Bulletin 167 - EC

evapco®

CONTAINERIZED

ATC Evaporative Condensers

Engineered to Deliver the
MaximumCapacity and
HighestQuality to the
Worldwide Market - with the
Lowest ShippingCosts!

U.S. GREEN BUILDING COUNCIL MEMBER

IARW International Association of Refrigerated Warehouses

MEMBER iiar International Institute of Ammonia Refrigeration

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
- District Energy

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 22 locations in 10 countries around the world and supplied through a sales network consisting of over 170 offices.

Advanced Technology Condensers for a Worldwide

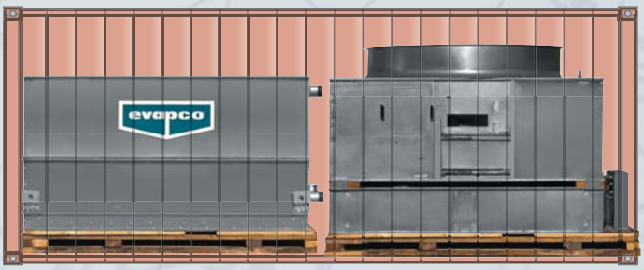
The Containerized line of Evaporative Condensers has been custom-engineered to ship in standard shipping containers. This feature greatly reduces the transportation costs associated with shipping. Customers around the world will benefit from the Advanced Technology features which are standard on the Containerized design:

- Low-Energy Consumption
- Induced-Draft Operation
- Thermal-Pak® Coils
- ZM® II Nozzles
- PVC Water Distribution System
- WST Air Inlet Louvers
- Simple Operation and Maintenance

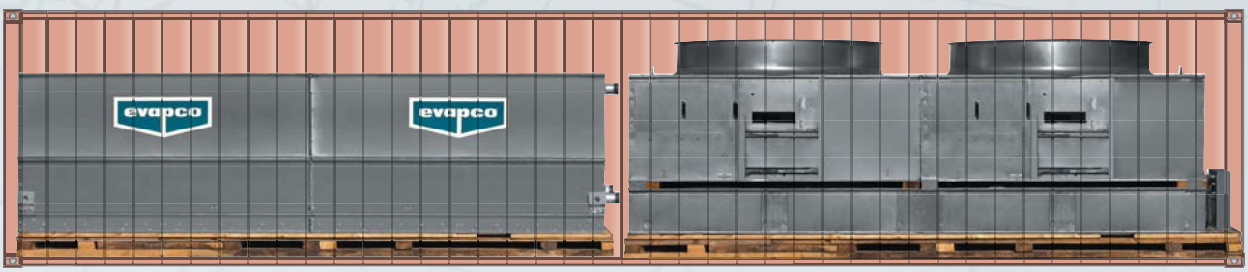
The Containerized Condensers have been designed for simplified field assembly and rigging, while delivering the quality and reliability of a factory-built unit. These units provide the maximum capacity with the lowest ocean shipping cost!

Designed to Lower Transportation and Installation Costs while Delivering Advanced Technology, Superior Performance, Ease of Maintenance and Long, Trouble-Free Operation.

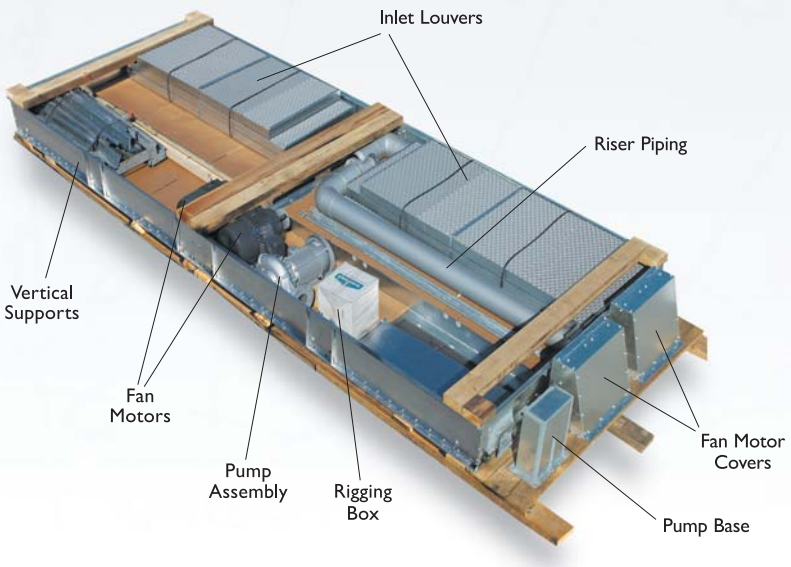
A complete 2.24M x 2.74M (7.35 ft. x 9 ft.) **unit will fit in a 20' Shipping Container!**



A complete 2.24M x 5.49M (7.35 ft. x 18 ft.) **unit will fit in a 40' Shipping Container!**



All Parts Required for Assembly Ship Inside the Basin.



Optional Accessories Ship Inside the Container

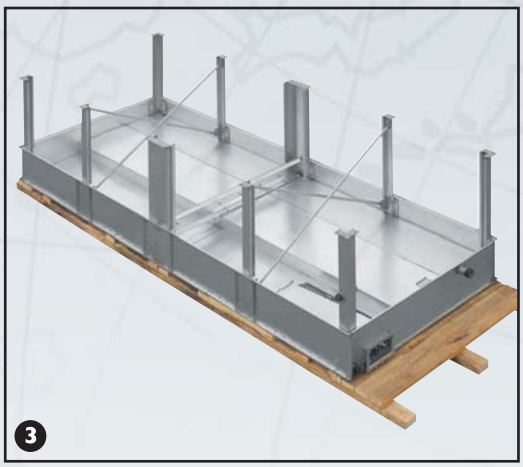
- Sloped Ladder
- Motor Davit
- Vibration Cutout Switch
- Basin Heater Package
- Electric Water Level Control

Easy Field Assembly

(See rigging and assembly instructions for fully detailed procedure.)

