

Clarify that the efficiency values for cooling towers listed in Table 112-G of Title 24 apply to open cooling towers only and not to closed-circuit cooling towers. Modify the text of Title 24 as proposed below.

Current Text:

TABLE 112-G PERFORMANCE REQUIREMENTS FOR HEAT REJECTION EQUIPMENT

Equipment Type	Total System Heat Rejection Capacity at Rated Conditions	Subcategory or Rating Condition	Performance Required ^{a,b}	Test Procedure ^c
Propeller or Axial Fan Cooling Towers	All	95°F Entering Water 85°F Leaving Water 75 °F wb Outdoor Air	≥ 38.2 gpm/hp	CTI ATC-105 and CTI STD-201
Centrifugal Fan Cooling Towers	All	95°F Entering Water 85°F Leaving Water 75 °F wb Outdoor Air	≥ 20.0 gpm/hp	CTI ATC-105 and CTI STD-201
Air Cooled Condensers	All	125°F Condensing Temperature R22 Test Fluid 190°F Entering Gas Temperature 15°F Subcooling 95°F Entering Drybulb	≥ 176,000 Btu/h/hp	ARI 460
^a For purposes of this table, cooling tower performance is defined as the maximum flow rating of the tower divided by the fan nameplate rated motor power. ^b For purposes of this table air-cooled condenser performance is defined as the heat rejected from the refrigerant divided by the fan nameplate rated motor power. ^c Cooling towers shall be tested using the test procedures in CTI ATC-105. Performance of factory assembled cooling towers shall be either certified as base models as specified in CTI STD-201 or verified by testing in the field by a CTI approved testing agency. Factory assembled cooling towers with custom options added to a CTI certified base model for the purpose of safe maintenance or to reduce environmental or noise impact shall be rated at 90% of the CTI certified performance of the associated base model or at the manufacturer's stated performance, whichever is less. Base models of factory assembled cooling towers are cooling towers configured in exact accordance with the Data of Record submitted to CTI as specified by CTI STD-201. There are no certification requirements for field erected cooling towers.				

Specific text changes to Table 112-G above (changes and/or additions shown in red):

Row 1, Equipment Type:

Propeller or Axial Fan **Open** Cooling Towers

Row 2, Equipment Type:

Centrifugal **Open** Cooling Towers

Footnote a:

^a For purposes of this table, **open** cooling tower performance is defined as the maximum flow rating of the tower divided by the fan nameplate rated motor power.

Footnote c:

^c **Open c**ooling towers shall be tested using the test procedures in CTI ATC-105. Performance of factory assembled **open** cooling towers shall be either certified as base models as specified in CTI STD-201 or verified by testing in the field by a CTI approved testing agency. **Open f**actory assembled cooling towers with custom options added to a CTI certified base model for the purpose of safe maintenance or to reduce environmental or noise impact shall be rated at 90% of the CTI certified performance of the associated base model or at the manufacturer's stated performance, whichever is less. Base models of **open** factory assembled cooling towers are **open** cooling towers configured in exact accordance with the data of Record submitted to CTI as specified by CTI STD-201. There are no certification requirements for field erected cooling towers.

Add the following as footnote d:

^d The efficiencies for open cooling towers listed in Table 112-G are not applicable for closed-circuit cooling towers.

Consider adding the following definitions to Section 101 – Definitions and Rules of Construction for clarification:

COOLING TOWER, OPEN – An open, or direct contact, cooling tower exposes water directly to the cooling atmosphere, thereby transferring the source heat load from the water directly to the air by a combination of heat and mass transfer.

COOLING TOWER, CLOSED-CIRCUIT – A closed-circuit cooling tower utilizes indirect contact between a heated fluid, typically water or glycol, and the cooling atmosphere to transfer the source heat load indirectly to the air, essentially combining a heat exchanger and cooling tower into one relatively compact device.

Justification for Change:

On occasion, inspectors in the field will attempt to enforce the minimum efficiency standards for open cooling towers on closed circuit cooling tower installations. As closed circuit cooling towers combine the function of a cooling tower and heat exchanger in one unit, the efficiency standards developed for open cooling towers are not applicable. This change is necessary to resolve any confusion regarding the applicability of the current minimum efficiency levels for open cooling towers.

Unlike open cooling towers, closed circuit cooling towers typically have a spray pump integrated into the cooling tower. Additionally, the heat exchanger in the unit, typically a tube bundle or coil, has an internal fluid pressure drop. Both open and closed circuit cooling tower certified ratings cover the thermal performance of the unit at a specific temperature condition and fan horsepower. The certified ratings of closed circuit cooling towers also include the spray pump horsepower and tube bundle pressure drop of the unit (reference CTI STD-201).

A closed circuit cooling tower is similar to a cooling tower – heat exchanger combination. Both are used on closed systems such as heat pump loops. Note that liquid to liquid heat exchangers (such as plate and frame heat exchangers) can now be certified under ARI Standard 400 (http://www.ari.org/cert/program_llhx.html).

The cooling tower industry is currently working together through ASHRAE and CTI to recommend a format for efficiency standards with specific efficiency levels for closed circuit cooling towers. Note that at least five closed circuit cooling tower product lines from four different manufacturers are currently certified by the Cooling Technology Institute.

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