CLOSED CIRCUIT COOLERS

PHW

Parallel Hybrid Closed Circuit Cooler

FEATURING

CROSScool™

INTERNALLY ENHANCED COIL TECHNOLOGY

evapco® for LIFE

CTI CERTIFIED

MOTOR AND DRIVE 5 Year WARRANTY

PHW Design Features

Proven Performance and Design Flexibility

About EVAPCO

EVAPCO is the global innovator in heat transfer solutions. Our pledge is to make everyday life easier, more comfortable, more reliable, and more sustainable for people everywhere. With 33 locations spread throughout 13 countries and over 200 active patents worldwide, we are the team that engineers and contractors know they can count on for life.

Contact

your local EVAPCO Representative
or visit **evapco.com** to learn more.

Proven Performance and Design Flexibility

The PHW Parallel Hybrid Closed Circuit Cooler offers more system design and layout flexibility than ever before. This Induced Draft Closed Circuit Cooler design enhances EVAPCO's already extensive line of evaporative cooling technology. The PHW offers more selections for large projects: more capacity with a smaller plan area, fewer motors, and less weight. More equipment choices, and more design flexibility mean greater value for the end user.

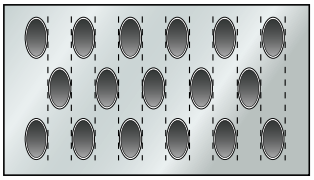
The PHW combines high-efficiency PVC crossflow fill with EVAPCO's patented coil designs featuring the exclusive CROSSCOOL™ tube enhancement for superior induced draft, parallel flow, hybrid closed circuit cooler performance. The PHW evaporative closed circuit cooler was designed in EVAPCO's state-of-the-art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

PHW – Double Air Inlet Models

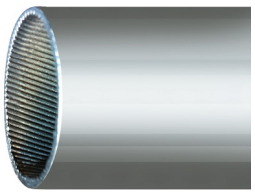
PHW Design Features

Coil Technology

The PHW incorporates EVAPCO's latest high-efficiency heat transfer coils featuring EVAPCO'S exclusive internal tube enhancement CROSSCOOL™! The PHW utilizes EVAPCO's patented **Sensi-Coil**® technology which 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!



Sensi-Coil®
(US Patent #7,296,620)



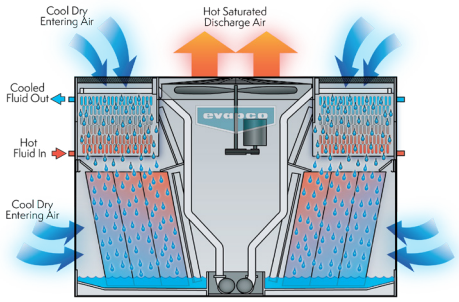
CROSSCOOL™

Principle of Operation

Hot process fluid enters the coil through the bottom coil connection(s). Cooled water from the unit basin is pumped through spray distribution nozzles and floods over the closed circuit cooler 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 process fluid. The cooled process fluid leaves the coil through the top coil connection(s) 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.

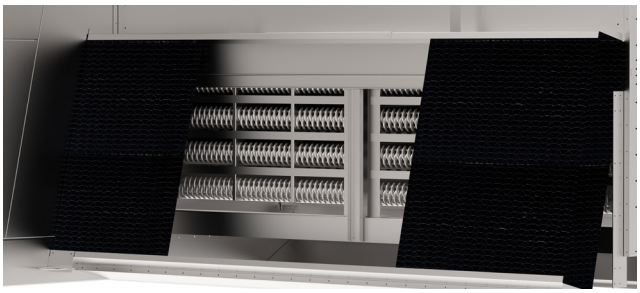


Principle of Operation

Cooling Coil

The coils are manufactured from high quality steel tubing following the most stringent quality control procedures. Each circuit is inspected to ensure the material quality and then tested before being assembled into a coil. The coil shall have design pressure of 300 psi and shall be in compliance with ANSI/ASME B31.5, Refrigeration Piping and Heat Transfer Components. The coil assembly shall be strength tested in accordance with ANSI/ASME B31.5 and subsequently leak tested using air under water. To protect the coil against corrosion, it is placed in a heavy steel frame and then the entire assembly is dipped in molten zinc (hot-dip galvanized) at a temperature of approximately 800°F.

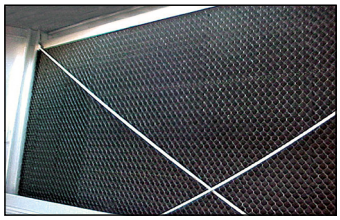
NOTE: Closed circuit coolers should only be used on sealed, pressurized systems. Continual aeration of the water in an open system can cause corrosion inside the tubes of the cooler leading to premature failure.



Crossflow Fill

The PVC crossflow fill used in the PHW Closed Circuit Cooler 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 120°F (48.9°C).

