

# Open Cooling Towers

Open cooling towers provide evaporative cooling for many types of systems, and the specific application will largely determine which BAC Cooling Tower is best suited for a project. The table on page D5 is intended as a general guide. Specialized assistance is available through your local BAC Representative.

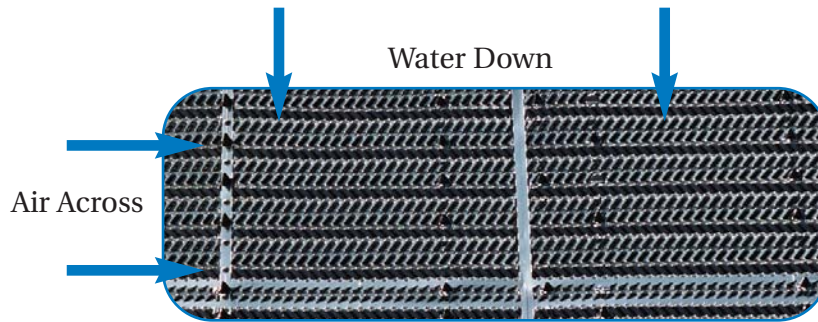
## Principle of Operation

Open cooling towers reject heat from water-cooled systems to the atmosphere. Hot water from the system enters the cooling tower and is distributed over the wet deck (heat transfer surface). Air is pulled or pushed through the wet deck, causing a small portion of the water to evaporate. Evaporation removes heat from the remaining water, which is collected in the cold water basin and returned to the system to absorb more heat.

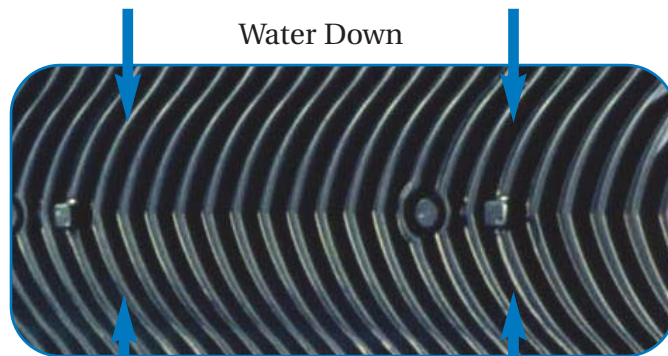
Each open cooling tower line, although operating under the same basic principle of operation, is arranged a little differently. See the schematics on page D5 for product specific details.

## Configuration

There are two main configurations of factory assembled open cooling towers: crossflow and counterflow. In crossflow cooling towers, the water flows vertically down the wet deck as air flows horizontally across it. In counterflow cooling towers, the water flows vertically down the wet deck as air flows vertically up it.