Unload Unit from Container

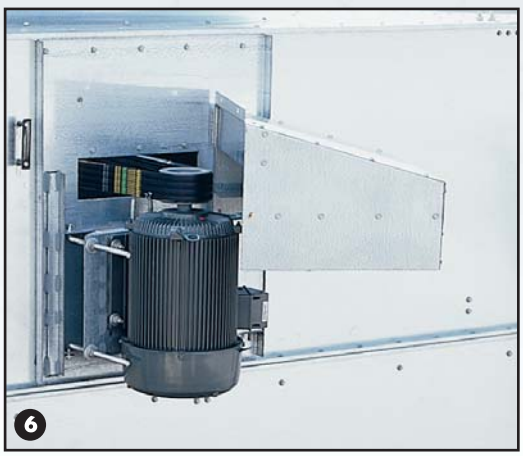
Mount Fan Section to Coil Section



Install Vertical Posts in Basin Section

Mount Coil/Fan to Basin Section

Mount Pump and Piping



Mount Fan Motor

Product Applications

Design

EVAPCO Evaporative Condensers are of heavy-duty construction and designed for long trouble-free operation. Proper equipment selection, installation and maintenance is, however, necessary to ensure full 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 fan intake exists. Recirculation raises the wet bulb temperature of the entering air causing the tower pressure to rise above the design. For these cases, a discharge hood or ductwork should be provided to raise the overall unit height even with 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

The heat rejection in a condenser is accomplished by the evaporation of a portion of the recirculated spray water. As this water evaporates, it leaves behind all of its mineral content and impurities. Therefore, it is important to bleed-off an amount of water equal to that which is evaporated to prevent the build-up of these impurities. If this is not done, the mineral or the acidic nature of the water will continue to increase. This will ultimately result in heavy scaling or a corrosive condition.

Bleed-off

Each unit supplied with a pump mounted on the side is furnished with a clear bleed line for visual inspection and a valve which, when fully open, will bleed-off the proper amount of water. If the make-up water supplying the unit is relatively free of impurities, it may be possible to cut back the bleed, but the unit must be checked frequently to make sure scale is not forming. Make-up water pressure should be maintained between 140 and 340kPa.

Water Treatment

A proper water treatment program is an essential part of routine maintenance in order to help assure proper operation and longevity of the unit. To help prevent the formation of "white rust", the interior of the unit should be passivated during start-up and monitored periodically as part of the water treatment program. For more information about white rust, please request a copy of EVAPCO Engineering Bulletin 36. A qualified water treatment company should be contacted to design a water treatment protocol specifically based on applicable location, water quality and unit materials of construction. If acid is used for treatment, it should be accurately metered and the concentration properly controlled. The pH of the water should be maintained between 6.5 and 8.0. Units constructed of galvanized steel operating with circulating water having a pH of 8.0 or higher will require periodic passivation of the galvanized steel to prevent the formation of "white rust". Batch chemical feeding is not recommended because it does not afford the proper degree of control. If acid cleaning is required extreme caution must be exercised and only inhibited acids recommended for use with galvanized construction should be used.

NOTE: Operating the condenser below 6.0 pH for any period of time may cause the removal of the protective zinc coating on the galvanized steel components.

For more information see EVAPCO Bulletin entitled "Maintenance Instructions".

Control of Biological Contamination

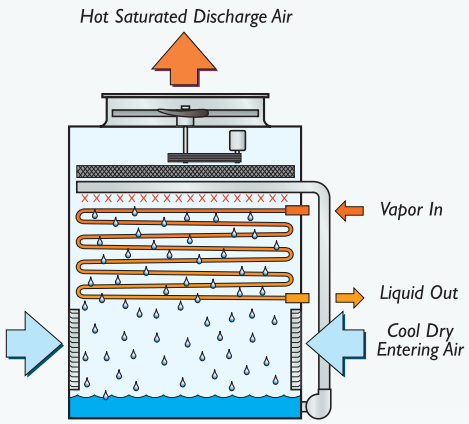
Water quality should be checked regularly for biological contamination. If biological contamination is detected, a more aggressive water treatment and mechanical cleaning program should be undertaken. The water treatment program should be performed in conjunction with a qualified water treatment company. 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.

cATC Design and Construction Features

The cATC line of evaporative condensers reflects EVAPCO's continuing commitment to research and development. Their advanced design provides owners with many operational and performance advantages. For particularly corrosive environments, EVAPCO condensers are available with Type 304 or 316 Stainless Steel construction. Contact the factory for details on available options.

Principle of Operation

The refrigerant gas is discharged from the compressor into the inlet connection of the cATC condenser. Water from the condenser's sump is circulated over the condenser coil, while ambient air is simultaneously drawn into the unit. As the ambient air moves up through the coil section, a portion of the spray water is evaporated into the air stream. The evaporative process cools the spray water, which in turn cools the tubes containing the refrigerant gas. The cool tube walls cause the refrigerant gas to give up heat and condense into a liquid. The condensed liquid flows out of the coil to the high pressure liquid receiver for return to the system. The hot, saturated air is drawn through the drift eliminators, where any entrained water droplets are removed. The condenser's fan then discharges this air stream out of the top of the unit at a high velocity, where it can dissipate harmlessly into the atmosphere. The water which was not evaporated falls into the sump and is recirculated by the spray pump to the water distribution system above the condensing coil section.



