880	98,820	24,190	1880	252	(4) 7.5	3600	3160	(2) 14	90,700	53-3/4	140-5/8
PHC-D1716	1716	(2) 60	437,500	68,440	99,380	24,470	1880	252	(4) 7.5	3600	3160	(2) 14	91,260	53-3/4	140-5/8
PHC-D1580	1580	(2) 40	479,200	66,320	107,440	21,660	1160	160	(4) 7.5	3600	4220	(2) 14	96,140	44-3/4	149-5/8
PHC-D1588	1588	(2) 30	426,900	70,740	112,100	23,870	1400	192	(4) 7.5	3600	4220	(2) 14	100,800	53-3/4	140-5/8
PHC-D1648	1648	(2) 50	515,900	66,340	107,460	21,670	1160	160	(4) 7.5	3600	4220	(2) 14	96,160	44-3/4	149-5/8
PHC-D1654	1654	(2) 30	409,800	73,240	115,080	25,120	1880	256	(4) 7.5	3600	4220	(2) 14	103,780	53-3/4	140-5/8
PHC-D1706	1706	(2) 60	547,800	66,900	108,020	21,950	1160	160	(4) 7.5	3600	4220	(2) 14	96,720	44-3/4	149-5/8
PHC-D1748	1748	(2) 50	505,300	71,180	112,540	24,090	1400	192	(4) 7.5	3600	4220	(2) 14	101,240	53-3/4	140-5/8
PHC-D1810	1810	(2) 60	536,600	71,760	113,120	24,380	1400	192	(4) 7.5	3600	4220	(2) 14	101,820	53-3/4	140-5/8
PHC-D1824	1824	(2) 50	485,000	73,680	115,520	25,340	1880	256	(4) 7.5	3600	4220	(2) 14	104,220	53-3/4	140-5/8
PHC-D1890	1890	(2) 75	577,600	71,820	113,180	24,410	1400	192	(4) 7.5	3600	4220	(2) 14	101,880	53-3/4	140-5/8
PHC-D1896	1896	(2) 50	475,300	78,900	121,020	27,950	2160	296	(4) 7.5	3600	4220	(2) 14	109,720	53-3/4	140-5/8
PHC-D1964	1964	(2) 60	504,800	79,460	121,580	28,230	2160	296	(4) 7.5	3600	4220	(2) 14	110,280	53-3/4	140-5/8
PHC-D1974	1974	(2) 75	554,500	74,300	116,140	25,650	1880	256	(4) 7.5	3600	4220	(2) 14	104,840	53-3/4	140-5/8
PHC-D2050	2050	(2) 75	543,400	79,540	121,660	28,270	2160	296	(4) 7.5	3600	4220	(2) 14	110,360	53-3/4	140-5/8

NOTE: Dimensions and weights are subject to change. The coil connection quantity and locations are subject to change due to refrigerant loading. Refer to project certified print drawings for specific weights, dimensions and all piping connections.

† Tons at standard conditions for ammonia 96.3°F, 20°F suction and 78°F E.W.B.

†† Heaviest section is the casing/fan section.

Application

Design

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

Air Circulation

In reviewing the system design and unit location, 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. Care must be taken when locating condensers in wells or enclosures or next to high walls. The potential for recirculation of hot, moist discharge air back into the air intake exists. Recirculation raises the wet bulb temperature of the entering air causing the condensing pressure to rise above the design. For these cases, the unit should be elevated to raise the air discharge above the adjacent wall, thereby reducing the chance of recirculation. Good engineering practice dictates that the evaporative condenser's discharge air not be directed or located close to or in the vicinity of building air intakes. Engineering assistance is available from the factory to identify potential recirculation problems and recommend solutions.

For additional information regarding layout of evaporative condensers, see EVAPCO Bulletin entitled ***"Equipment Layout."***

Piping

Condenser piping should be designed and installed in accordance with generally accepted engineering practice. All piping should be anchored by properly designed hangers and supports with allowance made for possible expansion and contraction. No external loads should be placed upon condenser connections, nor should any of the pipe supports be anchored to the unit framework. For additional information concerning refrigerant pipe sizing and layout, see EVAPCO Bulletin entitled ***"Piping Evaporative Condensers."***

Maintaining the Recirculated Water System

Evaporative condensers reject heat by evaporating a portion of the recirculated water into the atmosphere as warm, saturated discharge air. As the pure water evaporates it leaves behind the impurities found in the system's makeup water and any accumulated airborne contaminants. These impurities and contaminants, which continue to recirculate in the system, must be controlled to avoid excessive concentration which can lead to corrosion, scale, or biological fouling.