Crossflow Configuration



Counterflow Configuration



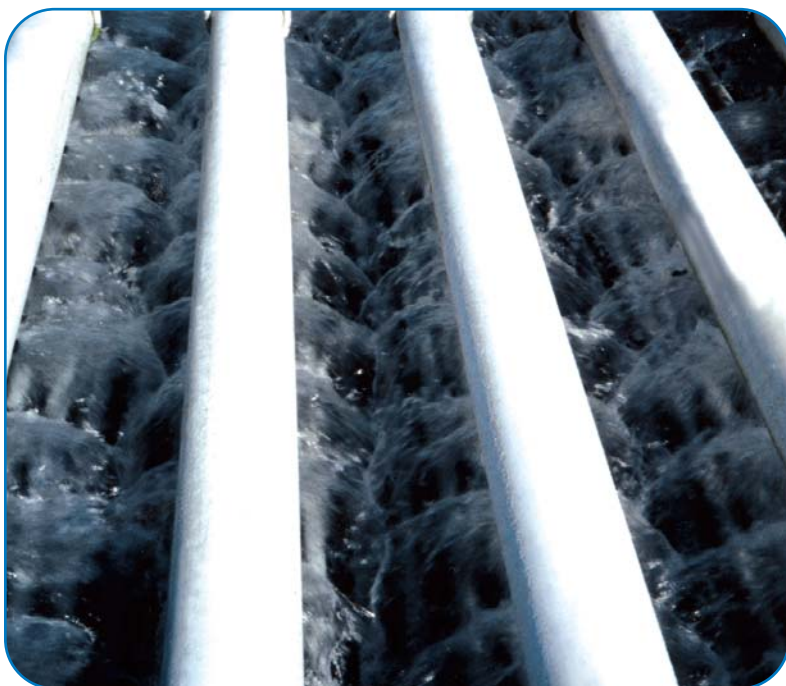


Gravity Distribution Basin

## Water Distribution System

Open cooling towers employ either gravity distribution or pressurized spray systems to distribute water over the wet deck surface. Gravity distribution systems, employed on BAC's crossflow cooling towers, feature hot water basins mounted on top of the tower above the wet deck. A series of metering orifices in the floor of each hot water basin distribute the water as a function of the depth of the water in the basin. Gravity distribution systems generally require minimal pump head, can be inspected while the unit is in operation and are easy to access for routine maintenance and service.

Spray distribution systems, employed on counterflow cooling towers, feature a series of pipes fitted with spray nozzles mounted inside the tower above the wet deck. These systems typically require 2-7 psi of water pressure at the water inlet and require the unit to be out of service for inspection and maintenance.



Spray Distribution

## Fan System

The flow of air through most factory assembled cooling towers is provided by one or more mechanically driven fans. The fan(s) may be axial or centrifugal, each type having its own distinct advantages.

Axial fan units require approximately half the fan motor horsepower of comparably sized centrifugal fan units, offering significant lifecycle cost savings.

Centrifugal fan units are capable of overcoming reasonable amounts of external static pressure ( 0.5"), making them suitable for both indoor and outdoor installations. Centrifugal fans are also inherently quieter than axial fans, although the difference is minimal and can often be overcome through the application of optional low sound fans and/or sound attenuation on axial fan units.



Centrifugal Fan



Axial Fan

### Induced Draft

The rotating air handling components of induced draft equipment are mounted in the top deck of the unit, minimizing the impact of fan noise on nearby neighbors and providing maximum protection from fan icing with units operating in sub-freezing conditions. The use of corrosion resistant materials ensures long life and minimizes maintenance requirements for the air handling components.

### Forced Draft

Rotating air handling components are located on the air inlet face at the base of forced draft towers, facilitating easy access for routine maintenance and service. Additionally, location of these components in the dry entering air stream extends component life by isolating them from the corrosive saturated discharge air.



## Capacity Range

In the following table, product capacities are called out in terms of nominal tons and a flow range at 95°F/85°F/78°F. A nominal cooling tower ton is defined as the capability to cool 3 gpm of water from a 95°F (35.0°C) entering water temperature to an 85°F (29.4°C) leaving water temperature at a 78°F (25.6°C) entering wet-bulb temperature. Nominal conditions are typical of conventional HVAC designs in most parts of the country, but will not apply to all projects. BAC offers selection software to evaluate the performance of a tower at any conditions; see page J6 for details.

All capacities shown are for a single cell; multiple cell units can be applied to achieve larger capacities.

## Maximum Entering Water Temperature

As previously stated, typical HVAC conditions call for an entering water temperature of approximately 95°F (35°C). All BAC Cooling Towers are capable of withstanding temperatures of at least 120°F (49°C) with standard fill materials. For applications where the entering water temperature exceeds 120°F (49°C), check the following table to determine whether alternate fill materials are available for your project.

## Typical Applications

A list of typical applications is provided on page D5 for your reference.



*...because temperature matters*



# Open Circuit Cooling Towers

## Product Lines

### Overview

	Series 3000	Series 1500	FXT
<b>Principle of Operation</b>			
<b>Configuration</b>	Crossflow	Crossflow	Crossflow
<b>Water Distribution</b>	Gravity	Gravity	Gravity
<b>Fan System</b>	Axial Fan, Induced Draft	Axial Fan, Induced Draft	Axial Fan, Forced Draft
<b>Capacity Range (Single Cell)</b>	220 – 1,350 Nominal Tons 660 – 4,050 gpm at 95°F/85°F/78°F	128 – 425 Nominal Tons 384 – 1,275 gpm at 95°F/85°F/78°F	6 – 268 Nominal Tons 18 - 804 gpm at 95°F/85°F/78°F
<b>Maximum Entering Water Temperature</b>	130°F (54.4°C) Std Fill; 135°F (57.2°C) w/Alternate Fill Material	120°F (48.9°C) Std Fill; 135°F (57.2°C) w/Alternate Fill Material	125°F (51.7°C) Std Fill; 140°F (60.0°C) w/Alternate Fill Material
<b>Typical Applications</b>	Medium to large HVAC & industrial applications  Replacement of field erected towers w/basinless units	Medium HVAC & industrial applications  Counterflow unit replacements  Crossflow unit replacements  Tight enclosures & installations requiring a single air inlet	Small HVAC & industrial applications