Principle of Operation

Fan Drive System

The fan motor and drive assembly is designed to allow easy servicing of the motor and adjustment of the belt tension from the exterior of the unit. The totally enclosed fan cooled (T.E.F.C.) fan motor is mounted on the outside for easy access. A protective cover swings away to allow servicing and belt adjustment.

A large, hinged access door with a "quick release" latch provides access to the fan section for maintenance.


External Motor Mount (Optional Ladder Shown)

Fan Shaft Bearings

The fan shaft bearings in cATC 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 bearings available.

Aluminum Alloy Pulleys

Fan pulleys located in the air stream are constructed of corrosion free aluminum for long life. The aluminum also helps belts last longer.

Power-Band Drive Belt

The Power-Band is a solid-back, multigroove belt system that has high lateral rigidity. The belt is constructed of neoprene with polyester cords. The drive belt is designed for 150 percent of the motor nameplate horsepower for long life and durability.

WST Air Inlet Louvers

Water and Sight Tight air inlet louvers are designed to effectively eliminate splash-out and sunlight, greatly reducing the potential for algae formation inside the condenser. They are manufactured of corrosion-free PVC and mounted in light-weight frames to allow for easy removal and convenient access to the basin section.

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 stainless steel for this important component.

U.S. Patent No. 6315804

PVC Drift Eliminators

EVAPCO eliminators are constructed entirely of inert, corrosion-free PVC. This patented design reduces drift rate to 0.001% and has been specially treated to resist damaging ultraviolet light. The eliminators are assembled in easily handled sections to facilitate removal, thereby exposing the upper portion of the unit and water distribution system for periodic inspection.

ZM® II Nozzles

Even and constant water distribution is paramount for reliable, scale-free evaporative condensing. EVAPCO's Zero Maintenance ZM® II Spray Nozzle remains clog-free under the toughest conditions to deliver approximately 4 l/s to every square meter of coil plan area.

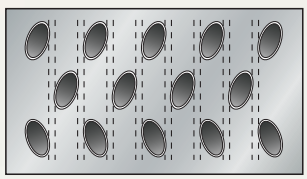
The heavy-duty ABS ZM® II Spray Nozzles have a 32mm diameter opening and a 32mm splash plate clearance. The fixed position ZM® II Spray Nozzles are mounted in corrosion-free PVC water distribution pipes that have threaded end caps. Together, these elements combine to provide unequaled coil coverage, enhanced droplet formation and make the industries best performing maintenance-free water distribution system.

Thermal-Pak® Coil

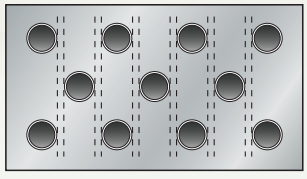
EVAPCO's Thermal-Pak® condensing coils feature a design which assures maximum condensing capacity. The air flow thru the coil is counterflow to the refrigerant flow, providing the most efficient heat transfer. This special coil design is utilized to reduce the air pressure drop through the unit while maximizing tube surface area and increasing its heat transfer capabilities. The uniquely shaped tubes of the coil are staggered in the direction of air flow to obtain a high film coefficient. In addition, all tubes are pitched in the direction of refrigerant flow assure drainage of liquid refrigerant.

These characteristics and other engineering advancements of the Thermal-Pak® coil have been proven in EVAPCO's world-class research and development laboratory resulting in the following end user benefits:

- Lower Operating Refrigerant Charge
- Low Power Consumption Per Ton
- Lower Operating Weight
- Small Plan Area Per Ton



Thermal-Pak® Coil by EVAPCO

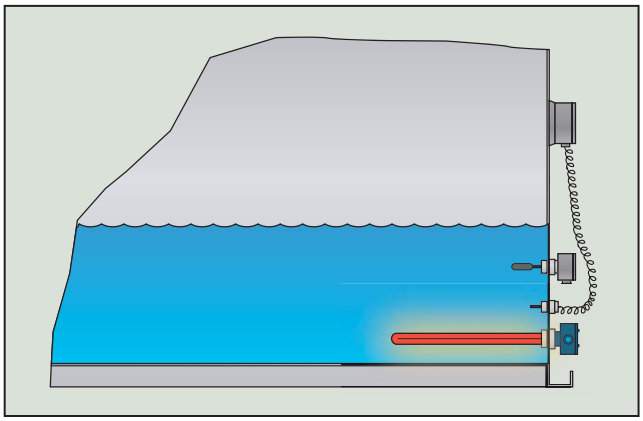


Round Tube Coil by Others

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 and then tested before being assembled into a coil. Finally, the assembled coil is air pressure tested under water at 390 psig (2.69 Mpa). 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 (430˚C).

Electric Heaters

Electric immersion heaters for the condenser basin are available. They are sized to maintain a +4°C to +5°C (+40°F) pan water temperature with the fans off and an ambient air temperature of -18°C (0°F). They are furnished with a thermostat and low water protection device to cycle the heater on when required and to prevent the heater elements from energizing unless they are completely submerged. All components are in weatherproof enclosures for outdoor use. The heater power contactors and electric wiring are not included as standard.

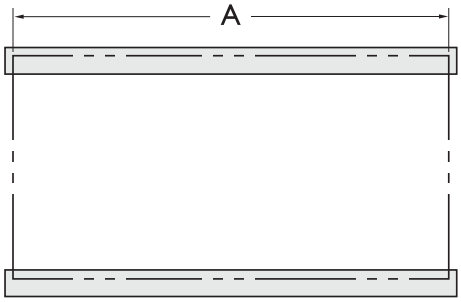


Heater Sizes			
Models	-18°C 0°F kW	-29°C -20°F kW	-40°C -40°F kW
cATC-181 to 251	7	10	15
cATC-264 to 338	8	14	18
cATC-329 to 373	10	14	20
cATC-362 to 504	12	18	24

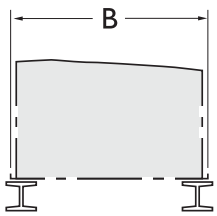
Steel Support

The recommended support for EVAPCO condensers is structural "I" beams located under the outer flanges and running the entire length of the unit. Mounting holes, 19mm (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 3mm per 2m (1/8" per 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.



