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Updates to Heat Rejection Equipment Requirements and References

Additional submitted attachment is included below.

Section 100.1 – Definitions and Rules of Construction

CTI Reference Update

CTI ATC-105 is the Cooling Technology Institute document titled "Acceptance Test Code for Water Cooling Towers," ~~2000~~ 2019 (CTI ATC-105-~~00~~ 19).

CTI ATC-105S ~~(11)~~ is the Cooling Technology Institute document titled "Acceptance Test Code for Closed-Circuit Cooling Towers," 2011 (CTI ATC-105-11).

CTI ATC-106 is the Cooling Technology Institute document titled "Acceptance Test Code for Mechanical Draft Evaporative Vapor Condensers", 2011 (CTI ATC-106 (11)).

CTI STD-201 is the Cooling Technology Institute document titled "Standard for Thermal Performance Certification of Evaporative Heat Rejection Equipment," ~~2015~~ 2019 (CTI STD-201-~~15~~ 19).

Section 100.1 – Definitions and Rules of Construction

OPEN CIRCUIT COOLING TOWER is an open, or direct contact, cooling tower which 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.

Section 110.2 – Mandatory requirements for Space-Conditioning Equipment

(e) **Open and Closed Circuit Cooling Towers.** All open and closed circuit cooling tower installations shall comply with the following:

1. Be equipped with Conductivity or Flow-based Controls that maximize cycles of concentration based on local water quality conditions. Controls shall automate system bleed and chemical feed based on conductivity, or in proportion to metered makeup volume, metered bleed volume, recirculating pump run time, or bleed time. Conductivity controllers shall be installed in accordance with manufacturer's specifications in order to maximize accuracy.
2. Documentation of Maximum Achievable Cycles of Concentration. Building owners shall document the maximum cycles of concentration based on local water supply as reported annually by the local water supplier, and using the calculator approved by the Energy Commission. The calculator is intended to determine maximum cycles based on a Langelier Saturation Index (LSI) of 2.5 or less. Building owner shall document maximum cycles of concentration on the mechanical compliance form which shall be reviewed and signed by the Professional Engineer (P.E.) of Record.
3. Be equipped with a Flow Meter with an analog output for flow either hardwired or available through a gateway on the makeup water line.
4. Be equipped with an Overflow Alarm to prevent overflow of the sump in case of makeup water valve failure. Overflow alarm shall send an audible signal or provide an alert via the Energy Management Control System to the tower operator in case of sump overflow.

5. Be equipped with Efficient Drift Eliminators that achieve drift reduction to 0.002 percent of the circulated water volume for counter-flow towers and 0.005 percent for cross-flow towers.

EXCEPTION to Section 110.2(e) 1 through 4: Open and closed-circuit cooling ~~T~~towers with rated capacity < 150 tons.

Reasoning: All cooling towers should be equipped with efficient drift eliminators, including those under 150 tons.

Please update the test and rating standards in the table for open and closed-circuit cooling towers as follows:

Table 110.2-G Performance Requirements for Heat Rejection Equipment

Propeller or axial fan Open-circuit cooling towers	All	95°F entering water 85°F leaving water 75°F entering air wb	≥ 42.1 gpm/hp
Centrifugal fan Open-circuit cooling towers	All	95°F entering water 85°F leaving water 75°F entering air wb	≥ 20.0 gpm/hp

The appropriate test and ratings references for the above are CTI-105 and CTI STD-201RS.

Propeller or axial fan closed-circuit cooling towers	All	102°F entering water 90°F leaving water 75°F entering air wb	≥ 16.1 gpm/hp
Centrifugal fan closed-circuit cooling towers	All	102°F entering water 90°F leaving water 75°F entering air wb	≥ 7.0 gpm/hp

The appropriate test and ratings references for the above are CTI-105S and STD-201RS.

Please update the test fluid and minimum efficiency for evaporative condensers as follows:

Propeller or axial fan evaporative condensers

R-~~507A~~ 448A test fluid 165°F entering gas temp 105°F condensing temp 75°F entering air wb	≥ ~~157,000~~ 160,000 Btu/h • hp

Centrifugal fan evaporative condensers

R-~~507A~~ 448A test fluid 165°F entering gas temp 105°F condensing temp 75°F entering air wb	≥ ~~135,000~~ 137,000 Btu/h • hp

Note there is no increase in stringency with the new refrigerant due to this change. Reference Standard 90.1 Table 6.8.1-7. Note also that there are no changes to the ammonia ratings.