Open Cooling Towers

Series V		
VTL	VTO	VT1
Counterflow	Counterflow	Counterflow
Pressurized	Pressurized	Pressurized
Centrifugal Fan, Forced Draft	Centrifugal Fan, Forced Draft	Centrifugal Fan, Forced Draft
16 – 272 Nominal Tons 48 - 816 gpm at 95°F/85°F/78°F	12 – 176 Nominal Tons 36 – 528 gpm at 95°F/85°F/78°F	134 – 1,335 Nominal Tons 402 – 4,005 gpm at 95°F/85°F/78°F
130°F (54.4°C) Std Fill; 170°F (76.7°C) w/Alternate Fill Materials	130°F (54.4°C) Std Fill; 170°F (76.7°C) w/Alternate Fill Materials	130°F (54.4°C) Std Fill; 170°F (76.7°C) w/Alternate Fill Materials
Small to medium HVAC & industrial applications  Installations w/extremely low height requirements  Indoor installations  High temperature industrial applications  Tight enclosures & installations requiring a single air inlet	Small HVAC & industrial applications  Indoor installations  High temperature industrial applications  Tight enclosures & installations requiring a single air inlet	Medium to large HVAC & industrial applications  Indoor installations  High temperature industrial applications  Tight enclosures & installations requiring a single air inlet

...because temperature matters





# University of Maryland

## Project Report

### Terrapins Play it *COOL* in the New Comcast Center!



November 24, 2002 marked the beginning of a new era for the University of Maryland's men's basketball team.

With a National Championship under their

belts from the previous year, the Terps were eager to repeat history, but there were a few details they wouldn't miss this time around. "Gone were the wooden seats and balmy temperatures," recalls Chris Stuchko, former Athletic Media Relations Associate for Maryland. Even with the record-setting crowd of 17,950 Terp basketball fans, the players ran out onto a cool and comfortable court, unlike what they were used to in the past at Cole Fieldhouse. The team would now enjoy playing in an air-conditioned arena, thanks to the construction of the Comcast Center located in the northeast edge of the College Park campus. Baltimore Aircoil Company is proud to have installed four of their Series 3000 Cooling Towers as part of the system cooling this innovative center.

The BAC Cooling Towers were shipped to the Comcast Center on September 24, 2001 and installed by the Poole & Kent Company, a contracting firm located in Baltimore, MD. Each of the four Cooling Towers are capable of producing 758 nominal tons of cooling, which is used in the enormous arena, an academic support and career center, locker rooms, administrative offices, a University of Maryland team shop, eateries, a gym used by 19 sports teams, weight rooms, and a wrestling room.

The BAC Series 3000 Cooling Towers are constructed from galvanized steel and FRP (fiberglass reinforced polyester) casing panels for increased life expectancy. Each tower is gear driven. In addition, all towers contain electric immersion heater elements to ensure that the basin water does not freeze, as well as heater controls, bottom equalizers, and one 50 hp motor each.

The EASY CONNECT® Piping Arrangement with BALANCE CLEAN® Chamber design incorporates a single bottom water inlet with a balancing chamber, ensuring that the water is evenly distributed to the nozzles and strainer. This arrangement allows for all maintenance of the hot water distribution system to be performed from the interior of the tower, rather than from the fan deck. Furthermore, this innovative option reduces installation and field maintenance costs, through the elimination of overhead piping.

All four Cooling Towers are CTI certified, as are all Series 3000 towers manufactured by BAC. The Cooling Technology Institute (CTI) is a nonprofit, self-governing, technical association dedicated to improving and standardizing measurements of evaporative cooling equipment. Simply stated, CTI certification assures the customer they get what they pay for.



**Baltimore Aircoil Company**