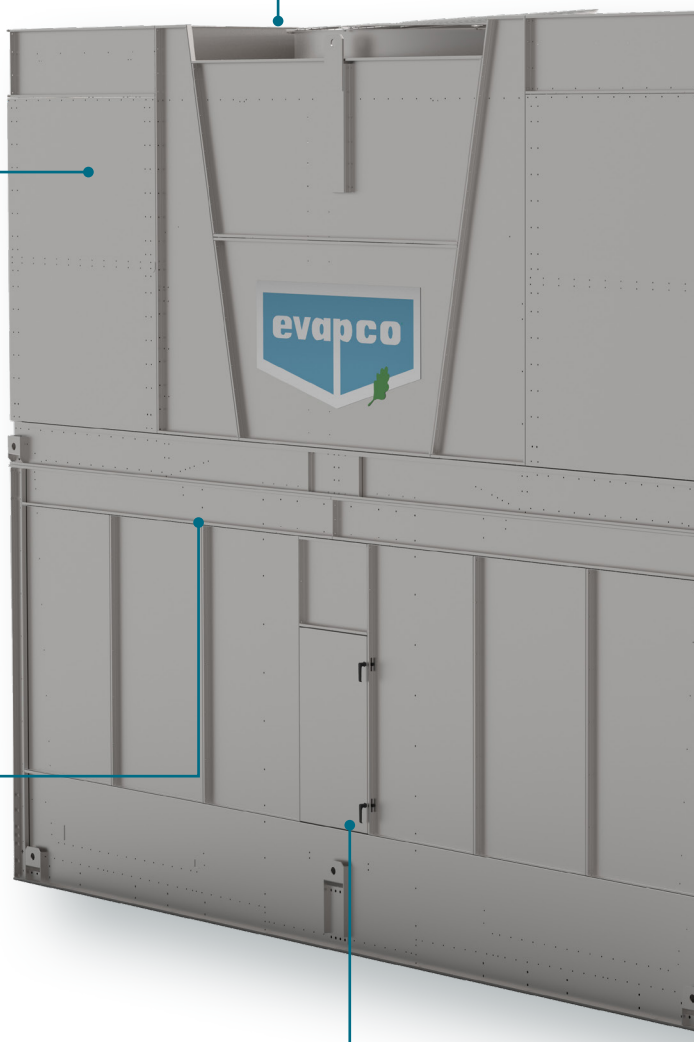
The individual crossflow fill sheets are bonded together and supported at the bottom to enhance the structural integrity of the fill section. The assembled fill sheets form an integral inlet louver to prevent debris from entering the heat transfer fill, and an integral drift eliminator to strip water droplets entrained in the air stream. The fill material selected for the PHW Closed Circuit Cooler are self-extinguishing and have a flame spread of less 25 under ASTM E84.



PHW Design and Construction Features - Double Air Inlet Models

PVC Spray Distribution Header with ZM® II Nozzles

- Large orifice nozzles prevent clogging (no moving parts)
- Designed 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



Galvanized Steel Coil

*Elliptical Sensi-Coil®** Featuring CROSSCOOL™ Internal Tube Enhancement Technology*

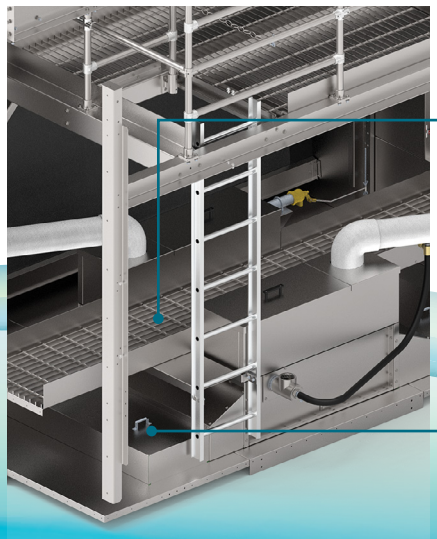
- Internal Tube Enhancement increases fluid turbulence providing additional capacity
- Elliptical return bends allows for more circuits per coil bundle

Efficient Drift Eliminators

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

Double-Brake Flange Joints

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



Internal Walkway

- 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

Stainless Steel Strainer

- Resists corrosion better than other materials

Totally Enclosed Pump Motors

- Long, trouble-free operation

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 100,000 hours
- All other components are of corrosion resistant materials
- 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

Easy Rig Field Seam

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

External Service Platform with Ladder (Optional)

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

XPak™ Crossflow Fill

- High efficiency bonded block fill
- Polyvinyl Chloride (PVC)
- Impervious to rot, decay and biological attack
- Integral louvers and drift eliminators
- Easy to handle
- Flame Spread rating of <25 per ASTM E84

Other PHW Double Air Inlet Options

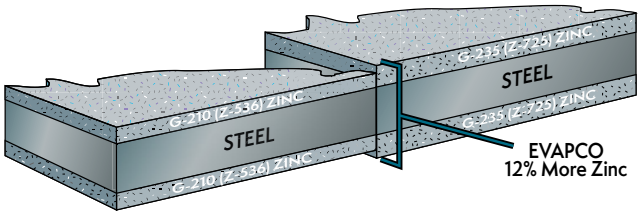
- Internal motor davit
- Internal upper access ladder & platform
- Low Sound Fan
- Super Low Sound Fan

PHW Construction Features

The PHW features more plan area options and fan horsepower options for the system design engineer. With more closed circuit cooler capacity, more plan area options, and greater flexibility in motor selection, the design engineer can now match the closed circuit cooler performance to the specific application requirements. More equipment choices and more design flexibility mean greater value for the end user.