Plan View



End Elevation

Models	S.I. Units (mm)		English Units	
	A	B	A	B
cATC-181 to 251	2731	2240	8' 11-1/2"	7' 4-3/16"
cATC-264 to 338	3651	2240	11' 11-3/4"	7' 4-3/16"
cATC-329 to 373	4261	2240	13' 11-3/4"	7' 4-3/16"
cATC-362 to 504	5486	2240	18' 0"	7' 4-3/16"

Selection Procedure

The following procedure is applicable to both reciprocating and screw compressors. (Refer to factory for selection on centrifugal compressors). The total heat of rejection for the system is determined by adding the evaporator load, expressed in kW or BTU/Hr, and the absorbed kW or BTU/Hr of the compressor motor. This procedure applies to both open type and hermetic compressors.

Heat of Rejection Method

Heat of Rejection = Evaporator Load (kW or BTU/Hr) + Compressor Load (kW or BTU/Hr)

The compressor load (BTU/Hr) can be calculated by one of the following formulaes:

Open Compressors:
Compressor Load (BTU/hr) = Compressor BHP x 2545

Hermetic Compressors:
Compressor Load (BTU/hr) = kW Compressor Input x 3415

Once the heat of rejection has been determined, multiply it by the factor for the specified operating conditions (condensing temperature and wet bulb temperature) obtained from either Table 1a/1b or Table 2a/2b. The resultant figure is then used to select a unit from Table 3a/3b. Unit capacities in Table 3B are given in thousands of BTU/Hr, or MBH.

Note: For screw compressor selections employing water cooled oil cooling, select a condenser for the total load (BTU/Hr or kW) as described above. The condenser can then function in one of two ways:

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

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

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.

EXAMPLE - S.I. Units

Given: 500 kW evaporator load, HCFC-22 refrigerant, 35°C condensing temperature, 26°C wet bulb temperature with a 150 kW compressor.

Selection:

Evaporator Load	=	500 kW
Compressor Load	=	150 kW
Total	=	750 kW

From Table 1a the capacity factor for 35°C condensing temperature and 26°C wet bulb temperature is 1.71. Therefore, the corrected heat of rejection load is:

750 kW (Total Heat of Rejection)	x	1.71 (Capacity Factor)	=	1282.5 kW (Corrected Heat Rejection Load)

Model cATC-304 is selected by using the unit heat of rejection capacities found in Table 3a.

EXAMPLE - English Units

Given: 240 ton evaporator load, ammonia (R-717) refrigerant, 95°F condensing temperature, 80°F wet bulb temperature with a 250 compressor BHP.

Selection:

Evaporator Load	=	240 tons x 12,000	=	2,880,000 BTU/Hr
Compressor Load	=	250 BHP x 2545	=	636,250 BTU/Hr
Total			=	3,516,250 BTU/Hr

From Table 2b the capacity factor for 95°F condensing temperature and 80°F wet bulb temperature is 1.63. Therefore, the corrected heat of rejection load is:

3,516.25 MBH (Total Heat of Rejection)	x	1.63 (Capacity Factor)	=	5,731.49 MBH (Corrected Heat Rejection Load)

Model cATC-415 is selected by using the unit heat of rejection capacities found in Table 3b.

Table 1a - HCFC-22 and HFC-134a Heat Rejection Factors – S.I. Units

Condensing Pres. (kPa)		Cond. Temp. °C	Wet Bulb Temperature, (°C)																
HCFC-22	HFC-134a		10	12	14	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30
1090	669	30	1.07	1.15	1.25	1.38	1.47	1.57	1.69	1.83	2.00	2.23	2.50	2.86	3.36	—	–			
1154	718	32	0.94	1.01	1.09	1.19	1.26	1.32	1.40	1.49	1.60	1.74	1.90	2.11	2.36	–	–	–	–	–
1220	759	34	0.85	0.90	0.97	1.04	1.09	1.14	1.20	1.26	1.34	1.43	1.54	1.66	1.81	2.02	2.31	–	–	–
1253	785	35	0.80	0.85	0.91	0.97	1.02	1.06	1.11	1.15	1.21	1.29	1.37	1.46	1.56	1.71	1.89	2.13	2.41	2.77
1287	814	36	0.77	0.81	0.86	0.92	0.96	1.00	1.04	1.07	1.13	1.19	1.26	1.34	1.43	1.56	1.71	1.90	2.14	2.43
1359	856	38	0.70	0.74	0.78	0.82	0.85	0.86	0.90	0.93	0.96	1.01	1.06	1.11	1.18	1.26	1.35	1.47	1.62	1.78
1431	915	40	0.65	0.67	0.70	0.73	0.76	0.78	0.80	0.83	0.86	0.89	0.93	0.97	1.02	1.08	1.14	1.22	1.32	1.44
1508	978	42	0.59	0.62	0.64	0.67	0.68	0.70	0.72	0.74	0.77	0.80	0.83	0.86	0.89	0.94	0.98	1.04	1.11	1.19
1587	1026	44	0.54	0.56	0..59	0.61	0.62	0.63	0.65	0.66	0.68	0.70	0.73	0.75	0.78	0.82	0.85	0.89	0.92	0.97

Note: Consult factory for selections using other refrigerants.