Bleed-off

Evaporative condensers require 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. Make-up supply water pressure to the unit should be maintained between 20 and 50 psig.

Water Treatment and Passivation

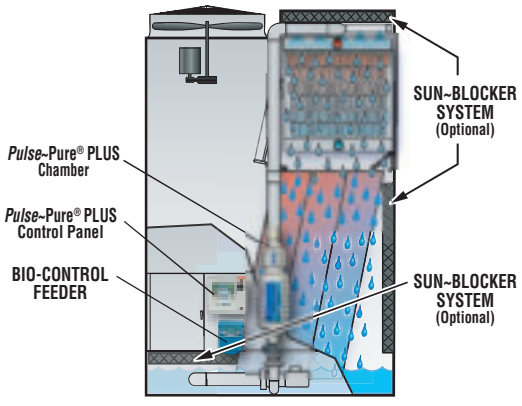
Proper water treatment is an essential part of the maintenance required for evaporative cooling equipment. A well designed and consistently implemented water treatment program will help to ensure efficient system operation while maximizing the equipment's service life. A qualified water treatment company should design a site specific water treatment protocol based on the equipment (including all metallurgies in the cooling system), location, makeup water quality, and usage.

'White Rust' is a premature failure of the protective zinc layer on hot dip or mill galvanized steel which can occur as a result of improper water treatment control during the start-up of new equipment. The initial commissioning and passivation period is critical for maximizing the service life of galvanized equipment. EVAPCO recommends that site specific water treatment protocols include 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. Since elevated temperatures have a harmful effect on the passivation process, the new galvanized equipment should be run without load for as much of the passivation period as is practical.

For more information on water treatment and water chemistry guidelines, see EVAPCO Bulletin entitled "Operation & Maintenance Instructions."

Control of Biological Contamination

Water quality should be checked regularly for biological contamination. If biological contamination is detected, a more aggressive water treatment and mechanical cleaning program should be undertaken. The water treatment program should be performed in conjunction with a qualified water treatment company. It is important that all internal surfaces be kept clean of accumulated dirt and sludge. In addition, the drift eliminators should be maintained in good operating condition. As a result of its physical arrangement, the PHC condenser has wetted areas open to direct sunlight which increases the potential for algae growth. EVAPCO recommends the optional Sun~Blocker System for all PHC models to minimize sunlight contact, reduce water treatment chemistry costs, and potentially save water.



Pulse~Pure® PLUS *with Sun~Blocker System*

Application

EVAPCO Water Treatment Systems

EVAPCO offers both *Pulse*~Pure® PLUS and Smart Shield water treatment systems for PHC-S and L model evaporative condensers. These water treatment systems are factory mounted, piped, and wired for the fastest and easiest commissioning in the industry; requiring only a single 120/230 VAC power source for start-up. Both systems include EVAPCO's conductivity control package featuring a torodial conductivity probe, motorized blow-down valve, and USB port for 60 day audit trail. The patented self draining design eliminates concerns of freezing in most climates. A factory authorized service partner provides the first year of water system service and monitoring to ensure proper operation and ongoing success.

U.S. Patent Nos. D545,395 S
7,704,364 and 7,981,288

Pulse~Pure PLUS®

EVAPCO's *Pulse*~Pure® PLUS water treatment system utilizes pulsed electric fields technology to provide an environmentally responsible alternative for the treatment of water in evaporative cooled equipment.

Pulsed Power Technology

The *Pulse*~Pure® PLUS water treatment system features an AC induction device, the chamber, which generates pulsed electrical fields. High and low frequency coils arranged inside the chamber but outside of the water flow generate electromagnetic fields in the water passing through the chamber. The result is an effective non-chemical control of scale, biological growth, and corrosion.