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 closed circuit coolers 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 closed circuit coolers 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 Nozzle

ZM® II Spray Nozzle Water Distribution System

Uniform and constant water distribution are paramount for reliable, scale-free evaporative cooling. 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

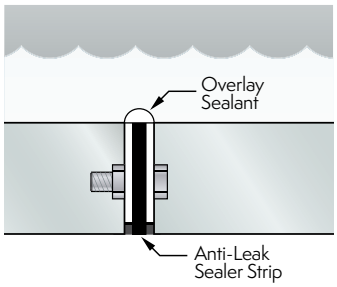
The PHW closed circuit coolers feature a field seam design which ensures easier assembly and fewer field seam leaks. The field seam incorporates self-guiding channels, which direct the coil casing section into position at the proper location on the bottom section of the closed circuit cooler. In addition,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

Type 304 Stainless Steel Strainers

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

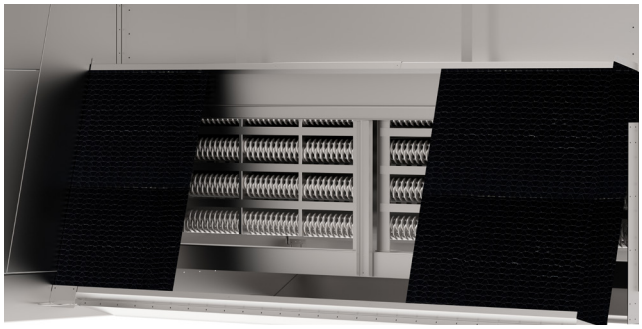
Unique Seam Design–Eliminate Field Leaks

The PHW features EVAPCO's unique pan construction which includes a special butyl tape sealer. 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 closed circuit cooler. With a low drift rate, EVAPCO closed circuit coolers 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.



PHW Construction Features/ Optional Equipment

Mechanical Drive System

Fan Motors: All PHW Closed Circuit Coolers utilize a Totally Enclosed Air Over (TEAO) fan motor designed specifically for evaporative cooling applications. Inverter duty fan motors are standard on all PHW Closed Circuit Coolers.

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 PHW units are specially selected for long, trouble-free life. They are rated for an L_{10} life of 100,000 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 PHW units are covered by EVAPCO's exclusive 5-year drive warranty—including fan motors and belts!

Maintenance Access

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 PHW models.

Internal Walkway

Once inside the PHW Closed Circuit Coolers, maintenance personnel can safely move throughout the unit by way of a non-slip walkway. This walkway is standard on double air inlet units.

Optional Equipment

Self-Supporting External Service Platforms

PHW Closed circuit coolers 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.

PHW Double Air Inlet Model Shown

Stainless Steel Basin and Casing

EVAPCO offers optional Type 304 or Type 316 stainless steel construction for superior corrosion resistance. EVAPCO induced draft closed circuit coolers have a modular design which allows for specific areas to be enhanced for increased corrosion protection. The basin area of a closed circuit cooler 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.

TITAN Coils – Stainless Steel Construction

EVAPCO offers the optional TITAN COIL. Constructed with Type 304L and Type 316L stainless steel, the TITAN COIL is manufactured using EVAPCO's patented elliptical tube **Sensi-Coil®** design upgraded to Xtra Tough construction featuring: Xtra Durability, Xtra Corrosion Resistance and an Xtra long 5 Year Coil Warranty as standard.

Coil, Air Inlet & Sump Sun~Blocker System

EVAPCO's Sun~Blocker System is designed to prevent sunlight from entering the closed circuit cooler at the coil inlet and at the fill/air intake. 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.

Electric Water Level Control

EVAPCO evaporative closed circuit coolers 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.

Optional Equipment/ Steel Support

Super Low Sound Fan

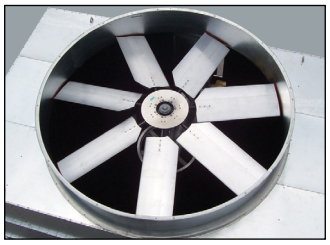
9-15 dB(A) Reduction versus Standard Fan

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

Low Sound Fan

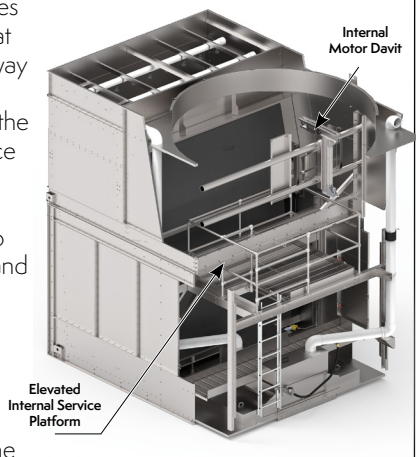
4-7 dB(A) Reduction versus Standard Fan

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



Elevated Internal Service Platform

An elevated internal service platform option can be provided on the PHW double air inlet 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 galvanized steel and provides easy access to lubricate fan bearings and service the motor and drive components.

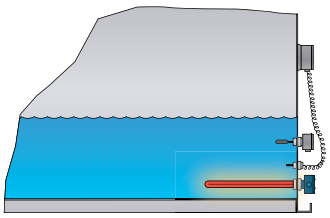


Internal Motor Davit

In order to provide for easy motor removal, the PHW double air inlet models 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.

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.

