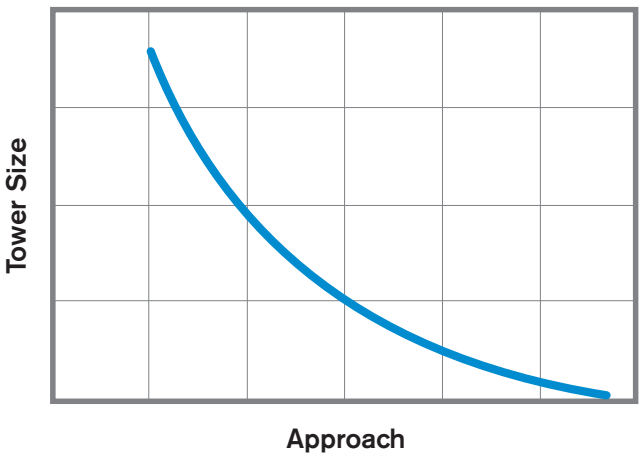
Understanding Less Than 5°F Approach

This paper will define approach temperature and how it affects cooling tower selection. Discussion will focus on industry minimum 5°F approach and implications of pushing below that boundary.

Definition and Overview of Approach

Approach is the difference between the leaving water temperature of the cooling tower and the wet-bulb temperature of the air entering the tower. Today, it is a common specification requirement for a package cooling tower to be certified under Cooling Technology Institute (CTI) Standard 201. Appendix B in CTI Standard 201 indicates the minimum approach for a certifiable condition to be 5°F (2.8°C). This industry minimum has been the consistent lower threshold for many years.



If the thermal operating conditions of a project call for an approach temperature below the 5°F (2.8°C) minimum, then the selection falls outside the CTI certification program. It is important to understand that although the thermal conditions do not meet the certification requirements, the tower model(s) themselves are considered CTI certified if listed as such in the manufacturer data of record found on the CTI website. It is also important to understand that as design approach temperature decreases, cooling tower size increases exponentially. This has budget, fan power and space constraint implications for the project.

UPDATE™ selection software

The UPDATE selection program for package tower applications allows a user to make a selection with approach temperatures of 3°F and higher (to a specific maximum). Tower selections that meet design conditions with less than a 5°F approach temperature display an icon next to the model number. By clicking on this icon, a window will pop up that states:

Messages

- This selection satisfies your design conditions.
- The performance for this selection is not guaranteed because the approach is less than 5°F.
- This selection is not CTI certified because the approach is less tan 5°F.

This message will show up on the tower data sheet as well. The tower is still capable of meeting the specified design conditions but under the governance of CTI Standard 201, the cooling tower manufacturer must state when thermal operating conditions fall outside the certification standard limits.

How does this affect testing?

CTI Code ATC-105 prescribes the method and requirements for conducting a performance test. When package towers are tested, they are tested per the procedures of ATC-105, but a 5% test tolerance is permitted per CTI STD-201. All precision performance test equipment has measurement variation and uncertainty. As approach temperature decreases, this inherent variation has a larger impact on overall performance. Another way to explain it is the tolerance becomes worth more in terms of performance percentage at small approach temperatures. Therefore a test tolerance greater than 5% is warranted in cases with approach temperature less than 5°F.

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