INSTALLER and INSPECTOR QUICK-REFERENCE:
2025-NRCA-PRC-17-F
Air-Cooled and Adiabatic Gas Coolers and Gas Cooler Fan Motor Variable Speed Control

Purpose and Scope of the Test

The purpose of this test is to confirm proper operation of gas cooler control, including variable speed fan operation and variable setpoint control logic, which are both important elements of floating head pressure control, with the intent to operate with the lowest total system energy (considering both compressors and gas cooler fan power) through the course of the year.
Submit one Certificate of Acceptance for each system that must demonstrate compliance.

Test trigger

Newly installed fan-powered gas coolers on all newly installed transcritical CO_2 refrigeration systems for refrigerated warehouses that are greater than or equal to 3,000 square feet and refrigerated spaces with a sum total of 3,000 square feet or more that are served by the same refrigeration system shall meet the requirements of Section 120.6(a).
The field technician shall perform either the functional test outlined in NA7.20.1.1.2 or NA7.20.1.1.3 depending on the ambient conditions and resulting system operating mode at the time of the test. The construction inspection must be completed regardless of ambient conditions.
NOTE: Air-cooled gas coolers are prohibited in Climate Zones 9 through 15

Relevant Energy Code References and Required Compliance Documents

Title 24, Part 6 of the California Building Standards Code, Building Energy Efficiency Standards (Energy Code) sections 120.6(a)5B, 120.6(a)7G, 120.6(a)8, Table 120.6-C, 120.6(b)2C, 120.6(b)5, Table 120.6-E, 120.6(b)6; NA7.20.1.1; NRCC-PRC-E; NRCI-PRC-E.

Who Can Perform the Test

There are no restrictions. The test is typically performed by the startup technician responsible for programming the setpoints in the control system. Note that the contractor can complete the test, and ATTCP certification is not required for this test at this time.

Required Tools

Performance of this test will require measuring the ambient wet-bulb temperature, relative humidity, and condenser operating pressure. The instrumentation needed to perform the test may include, but is not limited to:

- A temperature sensor calibrated to +/- 0.7°F between -30°F and 200°F.
- A pressure sensor shall be calibrated to +/- 2.5 psi between 0 and 500 psig.

Estimated Time to Complete Test

Construction Inspection: 45 minutes.
Functional testing: 2 hours.

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Potential Issues and Cautions

Transcritical CO_2 refrigeration systems are unique in that they can operate in one of two modes: subcritical operation and supercritical operation. Subcritical operation generally occurs during periods where ambient conditions are below 75°F to 80°F, where high pressure CO_2 vapor will condense in the gas cooler and the refrigeration system will operate analogous to other mechanical refrigeration systems (rejecting heat at a constant pressure and temperature).

Supercritical operation generally occurs during periods where ambient conditions are above 75°F to 80°F, where the high-pressure CO_2 vapor will not condense (or partially condense) in the gas cooler, and pressure and temperature can vary semi-independently during the heat rejection process. Because these two modes of operation are based on ambient conditions, it may not be possible for the field technician to observe both subcritical and supercritical control strategies during a single acceptance test.

Inspection Enforcement

Design Requirements:

- Compressors for transcritical CO_2 refrigeration systems must be designed to operate at a minimum condensing temperature of 60°F or less.
    - Exception: Compressors with a design saturated suction temperature greater than or equal to 30°F must be designed to operate at a minimum condensing temperature of 70°F or less.
- New fan-powered gas coolers on all new transcritical CO_2 refrigeration systems shall conform to the following:
    - Design leaving gas temperature for air-cooled gas coolers shall be less than or equal to the design dry-bulb temperature plus 6°F.
        - Exception: Design leaving gas temperature for air-cooled gas coolers in Climate Zones 2, 4 and 8 shall be less than or equal to the design dry-bulb temperature plus 8°F.
    - Design leaving gas temperature for adiabatic gas coolers necessary to reject the design total heat of rejection of a refrigeration system assuming dry mode performance shall be less than or equal to the design dry-bulb temperature plus 15°F.

Acceptance Criteria

- Follow the Construction Inspection and Functional Testing instructions on 2025-CEC-NRCA-PRC-17-F.
- Complete and sign the 2025-CEC-NRCA-PRC-17-F for each system that must demonstrate compliance.