	Box Size	Heater Sizes (kW)		
		0°F	-20°F	-40°F
Double Air Inlet Models	12' x24'	(2) 12	(4) 9	(4) 12
	14' x 26'	(2) 15	(4) 10	(4) 15

Steel Support

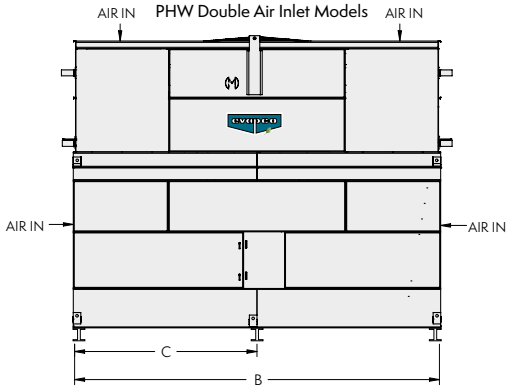
EVAPCO PHW closed circuit coolers are designed to be supported with structural I-beams located under the outer flanges and running the entire length of the unit. Mounting holes, 3/4" in diameter, are located in the bottom channels of the pan section to provide for bolting to the structural steel. (Refer 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 for required steel support layout and structural design

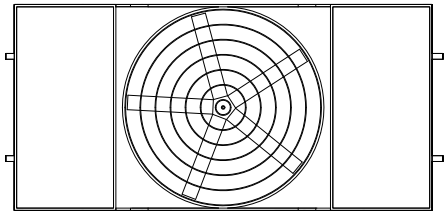
	PHW Pan Footprint Dimensions			
	Box Size	A	B	C
Double Air Inlet Models	12' x 24'	-	24'	12'
	14' x 26'	-	26'	13'

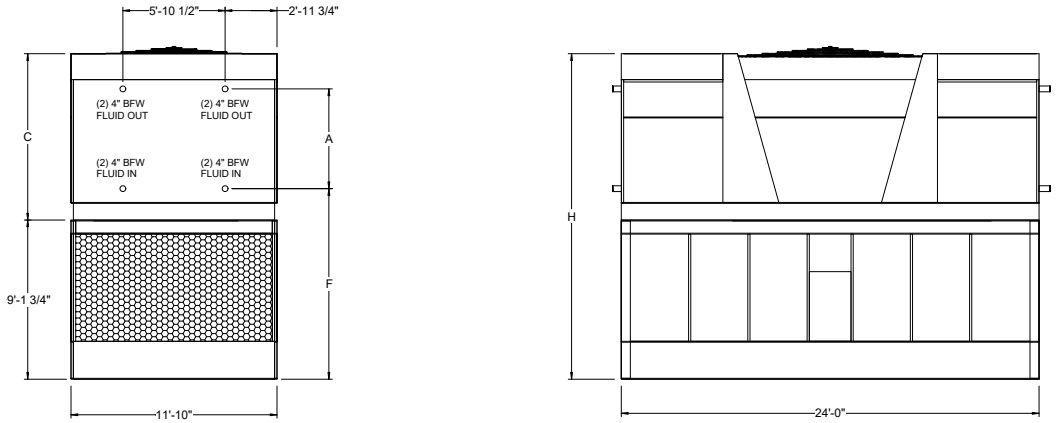
NOTE: Unit dimensions shown for reference only. Consult the PHW unit steel support drawings for specific beam dimensions and bolt locations.



Typical Steel Support

Engineering Dimensions & Data
Models PHW 12-5M24 to 12-8Q24





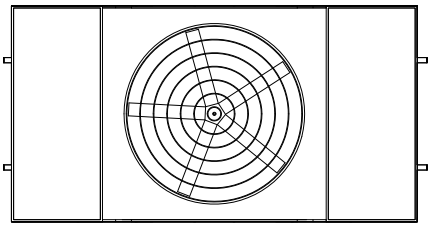
MODEL NO.[1]	FANS		WEIGHTS (LBS)			COIL VOL (GAL)	SPRAY PUMP		REMOTE PUMP			DIMENSIONS (IN)[3]			
	HP	CFM	SHIP	OPR	HEAVIEST SECTION[2]		HP	GPM	GAL RQD	CONN SIZE (IN)	OPR WGT	A	F	C	H
PHW 12-5M24	30	177,600	31,650	51,930	21,560	679	(2) 7.5	1,800	1,580	14	45,230	41.75	137.375	98.14	206.375
PHW 12-5N24	40	191,300	31,760	52,140	21,670	679	(2) 7.5	1,800	1,580	14	45,440	41.75	137.375	98.14	206.375
PHW 12-5O24	50	206,000	31,800	52,150	21,710	679	(2) 7.5	1,800	1,580	14	45,450	41.75	137.375	98.14	206.375
PHW 12-5P24	60	218,700	32,090	52,430	22,000	679	(2) 7.5	1,800	1,580	14	45,730	41.75	137.375	98.14	206.375
PHW 12-5Q24	75	235,600	32,130	52,460	22,040	679	(2) 7.5	1,800	1,580	14	45,760	41.75	137.375	98.14	206.375
PHW 12-6M24	30	177,400	33,970	55,140	23,880	807	(2) 7.5	1,800	1,580	14	48,440	50.75	128.375	98.14	206.375
PHW 12-6N24	40	195,200	34,080	55,350	23,990	807	(2) 7.5	1,800	1,580	14	48,650	50.75	128.375	98.14	206.375
PHW 12-6O24	50	210,200	34,120	55,360	24,030	807	(2) 7.5	1,800	1,580	14	48,660	50.75	128.375	98.14	206.375
PHW 12-6P24	60	223,200	34,410	55,640	24,320	807	(2) 7.5	1,800	1,580	14	48,940	50.75	128.375	98.14	206.375
PHW 12-6Q24	75	223,200	34,450	55,670	24,360	807	(2) 7.5	1,800	1,580	14	48,970	50.75	128.375	98.14	206.375
PHW 12-7M24	30	177,600	36,860	58,510	26,770	935	(2) 7.5	1,800	1,580	14	51,880	59.75	137.375	116.14	224.375
PHW 12-7N24	40	191,300	36,970	58,720	26,880	935	(2) 7.5	1,800	1,580	14	52,090	59.75	137.375	116.14	224.375
PHW 12-7O24	50	206,000	37,010	58,730	26,920	935	(2) 7.5	1,800	1,580	14	52,100	59.75	137.375	116.14	224.375
PHW 12-7P24	60	218,700	37,300	59,010	27,210	935	(2) 7.5	1,800	1,580	14	52,380	59.75	137.375	116.14	224.375
PHW 12-7Q24	75	235,600	37,340	59,040	27,250	935	(2) 7.5	1,800	1,580	14	52,410	59.75	137.375	116.14	224.375
PHW 12-8M24	30	172,600	39,200	62,000	29,110	1063	(2) 7.5	1,800	1,580	14	55,370	68.75	128.375	116.14	224.375
PHW 12-8N24	40	189,800	39,310	62,210	29,220	1063	(2) 7.5	1,800	1,580	14	55,580	68.75	128.375	116.14	224.375
PHW 12-8O24	50	204,300	39,350	62,220	29,260	1063	(2) 7.5	1,800	1,580	14	55,590	68.75	128.375	116.14	224.375
PHW 12-8P24	60	217,000	39,640	62,500	29,550	1063	(2) 7.5	1,800	1,580	14	55,870	68.75	128.375	116.14	224.375
PHW 12-8Q24	75	233,700	39,680	62,530	29,590	1063	(2) 7.5	1,800	1,580	14	55,900	68.75	128.375	116.14	224.375