Table 2a - Ammonia (R-717) Heat Rejection Factors – S.I. Units

Condensing Pres. (kPa)	Cond. Temp. °C	Wet Bulb Temperature, (°C)																	
		10	12	14	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30
1063	30	0.95	1.03	1.12	1.23	1.31	1.40	1.51	1.63	1.79	1.99	2.24	2.56	3.00	–	–	–	–	–
1133	32	0.84	0.90	0.97	1.06	1.12	1.18	1.25	1.32	1.43	1.55	1.70	1.88	2.11	–	–	–	–	–
1206	34	0.76	0.81	0.86	0.93	0.98	1.02	1.07	1.12	1.19	1.28	1.36	1.48	1.61	1.80	2.06	–	–	–
1245	35	0.71	0.76	0.81	0.87	0.91	0.95	0.99	1.03	1.08	1.15	1.23	1.30	1.39	1.53	1.69	1.90	2.15	2.47
1284	36	0.69	0.73	0.77	0.82	0.86	0.89	0.92	0.96	1.01	1.07	1.13	1.20	1.28	1.39	1.53	1.70	1.91	2.17
1365	38	0.63	0.66	0.69	0.73	0.76	0.78	0.81	0.83	0.86	0.90	0.94	0.99	1.05	1.12	1.21	1.31	1.44	1.59
1451	40	0.58	0.60	0.62	0.65	0.67	0.70	0.72	0.74	0.76	0.80	0.83	0.87	0.91	0.96	1.02	1.09	1.18	1.29
1539	42	0.53	0.55	0.57	0.60	0.61	0.63	0.64	0.66	0.68	0.71	0.74	0.76	0.80	0.84	0.88	0.93	0.99	1.06
1630	44	0.49	0.50	0.52	0.54	0.56	0.56	0.58	0.59	0.61	0.63	0.65	0.67	0.70	0.73	0.76	0.79	0.83	0.86

Table 3a - Unit Heat Rejection Capacity – S.I.

cATC Model	kW Base
181	780
193	832
208	896
220	948
225	970
241	1,039
251	1,082
264	1,138

cATC Model	kW Base
282	1,215
304	1,310
316	1,362
329	1,418
338	1,457
351	1,513
362	1,560
367	1,582

cATC Model	kW Base
373	1,608
387	1,668
415	1,789
442	1,905
453	1,952
462	1,991
482	2,077
504	2,172

Table 1b - HCFC-22 and HFC-134a Heat Rejection Factors – English

Condensing Pres. (psig)		Cond. Temp. °F	Wet Bulb Temperature, (°F)																
HCFC-22	HFC-134a		50	55	60	62	64	66	68	70	72	74	75	76	77	78	80	82	84	86
156	95	85	1.10	1.22	1.39	1.50	1.61	1.75	1.93	2.13	2.42	2.78	3.02	3.29	3.64	4.00	-	-	-	-
168	104	90	.93	1.02	1.14	1.21	1.28	1.36	1.45	1.57	1.71	1.89	2.00	2.12	2.25	2.38	2.85	3.50	-	-
182	114	95	.80	.87	.95	1.00	1.05	1.10	1.15	1.22	1.31	1.40	1.45	1.50	1.56	1.64	1.82	2.07	2.37	2.77
196	124	100	.71	.76	.82	.85	.88	.91	.94	.98	1.03	1.09	1.12	1.15	1.20	1.24	1.34	1.46	1.63	1.82
211	135	105	.63	.66	.70	.72	.75	.77	.80	.83	.87	.91	.93	.95	.97	1.00	1.06	1.13	1.23	1.35
226	146	110	.56	.59	.62	.64	.65	.67	.69	.71	.74	.77	.78	.80	.82	.84	.88	.93	.98	1.04

Note: Consult factory for selections using other refrigerants.

Table 2b - Ammonia (R-717) Heat Rejection Factors – English Units

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

Table 3b - Unit Heat Rejection Capacity – English Units

cATC Model	MBH Base
181	2,661
193	2,837
208	3,058
220	3,234
225	3,308
241	3,543
251	3,690
264	3,881

cATC Model	MBH Base
282	4,145
304	4,469
316	4,645
329	4,836
338	4,969
351	5,160
362	5,321
367	5,395

cATC Model	MBH Base
373	5,483
387	5,689
415	6,101
442	6,497
453	6,659
462	6,791
482	7,085
504	7,409