Scale Control

One of the most prevalent issues with evaporative condenser operation is the formation of scale on the surfaces of the heat exchanger, which reduces unit capacity and degrades the integrity of the heat exchanger materials of construction. *Pulse*~Pure® PLUS technology controls the formation of mineral scale (calcium carbonate) by creating "seed crystals" from small suspended particles in circulating cooling water. As the *Pulse*~Pure® PLUS treated water is cycled up beyond normal solubility, the calcium carbonate precipitates onto the seed crystals eventually settling out in the basin of the evaporative equipment as non-adherent powder. The result is clean heat transfer surfaces with crystal clear basin water.

Biological Control

Pulse~Pure® PLUS technology controls biological growth by two physical mechanisms - agglomeration and electroporation. Agglomeration is the mechanism where seed crystals form with calcium carbonate and trap bacteria and other small particles in the growing matrix. Electroporation is the process of damage to the bacteria's cell wall caused by the pulsed electric fields generated in the *Pulse*~Pure® PLUS chamber. Both of these mechanisms of bacteria control are physical and non-species-specific thus reducing the bacteria's ability to mutate or adapt to defend against the treatment. *Pulse*~Pure® PLUS provides supplemental control of biological growth with a controlled release of biocide through the integrated bio-control feeder. EVAPCO guarantees that total bacteria counts will not exceed 10,000 CFU/ml (Colony Forming Units per Milliliter) in the cooling water of an operating *Pulse*~Pure® PLUS treated system.

Corrosion Control

Pulse~Pure® PLUS technology controls corrosion by operating in an alkaline environment beyond the normal saturation for calcium carbonate. These operating characteristics allow calcium carbonate to act as a natural, cathodic corrosion inhibitor. Currently operating *Pulse*~Pure® PLUS systems typically exhibit uniform corrosion rates equivalent to most chemically treated systems without the risk of aggressive localized corrosion found in some chemically treated systems.

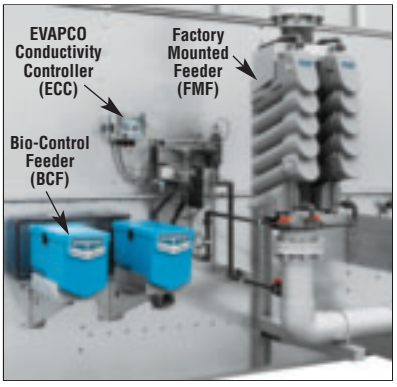
U.S. Patent No. 8,398,850

Smart Shield®

EVAPCO's Smart Shield® system utilizes proven solid chemistry delivered via a revolutionary feed system. Patented, controlled release scale and corrosion inhibitor, as well as biocide is fed whenever the spray water pump is energized, keeping the system protected anytime the spray water pump is operating.

Scale and Corrosion Control

Scale and corrosion control is provided through non-toxic, solid chemistry tablets packaged in "bag in bag" cartridges. The cartridges are loaded into EVAPCO's Factory Mounted Feeder (FMF) for a controlled release of chemistry over a 30 day period. As the spray water pump is cycled on, water fills the FMF and permeates the polymer coating of the tablets activating the chemistry and making it a slurry inside the tablet. Osmotic pressure forms causing the tablet to swell and force chemistry into the water stream through the polymer coating. When the pump cycles off, osmotic pressure equalizes stopping the release of chemistry.



Biological Control

The Smart Shield® system utilizes a bio-control feeder (BCF) to control microbiological activity with granular biocide contained in easy and safe reload packaging. The integrated membrane technology built into the BCF controls the release of the oxidizing biocide; providing a safer, more effective alternative to chlorine for control and broad spectrum effectiveness on a variety of bacteria, algae, and fungi.

For more information, visit EVAPCO's web site www.evapco.com, consult your local EVAPCO Representative or contact the factory.

Remote Sump Installations

The PHC Evaporative Condenser utilizes a hybrid technology design that presents some unique features and application issues when applied on typical remote sump applications. The PHC Condenser design uses a combination of primary condenser coil surface with high efficiency PVC fill to achieve the design condenser capacity. (Refer to page 3 for "Principle of Operation.") The PHC models are most effective when supplied with an integral recirculating pump. When the PHC Condenser is installed with a remote sump system with multiple condensers, thermal efficiency may be reduced.