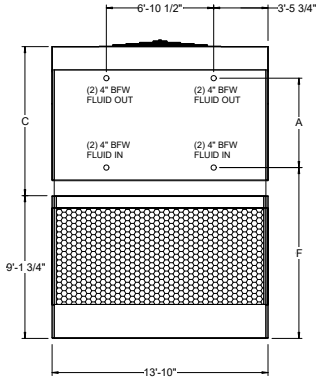
NOTE: *The coil connections increase to 6" BRW when the flow rate exceeds 450 gpm. This required option is referred to as the High Flow coil configuration. Connection locations for High Flow configuration may vary slightly from those shown here. Refer to certified drawings for exact piping interface locations.*

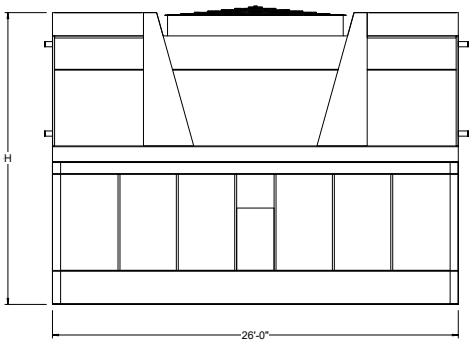
1 Model numbers will end in "-Z" for units with Series Flow piping configuration. Series Flow will require crossover piping. Model numbers will include "C" for units with stainless steel coil(s), "R" for units with low sound fan(s).
2 Heaviest section is the upper section.
3 Unit dimensions may vary slightly from catalog. See factory certified prints for exact dimensions. Coil connections are 4 inch bevel for weld (BFW). Other connection types such as grooved for mechanical coupling or flanged are also available as options.