cATC Engineering Dimensions & Data – S.I. Units

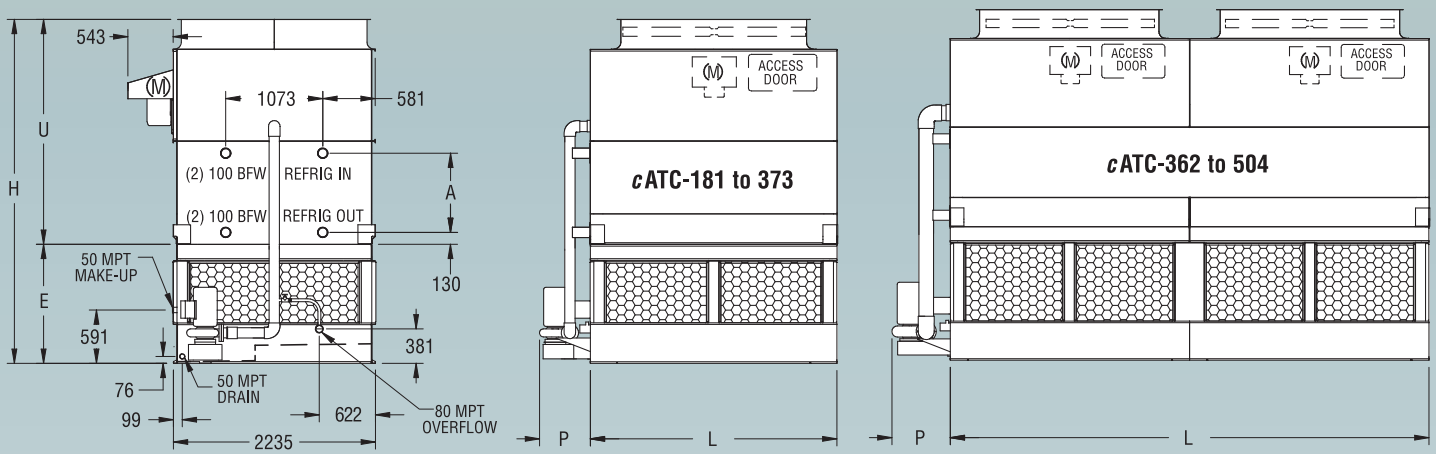


Table 1 Engineering Data

c-ATC Model No.*	R-717 kW*	Fans		Weights			Refrigerant Operating Charge kg***	Coil Volume L	Spray Pump		Remote Sump			Dimensions (mm)					
		KW	m³/s	Shipping	Operating	Heaviest Section†			KW	L/s	Liters Req'd**	Conn. Size (mm)	Operating Weight	Height H	Upper U	Lower E	Coil A	Length L	Pump P
cATC-181	551	5.5	16.8	3,420	4,140	2,690	66	544	1.5	25.8	455	200	3,610	3423	2105	1318	495	2727	563
cATC-193	590	7.5	18.5	3,420	4,150	2,690	66	544	1.5	25.8	455	200	3,620	3423	2105	1318	495	2727	563
cATC-208	638	7.5	17.9	3,890	4,650	3,160	84	710	1.5	25.8	455	200	4,120	3613	2296	1318	686	2727	563
cATC-225	689	11	20.1	3,950	4,710	3,220	84	710	1.5	25.8	455	200	4,180	3613	2296	1318	686	2727	563
cATC-220	672	7.5	17.4	4,380	5,180	3,660	104	876	1.5	25.8	455	200	4,650	3804	2486	1318	876	2727	563
cATC-241	737	11	19.5	4,440	5,240	3,710	104	876	1.5	25.8	455	200	4,710	3804	2486	1318	876	2727	563
cATC-251	767	11	18.9	4,930	5,760	4,200	122	1041	1.5	25.8	455	200	5,230	3994	2677	1318	1067	2727	563
cATC-264	806	11	25.5	4,210	5,240	3,330	84	715	2.2	34.7	585	250	4,510	3423	2105	1318	495	3648	631
cATC-282	862	11	24.8	4,850	5,930	3,970	111	937	2.2	34.7	585	250	5,200	3613	2296	1318	686	3648	631
cATC-304	931	11	24.0	5,470	6,600	4,590	138	1160	2.2	34.7	585	250	5,870	3804	2486	1318	876	3648	631
cATC-316	965	15	26.0	5,500	6,630	4,620	138	1160	2.2	34.7	585	250	5,900	3804	2486	1318	876	3648	631
cATC-338	1,034	15	25.2	6,150	7,330	5,270	163	1382	2.2	34.7	585	250	6,600	3994	2677	1318	1067	3648	631
cATC-329	1,004	11	26.8	6,300	7,580	5,280	159	1349	2.2	37.8	700	250	6,760	3915	2486	1429	876	4258	617
cATC-351	1,073	15	29.1	6,320	7,610	5,310	159	1349	2.2	37.8	700	250	6,790	3915	2486	1429	876	4258	617
cATC-367	1,120	15	28.2	7,070	8,410	6,060	191	1610	2.2	37.8	700	250	7,590	4105	2677	1429	1067	4258	617
cATC-373	1,142	18.5	30.0	7,080	8,430	6,070	191	1610	2.2	37.8	700	250	7,610	4105	2677	1429	1067	4258	617
cATC-362	1,107	(2)5.5	33.8	6,340	7,920	4,950	125	1056	4	50.4	890	300	6,840	3632	2105	1527	495	5483	670
cATC-387	1,180	(2)7.5	37.1	6,350	7,940	4,960	125	1056	4	50.4	890	300	6,860	3632	2105	1527	495	5483	670
cATC-415	1,267	(2)7.5	36.0	7,310	8,970	5,910	166	1392	4	50.4	890	300	7,890	3823	2296	1527	686	5483	670
cATC-453	1,383	(2)11	40.3	7,420	9,080	6,030	166	1392	4	50.4	890	300	8,000	3823	2296	1527	686	5483	670
cATC-442	1,348	(2)7.5	34.9	8,260	10,000	6,870	204	1728	4	50.4	890	300	8,920	4013	2486	1527	876	5483	670
cATC-482	1,473	(2)11	39.1	8,380	10,120	6,990	204	1728	4	50.4	890	300	9,040	4013	2486	1527	876	5483	670
cATC-462	1,413	(2)7.5	33.8	9,240	11,050	7,850	243	2064	4	50.4	890	300	9,970	4204	2677	1527	1067	5483	670
cATC-504	1,538	(2)11	37.9	9,360	11,170	7,970	243	2064	4	50.4	890	300	10,090	4204	2677	1527	1067	5483	670

* Tons at standard conditions: HCFC-22 and HFC-134a. 40.6°C condensing, 4.5°C suction and 25.6°C W.B.; ammonia 35.7°C condensing, -6.7°C suction and 25.6°C W.B.

** Liters shown is water in suspension in unit and piping. Allow for additional water in bottom of remote sump to cover pump suction and strainer during operation. (300mm would normally be sufficient.)

