



ORGANICA
Sustainable Water

Water Used to Cool Buildings on Campus

Water based air conditioning (cooling towers and centralized chiller plants) is widely used across college and university campus'. Designed to reduce intensive energy consumption associated with dry cooling, water based air conditioning is far more efficient and cost effective for large buildings. However, while these systems manage to reduce energy consumption, they do so at the expense of substantial water consumption. Quite often this process is using potable water even though drinking water standards are not necessary to meet.

Operating Conditions		
Tower Water Flow	<input type="text" value="1000"/>	gpm
Hot Water Temperature	<input type="text" value="95.00"/>	°F
Cold Water Temperature	<input type="text" value="85.00"/>	°F
Wet Bulb Temperature	<input type="text" value="78.00"/>	°F
Drift Rate	<input type="text" value="0.005"/>	%
Concentrations	<input type="text" value="3"/>	
Water Usage		
Evaporation	<input type="text" value="10.35"/>	gpm
Drift	<input type="text" value="0.05"/>	gpm
Blow down	<input type="text" value="5.12"/>	gpm
Total Usage	<input type="text" value="15.52"/>	gpm

The exercise below is designed to demonstrate just how much water is required in a typical water based air conditioning process.

There are a number of factors that determine how much water is required to effectively air condition large buildings. An example of this complexity is provided in the screen capture to the left showing an online formula used to calculate cooling tower water usage. Assuming the following conditions are set in your cooling tower and it is operating 24 hours per day, how much total water is used by this system over the course of one day?

Hint: Look for total water usage by the system.



Something to think about...

The water usage calculated in the above exercise demonstrated water needs for air conditioning only one building. How many air conditioned buildings does your campus have? Now, how much water is your entire campus using for air conditioning? For comparison, think of the University of Notre Dame. This campus utilizes three centralized chiller plants to cool multiple buildings. One of these chillers has about 20,000 tons of refrigeration capacity (the cooling tower in the above problem has about 333 tons of refrigeration capacity). Using the same settings in the exercise above, the central chiller plant at Notre Dame has a total water usage of 931 gallons per minute (as opposed to 15.52). Think about how much water this is over the course of a year. What are the problems associated with this process? Is this sustainable?