Engineering Dimensions & Data

Models PHW 14-5M26 to 14-8R26







MODEL NO.[1]	FANS		WEIGHTS (LBS)			COIL VOL (GAL)	SPRAY PUMP		REMOTE PUMP			DIMENSIONS (IN)[3]			
	HP	CFM	SHIP	OPR	HEAVIEST SECTION[2]		HP	GPM	GAL RQD	CONN SIZE (IN)	OPR WGT	A	F	C	H
PHW 14-5M26	30	209,100	36,470	61,400	25,200	799	(2) 7.5	1,800	2,110	14	52,580	41.75	137.375	98.14	206.375
PHW 14-5N26	40	229,900	36,580	61,620	25,310	799	(2) 7.5	1,800	2,110	14	52,800	41.75	137.375	98.14	206.375
PHW 14-5O26	50	247,400	36,620	61,620	25,350	799	(2) 7.5	1,800	2,110	14	52,800	41.75	137.375	98.14	206.375
PHW 14-5P26	60	263,000	36,920	61,910	25,650	799	(2) 7.5	1,800	2,110	14	53,090	41.75	137.375	98.14	206.375
PHW 14-5Q26	75	282,900	36,950	61,940	25,680	799	(2) 7.5	1,800	2,110	14	53,120	41.75	137.375	98.14	206.375
PHW 14-5R26	100	311,400	37,260	62,070	25,990	799	(2) 7.5	1,800	2,110	14	53,250	41.75	137.375	98.14	206.375
PHW 14-6M26	30	204,900	39,290	65,160	28,020	949	(2) 7.5	1,800	2,110	14	56,340	50.75	128.375	98.14	206.375
PHW 14-6N26	40	225,300	39,400	65,380	28,130	949	(2) 7.5	1,800	2,110	14	56,560	50.75	128.375	98.14	206.375
PHW 14-6O26	50	242,500	39,440	65,380	28,170	949	(2) 7.5	1,800	2,110	14	56,560	50.75	128.375	98.14	206.375
PHW 14-6P26	60	257,600	39,740	65,670	28,470	949	(2) 7.5	1,800	2,110	14	56,850	50.75	128.375	98.14	206.375
PHW 14-6Q26	75	277,200	39,770	65,700	28,500	949	(2) 7.5	1,800	2,110	14	56,880	50.75	128.375	98.14	206.375
PHW 14-6R26	100	305,100	40,080	65,830	28,810	949	(2) 7.5	1,800	2,110	14	57,010	50.75	128.375	98.14	206.375
PHW 14-7M26	30	200,800	42,720	69,250	31,450	1,100	(2) 7.5	1,800	2,110	14	60,490	59.75	137.375	116.14	224.375
PHW 14-7N26	40	220,800	42,830	69,470	31,560	1,100	(2) 7.5	1,800	2,110	14	60,710	59.75	137.375	116.14	224.375
PHW 14-7O26	50	237,700	42,870	69,470	31,600	1,100	(2) 7.5	1,800	2,110	14	60,710	59.75	137.375	116.14	224.375
PHW 14-7P26	60	252,400	43,170	69,760	31,900	1,100	(2) 7.5	1,800	2,110	14	61,000	59.75	137.375	116.14	224.375
PHW 14-7Q26	75	271,700	43,200	69,790	31,930	1,100	(2) 7.5	1,800	2,110	14	61,030	59.75	137.375	116.14	224.375
PHW 14-7R26	100	299,000	43,510	69,920	32,240	1,100	(2) 7.5	1,800	2,110	14	61,160	59.75	137.375	116.14	224.375
PHW 14-8M26	30	199,200	45,520	73,270	34,250	1,251	(2) 7.5	1,800	2,110	14	64,510	68.75	128.375	116.14	224.375
PHW 14-8N26	40	219,000	45,630	73,490	34,360	1,251	(2) 7.5	1,800	2,110	14	64,730	68.75	128.375	116.14	224.375
PHW 14-8O26	50	235,800	45,670	73,490	34,400	1,251	(2) 7.5	1,800	2,110	14	64,730	68.75	128.375	116.14	224.375
PHW 14-8P26	60	250,400	45,970	73,780	34,700	1,251	(2) 7.5	1,800	2,110	14	65,020	68.75	128.375	116.14	224.375
PHW 14-8Q26	75	269,500	46,000	73,810	34,730	1,251	(2) 7.5	1,800	2,110	14	65,050	68.75	128.375	116.14	224.375
PHW 14-8R26	100	296,700	46,310	73,940	35,040	1,251	(2) 7.5	1,800	2,110	14	65,180	68.75	128.375	116.14	224.375

NOTE: *The coil connections increase to 6" BRW when the flow rate exceeds 450 gpm. This required option is referred to as the High Flow coil configuration. Connection locations for High Flow configuration may vary slightly from those shown here. Refer to certified drawings for exact piping interface locations.*

1 Model numbers will end in "-Z" for units with Series Flow piping configuration. Series Flow will require crossover piping. Model numbers will include "C" for units with stainless steel coil(s), "R" for units with low sound fan(s).
2 Heaviest section is the upper section.
3 Unit dimensions may vary slightly from catalog. See factory certified prints for exact dimensions. Coil connections are 4 inch bevel for weld (BFW). Other connection types such as grooved for mechanical coupling or flanged are also available as options.

Application

Design

EVAPCO equipment is constructed of the highest quality materials and designed to provide years of reliable service when properly installed and maintained. The following sections present items that must be considered prior to the selection and installation of equipment.

Equipment Layout Planning

Proper equipment layout is essential to ensure that the fluid cooler operates at its rated capacity. Since evaporative cooling equipment requires large quantities of fresh air for cooling, it is important that the unit be located where the air supply is fresh and unobstructed.

The unit should also be located so that recirculation of the moist discharge air is minimized. Recirculation, also known as short-cycling, occurs when some of the warm, moist air discharge flows back to the unit's air inlet. The recirculation effect results in higher wet bulbs to the unit, which has a negative impact on the unit's field performance.

Engineering Bulletin No. 311 presents the Layout Guidelines for EVAPCO cooling towers, fluid coolers and evaporative condensers. Download it at evapco.com.

The closed circuit cooler should be located away from fresh air intakes, operable windows, kitchen exhaust and prevailing winds directed toward public areas.

Closed Circuit Applications

Closed Circuit Coolers are designed to be used on closed loop systems where the cooling loop is sealed and pressurized. These units are not intended for use in "Open Systems" where the cooling fluid has atmospheric contact.

If applied in open systems, the coil may corrode from the inside with rust deposition throughout the cooling loop.

The cooling fluid must be compatible with the coil material; standard coils are fabricated from black steel with the outer surface hot dip galvanized.

Piping

Supply and return piping for fluid coolers should be designed and installed in accordance with generally accepted engineering practice. The piping layout should be symmetrical for systems with multiple units, and should be sized for a low water velocity and pressure drop.

Since these units are intended for closed loop applications, the loop piping should include an expansion tank to allow for fluid expansion and to purge excess air from the system.