Performance

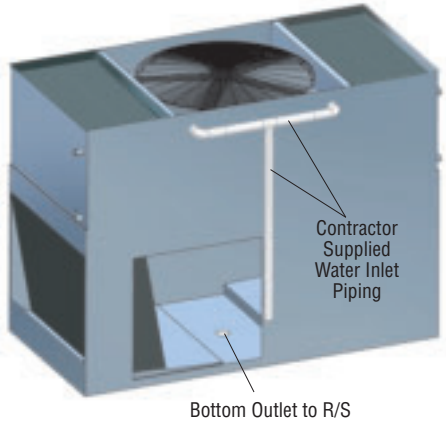
Due to its design, the PHC unit performance may require additional consideration when applied in a remote sump application. The inherent performance of the PHC Condenser utilizes PVC fill to cool the recirculating water in combination with the prime surface condenser coil. When the PHC is installed in an existing remote sump system with multiple evaporative condensers (such as PMC-E, ATC-E, or LRC models or other PHC's where the fans are shut down to control capacity), the return water to the condensers may be elevated during peak design conditions. The higher recirculating water temperatures will have an adverse effect on the PHC Condenser performance resulting in reduced operating efficiency. These applications should be limited to ensure maximum operating efficiency.

Piping

The traditional method of piping an evaporative condenser on a remote sump installation is to pipe the supply lines to the condenser water distribution system connection(s) located on the side of the coil casing. The remote sump drain connections are typically located in the bottom of the condenser basin to return the water to the sump tank.

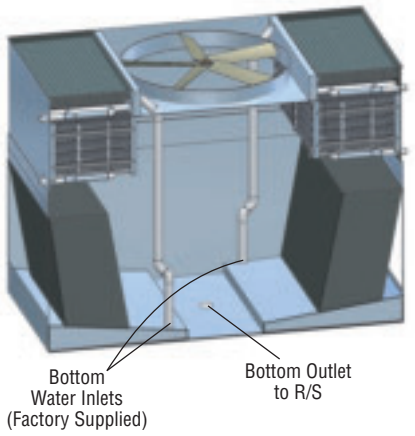
The PHC design offers similar pipe arrangements on the PHC-S & L Models. However, the larger PHC-D Models offer alternate piping options for the remote sump systems. Figure 1, illustrates the water supply piping arrangement that connects to the condenser water distribution system on the top side of the casing. The PHC-D Models will require two supply connections that can be piped individually or piped to a manifold header as shown in Figure 1.

Figure 1 – Top Side Mount Water Inlet



The alternate method of piping the PHC-D Model is shown in Figure 2. Using this piping method, the remote sump supply lines may be piped to the bottom of the condenser to connect to the water distribution system. For this piping design, two water supply lines are required to feed each cell of the PHC-D Models.

Figure 2 – Bottom Water Inlet



Note: When individual supply lines are piped to the PHC condenser balancing valves are recommended to ensure equal flow to each side of the condenser water distribution system.

The remote sump drain connections for the PHC Condenser design will typically be located on the bottom of the basin section of the condenser as standard. The PHC-S, L and D Models will require one connection per condenser cell.

EVAPCO will supply a detailed certified print drawing for each PHC Condenser to illustrate the unit dimensions, connection sizes, quantity and location of all water inlet and remote sump drain connections as specified on the order. Refer to the EVAPCO certified dimensional drawings to determine all piping requirements.

Water Treatment Systems

Remote sump systems typically present many different piping designs to supply water from the sump back to the condenser(s) and are therefore a challenge for factory supplied water treatment system designs. EVAPCO's water treatment systems, *Pulse*~Pure® PLUS and Smart Shield®, may be adapted to operate in conjunction with remote sumps. For factory supplied, remote sump water treatment recommendations and applications, consult your local EVAPCO Sales Representative or the factory for assistance.

Mechanical Specifications

Furnish and install, as shown on the plans, an EVAPCO model _____ induced draft, parallel, hybrid evaporative condenser with a condensing capacity of _____ MBH total heat of rejection when operating with _____ refrigerant at _____ °F condensing temperature with a _____ °F design wet bulb temperature.