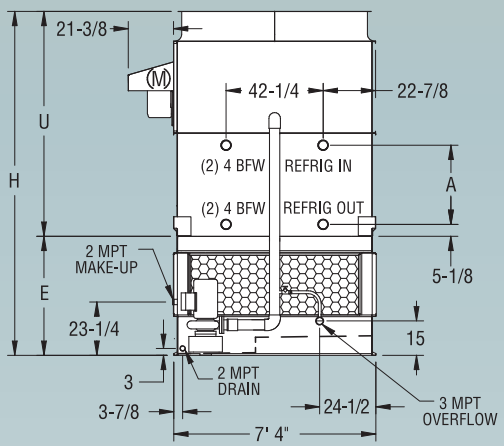
*** Refrigerant charge is shown for R-717. Multiply by 1.93 for R-22 and 1.98 for R-134a.

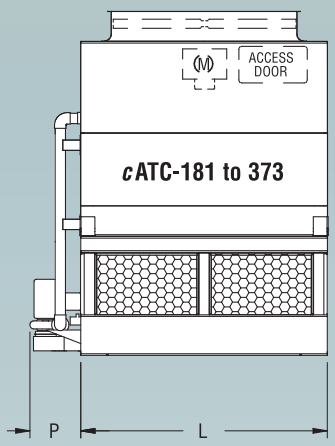
† Heaviest section is the coil section.

†† Pump base ships loose on models cATC-264 to 338.

Dimensions are subject to change. Do not use for pre-fabrication.

cATC Engineering Dimensions & Data – English Units





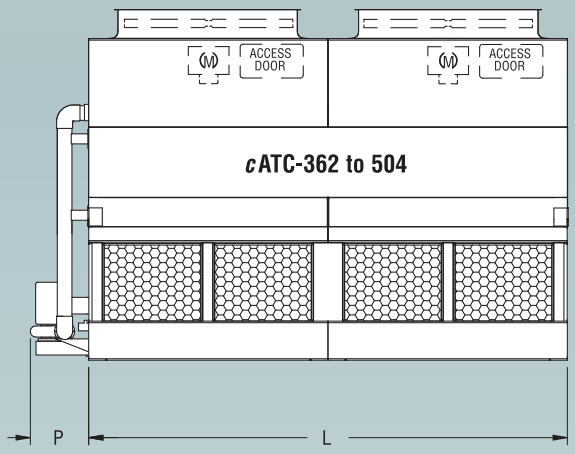


Table 1 Engineering Data

c-ATC Model No.*	R-717 Tons*	Fans		Weights			Refrigerant Operating Charge lbs.***	Coil Volume ft³	Spray Pump		Remote Sump			Dimensions					
		HP	CFM	Shipping	Operating	Heaviest Section†			HP	GPM	Gallons Req'd**	Conn. Size	Operating Weight	Height H	Upper U	Lower E	Coil A	Length L	Pump P
cATC-181	128	7.5	35,830	7,530	9,130	5,930	145	19	2	410	120	8"	7,960	11' 2-3/4"	6' 10-7/8"	4' 3-7/8"	19-1/2"	8' 11-3/8"	22-1/8"
cATC-193	137	10	39,290	7,540	9,140	5,940	145	19	2	410	120	8"	7,970	11' 2-3/4"	6' 10-7/8"	4' 3-7/8"	19-1/2"	8' 11-3/8"	22-1/8"
cATC-208	148	10	38,140	8,570	10,250	6,970	185	25	2	410	120	8"	9,080	11' 10-1/4"	7' 6-3/8"	4' 3-7/8"	27"	8' 11-3/8"	22-1/8"
cATC-225	160	15	42,730	8,700	10,380	7,100	185	25	2	410	120	8"	9,210	11' 10-1/4"	7' 6-3/8"	4' 3-7/8"	27"	8' 11-3/8"	22-1/8"
cATC-220	156	10	37,000	9,660	11,420	8,060	230	31	2	410	120	8"	10,250	12' 5-3/4"	8' 1-7/8"	4' 3-7/8"	34-1/2"	8' 11-3/8"	22-1/8"
cATC-241	171	15	41,450	9,790	11,550	8,190	230	31	2	410	120	8"	10,380	12' 5-3/4"	8' 1-7/8"	4' 3-7/8"	34-1/2"	8' 11-3/8"	22-1/8"
cATC-251	178	15	40,170	10,860	12,700	9,260	270	37	2	410	120	8"	11,530	13' 1-1/4"	8' 9-3/8"	4' 3-7/8"	42"	8' 11-3/8"	22-1/8"
cATC-264	187	15	54,270	9,280	11,550	7,350	185	25	3	550	155	10"	9,940	11' 2-3/4"	6' 10-7/8"	4' 3-7/8"	19-1/2"	11' 11-5/8"	24-7/8"
cATC-282	200	15	52,690	10,690	13,070	8,760	245	33	3	550	155	10"	11,460	11' 10-1/4"	7' 6-3/8"	4' 3-7/8"	27"	11' 11-5/8"	24-7/8"
cATC-304	216	15	51,110	12,060	14,550	10,130	305	41	3	550	155	10"	12,940	12' 5-3/4"	8' 1-7/8"	4' 3-7/8"	34-1/2"	11' 11-5/8"	24-7/8"
cATC-316	224	20	55,390	12,120	14,610	10,190	305	41	3	550	155	10"	13,000	12' 5-3/4"	8' 1-7/8"	4' 3-7/8"	34-1/2"	11' 11-5/8"	24-7/8"
cATC-338	240	20	53,680	13,550	16,150	11,620	360	49	3	550	155	10"	14,540	13' 1-1/4"	8' 9-3/8"	4' 3-7/8"	42"	11' 11-5/8"	24-7/8"
cATC-329	233	15	57,120	13,880	16,720	11,650	350	48	3	600	185	10"	14,910	12' 10-1/8"	8' 1-7/8"	4' 8-1/4"	34-1/2"	13' 11-5/8"	24-1/4"
cATC-351	249	20	61,910	13,940	16,780	11,710	350	48	3	600	185	10"	14,970	12' 10-1/8"	8' 1-7/8"	4' 8-1/4"	34-1/2"	13' 11-5/8"	24-1/4"
cATC-367	260	20	60,000	15,580	18,550	13,350	420	57	3	600	185	10"	16,740	13' 5-5/8"	8' 9-3/8"	4' 8-1/4"	42"	13' 11-5/8"	24-1/4"
cATC-373	265	25	63,860	15,610	18,580	13,380	420	57	3	600	185	10"	16,770	13' 5-5/8"	8' 9-3/8"	4' 8-1/4"	42"	13' 11-5/8"	24-1/4"
cATC-362	257	(2)7.5	71,910	13,980	17,470	10,910	275	37	5	800	235	12"	15,090	11' 11"	6' 10-7/8"	5' 1/8"	19-1/2"	17' 11-7/8"	26-3/8"
cATC-387	274	(2)10	78,880	14,010	17,500	10,940	275	37	5	800	235	12"	15,120	11' 11"	6' 10-7/8"	5' 1/8"	19-1/2"	17' 11-7/8"	26-3/8"
cATC-415	294	(2)10	76,580	16,110	19,770	13,040	365	49	5	800	235	12"	17,390	12' 6-1/2"	7' 6-3/8"	5' 1/8"	27"	17' 11-7/8"	26-3/8"
cATC-453	321	(2)15	85,790	16,360	20,020	13,290	365	49	5	800	235	12"	17,640	12' 6-1/2"	7' 6-3/8"	5' 1/8"	27"	17' 11-7/8"	26-3/8"
cATC-442	313	(2)10	74,280	18,220	22,050	15,150	450	61	5	800	235	12"	19,670	13' 2"	8' 1-7/8"	5' 1/8"	34-1/2"	17' 11-7/8"	26-3/8"
cATC-482	342	(2)15	83,210	18,470	22,300	15,400	450	61	5	800	235	12"	19,920	13' 2"	8' 1-7/8"	5' 1/8"	34-1/2"	17' 11-7/8"	26-3/8"
cATC-462	328	(2)10	71,980	20,380	24,370	17,310	535	73	5	800	235	12"	21,990	13' 9-1/2"	8' 9-3/8"	5' 1/8"	42"	17' 11-7/8"	26-3/8"
cATC-504	357	(2)15	80,640	20,630	24,620	17,560	535	73	5	800	235	12"	22,240	13' 9-1/2"	8' 9-3/8"	5' 1/8"	42"	17' 11-7/8"	26-3/8"