The piping system should include air vents and drain valves at the coil piping so that the coil can be drained if the need arises.

All piping external to the unit should be secured and anchored by properly designed hangers and supports. No external loads should be placed upon the coil connections nor should any pipe supports be anchored to the unit.

Recirculating Water Quality

Proper water treatment is an essential part of the maintenance required for evaporative cooling equipment.

A well-designed and consistently implemented water treatment program will help to ensure efficient system operation while maximizing the equipment's service life.

A qualified water treatment company should design a site specific water treatment protocol based on equipment (including all metallurgies in the cooling system), location, makeup water quality and usage.

Bleed off

Evaporative cooling equipment requires a bleed or blowdown line, located on the discharge side of the recirculating pump, to remove concentrated (cycled up) water from the system. EVAPCO recommends an automated conductivity controller to maximize the water efficiency of your system. Based on recommendations from your water treatment company, the conductivity controller should open and close a motorized ball or solenoid valve to maintain the conductivity of the recirculating water. If a manual valve is used to control the rate of bleed, it should be set to maintain the conductivity of the recirculating water during periods of peak load at the maximum level recommended by your water treatment company.

Water Treatment

The water treatment program prescribed for the given conditions must be compatible with the unit's materials of construction, including any galvanized components. The initial commissioning and passivation period is a critical time for maximizing the service life of galvanized equipment. EVAPCO recommends that your site specific water treatment protocol includes a passivation procedure that details water chemistry, any necessary chemical addition, and visual inspections during the first six (6) to twelve (12) weeks of operation. During this passivation period, recirculating water pH should be maintained above 7.0 and below 8.0 at all times. Batch feeding of chemicals is not recommended.

Control of Biological Contaminants

Evaporative cooling equipment should be inspected regularly to ensure good microbiological control. Inspections should include both monitoring of microbial populations via culturing techniques and visual inspections for evidence of biofouling.

Poor microbiological control can result in loss of heat transfer efficiency, increase corrosion potential, and increase the risk of pathogens such as those that cause Legionnaires' disease. Your site specific water treatment protocol should include procedures for routine operation, startup after a shut-down period, and system lay-up, if applicable. If excessive microbiological contamination is detected, a more aggressive mechanical cleaning and/or water treatment program should be undertaken.

PHW Mechanical Specifications

Each unit shall be capable to cool _____ GPM of water entering at _____° F leaving at _____° F at a design wet bulb of _____° F with a pressure drop across the coil not to exceed _____ psi.

IBC Compliance

The closed circuit cooler shall be designed and constructed to meet the International Building Code (IBC) specifications for installed components per ASCE.

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 makeup 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.

Drive

The fan drive shall be a multi-groove, 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 closed circuit cooler 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 100,000 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

Spray nozzles shall be zero-maintenance precision molded ABS with large 1-1/4" diameter orifice threaded into branch piping with internal sludge ring to eliminate clogging. Spray header, branches, and riser shall be Schedule 40 Polyvinyl Chloride (PVC) for corrosion resistance.

Heat Transfer Coil & Drift Eliminators

Cooling 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. Coils shall have a design pressure of 300 psig and shall be in compliance with ANSI/ASME B31.5 Refrigerant Piping and Heat Transfer Components. The coil shall be strength tested in accordance with ANSI/ASME B31.5 and subsequently leak tested using air under water.

The eliminators 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. Maximum drift rate shall be less than 0.002% of the circulating water rate.

Heat Transfer Fill

The closed circuit cooler 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.

Specifications

SECTION 23 65 00 – FACTORY-FABRICATED COOLING TOWERS

PART 1 – GENERAL

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

1.2 SUMMARY:
- A. This Section includes factory assembled and tested, closed circuit, parallel hybrid cooling tower (also known as a closed circuit cooler).

1.3 SUBMITTALS
- A. General. Submit the following:
  1. Certified drawings of the closed circuit cooler, sound data, recommended steel support indicating weight loadings, wiring diagrams, installation instructions, operation and maintenance instructions, and thermal performance guarantee by the manufacturer.

1.4 QUALITY ASSURANCE
- A. Verification of Performance:
  1. Test and certify closed circuit cooler thermal performance according to CTI Standard 201.
  2. Test and certify closed circuit cooler sound performance according to CTI ATC-128.
- B. Meet or Exceed energy efficiency per ASHRAE 90.1.

1.5 WARRANTY
- A. Motor/Drive System: Five (5) year comprehensive warranty against materials and workmanship including motor, fan, bearings, mechanical support, sheaves, bushings and belt.
- B. Unit: One (1) year from start-up, not to exceed eighteen (18) months from shipment on the unit.

PART 2 - PRODUCTS

2.1 MANUFACTURERS
- A. Manufacturers: Subject to compliance with requirements, provide closed circuit coolers manufactured by one of the following:
  1. EVAPCO, Inc.
  2. Approved Substitute

2.2 MATERIALS
- A. Galvanized Sheet Steel complying with ASTM A 653/A 653M and having G-235 designation.
- B. Optional Type 304 and/or 316 Stainless Steel as specified.