IBC 2012 Compliance
The condenser shall be designed and constructed to meet the International Building Code (IBC) specifications for installed components per ASCE. The manufacturer shall provide a certificate of compliance to demonstrate that the equipment/unit has been independently certified in accordance with the IBC.

Basin and Casing
The basin and casing shall be constructed of G-235 hot-dip galvanized steel for long life and durability.
Standard basin accessories shall include overflow, drain, type 304 stainless steel strainers, and brass make-up valve with plastic float.

Fan Motor
_____ horsepower totally enclosed air over ball bearing fan motor(s), with 1.15 service factor shall be furnished suitable for service on _____ volts, _____ hertz, and _____ phase. Motor(s) shall be mounted on an adjustable base which allows the motor to swing to the outside of the unit for servicing.

Drive
The fan drive shall be a multigroove, solid back V-belt type with taper lock bushings designed for 150% of the motor nameplate horsepower. The belt material shall be neoprene reinforced with polyester cord and specifically designed for evaporative condenser service. Fan and motor sheaves shall be aluminum alloy construction. The fans and fan sheaves shall be mounted on the shaft with a specially coated bushing to provide maximum corrosion protection. Belt adjustment shall be accomplished from the interior of the unit.

Axial Propeller Fans
Fans shall be heavy duty axial propeller type statically balanced. The fans shall be constructed of aluminum alloy blades, installed in a closely fitted cowl with venturi air inlet. Fan screens shall be galvanized steel mesh and frame, bolted to the fan cowl.

Fan Shaft Bearings
Fan shaft bearings shall be heavy duty self-aligning ball type with grease fittings extended to the outside of the unit. Bearings shall be designed for a minimum L-10 life of 75,000 hours.

Water Recirculation Pump
The pump(s) shall be a close-coupled, centrifugal type with mechanical seal, installed at the factory. _____ horsepower totally enclosed motor(s) shall be furnished suitable for outdoor service on _____ volts, _____ hertz, and _____ phase.

Water Distribution System
The PVC distribution branches shall contain large diameter fixed position holes aligned by the manufacturer to eject a stream of water that efficiently collides with the opposing branch water flow. The intersecting streams of water shall create a broad scattering of water resulting in uniform water coverage of the heat transfer coil with no moving parts. The distribution branches shall be constructed of schedule 40 polyvinyl chloride pipe for corrosion resistance.

Heat Transfer Coil & Drift Eliminators
Condensing coil(s) shall be all prime surface steel, encased in a steel framework and hot-dip galvanized after fabrication as a complete assembly. The coil(s) shall be designed with sloping tubes for free drainage of liquid refrigerant and shall be pneumatically tested at 390 psig, under water.

The eliminators adjacent to the coil shall be constructed entirely of inert polyvinyl chloride (PVC) in easily handled sections. The eliminator design shall incorporate three changes in air direction to assure complete removal of all entrained moisture from the discharge air stream.

Heat Transfer Fill & Drift Eliminators
The condenser shall be designed with a bank of heat transfer fill constructed of polyvinyl chloride (PVC) that is impervious to rot or decay. The fill sheets shall be bonded together and supported from the base to provide greater structural integrity. The support channels shall be designed to provide for easy cleaning below the fill bundles.

The fill bundle shall form an integral inlet louver to prevent debris from entering the heat transfer surface and a drift eliminator to remove water droplets from the air discharging the side of the fill.

Finish
All basin and casing materials shall be constructed of G-235 heavy gauge mill hot-dip galvanized steel. During fabrication, all panel edges shall be coated with a 95% pure zinc-rich compound for superior protection against corrosion.

Sun~Blocker System (Optional)
A louver system shall be provided directly over the heat transfer coil, air inlet, and internal basin area constructed from polyvinyl chloride (PVC). The louver system shall be designed to block all sunlight to prevent the formation of algae in these critical areas of the unit. The louver system shall also prevent debris from entering the water distribution system/heat transfer coil and prevent splash out.

EVAPCO PRODUCTS ARE MANUFACTURED WORLDWIDE.

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