Section 120.6 – Mandatory Requirements for Covered Processes

Exception 1 to Section 120.6(a)4C E.

E. The minimum condensing temperature setpoint shall be less than or equal to 70°F for systems utilizing air-cooled condensers, evaporative-cooled condensers, adiabatic condensers, gas coolers, air or water-cooled fluid coolers or cooling towers for heat rejection.

Alternate:

E. The minimum condensing temperature setpoint shall be less than or equal to 70°F for air-cooled condensers, evaporative-cooled condensers, adiabatic condensers, gas coolers, or systems utilizing air or water-cooled fluid coolers or cooling towers for heat rejection.

Reasoning: Water-cooled fluid coolers and cooling towers do not have a "condensing temperature" per se, but the system does.

Exception to Section 120.6(a)8 G.

G. The minimum condensing temperature setpoint shall be less than or equal to 60°F for systems utilizing air-cooled gas coolers, evaporative-cooled gas coolers, adiabatic gas coolers, air or water-cooled fluid coolers or cooling towers for heat rejection.

Alternate:

G. The minimum condensing temperature setpoint shall be less than or equal to 60°F for air-cooled gas coolers, evaporative-cooled gas coolers, adiabatic gas coolers, or systems utilizing air or water-cooled fluid coolers or cooling towers for heat rejection.

Reasoning: Water-cooled fluid coolers and cooling towers do not have a "condensing temperature" per se, but the system does.

5. Transcritical CO_2 Gas Coolers G.

G. The minimum condensing temperature setpoint shall be less than or equal to 60°F for systems utilizing air-cooled gas coolers, evaporative-cooled gas coolers, adiabatic gas coolers, air or water-cooled fluid coolers or cooling towers for heat rejection.

Alternate:

G. The minimum condensing temperature setpoint shall be less than or equal to 60°F for air-cooled gas coolers, evaporative-cooled gas coolers, adiabatic gas coolers, or systems utilizing air or water-cooled fluid coolers or cooling towers for heat rejection.

Reasoning: Water-cooled fluid coolers and cooling towers do not have a "condensing temperature" per se, but the system does.

Section 170.2 – Prescriptive Approach

F. Heat Rejection Systems. Heat rejection equipment used in comfort cooling systems such as air-cooled condensers, open cooling towers, closed-circuit cooling towers, and evaporative condensers shall include the following:
i. Fan Speed Control. Each fan powered by a motor of ~~7.5~~ 5 hp (~~5.6~~ 3.7 kW) or larger shall have the capability to operate that fan at 2/3 of full speed or less, and shall have controls that automatically change the fan speed to control the leaving fluid temperature or condensing temperature or pressure of the heat rejection device.
EXCEPTION 1 to Section 170.2(c)4Fi: Heat rejection devices included as an integral part of the equipment listed in TABLE 110.2-A through TABLE 110.2-I.
EXCEPTION 2 to Section 170.2(c)4Fi: Condenser fans serving multiple refrigerant circuits.
EXCEPTION 3 to Section 170.2(c)4Fi: Condenser fans serving flooded condensers.
~~**EXCEPTION 4 to Section 170.2(c)4Fi:** Up to one third of the fans on a condenser or tower with multiple fans where the lead fans comply with the speed control requirement.~~

Reasoning: Lowering the fan motor limit to 5 HP and removing the 4th exception was previously justified and implemented in Standard 90.1.

Appendix 1-A Standards and Documents Referenced in the Energy Code

CTI ATC-105-~~00~~ 19 Acceptance Test Code for Water Cooling Towers (~~2000~~ 2019)

CTI ATC 105S-11 Acceptance Test Code for Closed-Circuit Cooling Towers (2011)

CTI ATC 105DS-18 Acceptance Test Code for Dry Fluid Coolers (2018)

CTI ATC-106-11 Acceptance Test Code for Mechanical Draft Evaporative Vapor Condensers (2011)

CTI STD-201RS-~~15~~ 19 ~~Standard for the Certification of Water-Cooling Tower Thermal Performance~~ Performance Rating of Evaporative Heat Rejection Equipment (~~2015~~ 2019)

Available from:

Cooling Technology Institute

~~2611 FM 1960 West, Suite A101~~ 3845 Cypress Creek Parkway

Suite #420

Houston, Texas 77068-~~3730~~

https://www.coolingtechnology.org/

Reasoning: The above references are now all inclusive of the CTI standards and codes utilized in Title 24, along with the date of the latest edition. The CTI has also moved into new, larger offices and so the address needed to be updated.