2.3 INDUCED-DRAFT, Parallel Hybrid CLOSED CIRCUIT COOLERS
- A. Description: Factory assembled and tested, induced draft parallel hybrid closed circuit cooler complete with crossflow fill, drift eliminators, fan, accessories, and rigging supports.
- B. Closed Circuit Cooler Characteristics and Capacities: Refer to the closed circuit cooler schedule.
- C. Fan(s):
  1. Type and Material: Axial propeller, individually adjustable wide chord blade extruded aluminum installed in a closely fitted cowl with venturi air inlet for maximum efficiency, covered with a heavy gauge hot dipped Galvanized Steel fan guard.
  2. Maximum sound pressure level of _____dB(A) measured at 5 feet above the fan discharge during full speed operation in accordance with CTI Standard ATC-128.
- D. Water Distribution System: Non-corrosive materials.
  1. Even distribution of water over fill material with pressurized spray tree.
     a. Pipes: Schedule 40 PVC, Non-corrosive Materials
     b. Nozzles: Non-clogging, nylon, threaded into branch piping.
  2. Maximum pressure at inlet shall be _____ psig.
- E. IBC Compliance: The unit structure shall be designed, analyzed, and constructed in accordance with the latest edition of the International Building Code (IBC) Regulations for seismic loads up to _____ g and wind loads up to __ psf.
- F. Collection Basin Material: Galvanized Steel. Type 304 or 316 Stainless Steel Optional:
  1. Removable stainless-steel strainer with openings smaller than nozzle orifices.
  2. Joints: Bolted and sealed watertight or welded.
  3. Overflow, makeup and side drain connections
  4. Flume plate between cells (for multiple-cell units) or Equalizer connection (for multiple- closed circuit cooler system).
- G. Heat Transfer Media:
  1. Coil: Heavy Gauge G-235 Galvanized Steel encased in a steel framework, assembly hot-dip galvanized after construction. Type 304 or 316 Stainless Steel Optional. Coil assembly completely enclosed and protected from sunlight exposure, environmental elements and debris. Tubes sloped for free drainage of the coil and designed for low pressure drop. The coil shall have design pressure of 300 psi and shall be in compliance with ANSI/ASME B31.5, Refrigeration Piping and Heat Transfer Components. The coil assembly shall be strength tested in accordance with ANSI/ASME B31.5 and subsequently leak tested using air under water. Coil connections beveled for weld, flanged (optional) or grooved (optional).
  2. Fill media and integral drift eliminators shall be constructed of Polyvinyl Chloride (PVC) and suitable for inlet water temperatures up to 120°F. The bonded block fill and integral drift eliminators shall be bottom supported to prevent sag and allow for at least a 3" space between the bottom of the fill and the pan bottom to facilitate cleaning. Fill and integral drift eliminators shall be self-extinguishing, have a flame spread of less than 25 under ASTM E84, and shall be resistant to rot, decay and biological attack.
- H. Casing: Galvanized Steel. Type 304 or 316 Stainless Steel Optional:
  1. Casing panels shall totally encase the heat transfer coil.
  2. Fasteners: Corrosion resistance equal to or better than materials being fastened.
  3. Joints: Sealed watertight.
  4. Welded Connections: Continuous and watertight
- I. Drift Eliminators: PVC, for long life and durability resistant to rot, decay and biological attack; formed, bonded together for strength and durability in block format for easy removal and replacement; self extinguishing with flame spread rating of 5 per ASTM E84-81a; 0.002% drift rate.
- J. Water Level Control: Brass mechanical makeup water valve and plastic float with an adjustable linkage.
- K. Water Recirculation Pump: Close-coupled, centrifugal type with mechanical seal. The pump motor shall be _____ horsepower totally enclosed for outdoor service on _____ volts, _____ hertz, and _____ phase.

2.4 MOTORS AND DRIVES
- A. General requirements for motors are specified in Division 15 Section "Motors".
- B. Enclosure Type: TEAO.
- C. Motor Speed: Premium Efficient VFD Duty (Option: 2-speed)
- D. Drive: Power-Band Belt designed for 150% of the motor nameplate HP.
  1. Belt: Multi-groove, solid back V-belt type neoprene reinforced with polyester cord.
  2. Sheaves: Aluminum alloy if located inside the airstream.
  3. Bearings: Heavy duty, self-aligning pillow block bearings with lubrication lines extended to side access door. Minimum L-10 life for bearings shall be 100,000 hours. Provide extended grease lines and fittings.
  4. Vibration Cutout Switch: (optional) Mechanical switch to de-energize fan motors if excessive vibration in NEMA 4 enclosure.

2.5 MAINTENANCE ACCESS
- A. Internal Walkway
  1. An internal walkway shall be provided at the level of the basin door to provide access to the interior of the unit for routine maintenance. The walkway extends the length of the basin for easier travel through multiple units.

Heat Exchanger Coil/ Heat Loss Data

Heat Exchanger Coil

The simplest and most foolproof method of protecting the heat exchanger coil from freeze-up is to use a glycol solution. If this is not possible, an auxiliary heat load must be maintained on the coil at all times so that the water temperature does not drop below 50°F when the cooler is shut down. Also, a minimum recommended flow rate per unit must be maintained. Refer to Heat Loss Data Table below.

Minimum Flows	Standard Flow GPM	Series Flow GPM
12' Wide Models		
PHW 12x24	700	350
14' Wide Models		
PHW 14x26	820	410

Heat Loss Data (MBH)

PHW Model	Standard Unit
12-5x24	763
12-6x24	814
12-7x24	830
12-8x24	949
14-5x26	898
14-6x26	958
14-7x26	978
14-8x26	1117

Notes

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