* Tons at standard conditions: HCFC-22 and HFC-134a. 105°F condensing, 40°F suction and 78°F W.B.; ammonia 96.3°F condensing, 20°F suction and 78°F W.B.

** Gallons shown is water in suspension in unit and piping. Allow for additional water in bottom of remote sump to cover pump suction and strainer during operation. (12" would normally be sufficient.)

*** Refrigerant charge is shown for R-717. Multiply by 1.93 for R-22 and 1.98 for R-134a.

† Heaviest section is the coil section.

†† Pump base ships loose on models cATC-264 to 338.

Dimensions are subject to change. Do not use for pre-fabrication.

cATC Evaporative Condenser Specification

Furnish and install as shown on the plans an EVAPCO Model _____ induced draft counterflow evaporative condenser with a condensing capacity of _____ BTUH (kW) operating with a _____ refrigerant at _____ °F (°C) condensing temperature with a _____ °F (°C) entering wet bulb temperature.

Basin and Casing

The basin and casing shall be constructed of heavy gauge mill hot-dip galvanized steel (G-235 in U.S.A. and Asia, Z-725 in Europe) 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 (kW) totally enclosed fan cooled motors shall be furnished suitable for outdoor service on _____ volts, _____ hertz, and _____ phase. Motor(s) shall be mounted on an adjustable base, which is accessible from the outside of the unit for service. A swing away protective cover shall shield the motor and sheave from the weather.

Drive

The fan drive shall be multigroove, solid back V-belt type with taper lock sheaves 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 sheave shall be aluminum alloy construction. The fans and the 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 exterior of the unit. Bearing lube lines shall be extended to the exterior of the unit for easy maintenance.

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. Materials shall be stainless steel balls with chrome steel races and zinc plated housing for corrosion resistance. 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 vertically at the factory to allow free drainage on shut down. _____ horsepower (kW) totally enclosed motor(s) shall be furnished suitable for outdoor service on _____ volts, _____ hertz, and _____ phase.

Heat Transfer Coil

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 (2.69 MPa), under water.

Water Distribution System

The spray header shall be constructed of schedule 40 polyvinyl chloride pipe for corrosion resistance. All spray branches shall be removable for cleaning. The water shall be distributed over the entire coil surface by heavy-duty, ABS spray nozzles with large 1-1/4" (32mm) diameter opening and internal sludge ring to eliminate clogging. Nozzles shall be threaded into spray header to provide easy removal for maintenance.

Eliminators

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 0.001% of the circulating water rate.

Louvers

The louvers shall be constructed from polyvinyl chloride (PVC). The louvers shall be mounted in easily removable frames for access to the pan for maintenance. The louvers shall have a minimum of two changes in air direction to prevent splash out and block direct sunlight.

Finish

All basin and casing materials shall be constructed of heavy gauge mill hot-dip galvanized steel (G-235 in U.S.A. and Asia, Z-725 in Europe). During fabrication, all panel edges shall be coated with a 95% pure zinc-rich compound for superior protection against corrosion.

Notes:

Innovation, Performance, Experience

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