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

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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 CROSScool™ 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.
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!

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.
The PHC line of evaporative condensers reflect EVAPCO’s commitment 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.

**Stainless Steel Strainer**
- Resists corrosion better than other materials

**Totally Enclosed Pump Motors**
- Help assure long, trouble-free operation

**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 accessibility
- Internal walkway for safe and easy basin access

**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

**Sun-Blocker System (optional)**
- Blocks sun light to minimize potential algae formation
- Prevents debris from entering the unit
- Eliminates water splash out

**Guaranteed for life.**
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

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

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

Other PHC–S & L Options
- Internal ladder
- Individual fan drives
- Pulse-Pure® PLUS & Smart Shield® Water Treatment
- Low Sound Fan
- Super Low Sound Fan

G-235 Mill Hot-Dip Galvanized Steel Construction
(Stainless steel available as affordable option)
**PHC Design and Construction Features—D Models**

**Stainless Steel Strainer**
- Resists corrosion better than other materials

**Totally Enclosed Pump Motors**
- Long, trouble-free operation

**Efficient Drift Eliminators**
- Patented design reduces drift rate
- Made from corrosion resistant PVC for long life
  - U.S. Patent No. 6315804

**CROSScool™ Coil Design**
- 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 design
- Minimizes water leaks at field joints
- Greater structural rigidity

**Internal Walkway (optional)**
- For safe easy access to entire basin

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

**Large Access Door**
- Oversized access door for enhanced accessibility
- Standard on all models

**Totally Enclosed Pump Motors**
- Long, trouble-free operation

**Stainless Steel Strainer**
- Resists corrosion better than other materials
**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

**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

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

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

**G-235 Mill Hot-Dip Galvanized Steel Construction**
(Stainless steel available as affordable option)

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

**IBC 2012 Compliant**
(standard)
**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**

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.

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**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.

**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.
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.

<table>
<thead>
<tr>
<th>Model Number</th>
<th>HTC Heater Sizes (kW)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>0°F</td>
</tr>
<tr>
<td>PHC-S208 to PHC-S411</td>
<td>(2) 5</td>
</tr>
<tr>
<td>PHC-S373 to PHC-S591</td>
<td>(2) 7</td>
</tr>
<tr>
<td>PHC-L463 to PHC-L842</td>
<td>(2) 10</td>
</tr>
<tr>
<td>PHC-S416 to PHC-S822</td>
<td>(4) 5</td>
</tr>
<tr>
<td>PHC-S746 to PHC-S1182</td>
<td>(4) 7</td>
</tr>
<tr>
<td>PHC-D621 to PHC-D858</td>
<td>(2) 12</td>
</tr>
<tr>
<td>PHC-D790 to PHC-D1025</td>
<td>(2) 15</td>
</tr>
<tr>
<td>PHC-D1242 to PHC-D1716</td>
<td>(4) 12</td>
</tr>
<tr>
<td>PHC-D1580 to PHC-D2050</td>
<td>(4) 15</td>
</tr>
</tbody>
</table>

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.

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.
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.

<table>
<thead>
<tr>
<th>PHC Pan Footprint Dimensions</th>
</tr>
</thead>
<tbody>
<tr>
<td>Model</td>
</tr>
<tr>
<td>PHC-S208 to PHC-S411</td>
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<tr>
<td>PHC-S373 to PHC-S591</td>
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<tr>
<td>PHC-D1242 to PHC-D1716</td>
</tr>
<tr>
<td>PHC-D1580 to PHC-D2050</td>
</tr>
</tbody>
</table>

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

\[
F_p = \left[0.4 \cdot (a_p) \cdot (S_{DS}) \cdot (W_p) / (R_p / I_p) \right] \cdot (1 + 2 \cdot (z / h))
\]

- \(F_p\) = 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:

\[
F_p{-}\text{min} = 0.3 \cdot S_{DS} \cdot I_p \cdot W_p
\]
\[
F_p{-}\text{max} = 1.6 \cdot S_{DS} \cdot I_p \cdot W_p
\]

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
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:

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

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:
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) + K.W. x 2545

**Hermetic Compressors:**

Heat of Rejection = Evaporator Load (BTU/Hr) + K.W.

**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 circulated 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

<table>
<thead>
<tr>
<th>Condensing Pres. psig</th>
<th>Cond. Temp. °F</th>
<th>Wet Bulb Temperature, °F</th>
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<tbody>
<tr>
<td>152</td>
<td>85</td>
<td>50</td>
</tr>
<tr>
<td>166</td>
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<td>60</td>
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<tr>
<td>185</td>
<td>96.3</td>
<td>62</td>
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<tr>
<td>197</td>
<td>100</td>
<td>64</td>
</tr>
<tr>
<td>214</td>
<td>105</td>
<td>66</td>
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<td>292</td>
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</table>

**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.

Table 2 - Unit Heat Rejection
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:

\[ 600 \times 1.07 \times 1.03 = 661 \text{ corrected tons.} \]

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

<table>
<thead>
<tr>
<th>Condensing Press. psig</th>
<th>Cond. Temp. °F</th>
<th>Wet Bulb Temperature, (°F)</th>
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<tr>
<td>152</td>
<td>85</td>
<td>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</td>
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<tr>
<td>166</td>
<td>90</td>
<td>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</td>
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<tr>
<td>181</td>
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<tr>
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<td>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</td>
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<td>197</td>
<td>100</td>
<td>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</td>
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<td>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</td>
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### Table 4 - Unit Sizes

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<th>Model</th>
<th>Model</th>
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</table>

### 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 5 Engineering Data

<table>
<thead>
<tr>
<th>Model Number</th>
<th>R-717 Capacity Tons|</th>
<th>HP</th>
<th>CFM</th>
<th>Shipping</th>
<th>Operating</th>
<th>Heaviest Section</th>
<th>Operating Charge (lbs.)</th>
<th>RH</th>
<th>Spray Pump</th>
<th>Gpm</th>
<th>Conn. Size (in.)</th>
<th>Operating Weight (lbs.)</th>
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<td>920</td>
<td>90</td>
<td>10 39,190</td>
</tr>
</tbody>
</table>

**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.
### Table 6 Engineering Data

<table>
<thead>
<tr>
<th>Model Number</th>
<th>R-717 Capacity Tons†</th>
<th>HP (2)</th>
<th>CFM</th>
<th>Shipping</th>
<th>Operating</th>
<th>Heaviest Charge Volume (lts)††</th>
<th>Net Coil Charge Volume (lts)</th>
<th>Spray Pump</th>
<th>Remote Pump</th>
<th>Dimensions (in.)</th>
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**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.
Table 7 Engineering Data

<table>
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<tr>
<th>Model Number</th>
<th>Capacity</th>
<th>Tons†</th>
<th>HP</th>
<th>CFM</th>
<th>Weight (lbs.)</th>
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<th>N540</th>
<th>Spray Pump</th>
<th>Remote Pump</th>
<th>Dimensions (in.)</th>
<th>Heaviest</th>
<th>NH3 Coil Charge (lbs.)</th>
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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.
Table 8 Engineering Data

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<thead>
<tr>
<th>Model Number</th>
<th>R-717 Capacity Tons†</th>
<th>HP</th>
<th>CFM</th>
<th>Weights (lbs.)</th>
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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.
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.
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 toroidal 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.

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.

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 equals 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.

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.

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.

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.
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.