INSTALLER and INSPECTOR QUICK-REFERENCE: 2022-NRCA-PRC-16-F Adiabatic Condenser Fan Motor Variable Speed Controls

Purpose and Scope of the Test

Verify the proper operation of the adiabatic condensers to reject the design total heat of rejection of a refrigeration system assuming dry mode performance.

Test trigger

Newly Constructed Buildings: Applies to functional testing and verification of fan motor variable speed control for adiabatic condensers.
Condenser fan motor controls are required on any new adiabatic condensers installed on new refrigeration systems.

Exceptions:

- *Systems for which more than 20 percent of the total design load is for quick chilling, freezing or process refrigeration.*

Relevant Energy Code References and Required Compliance Documents

Title 24, Part 6 of the California Building Code, Building Energy Efficiency Standards (Energy Code) sections 120.6(a)4C, 120.6(a)7E; NA7.10.3.3; NRCC-PRC-E Table F.

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.

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: 1 hours (for one condenser)

Functional testing: 3 hours (for one condenser)

Potential Issues and Cautions

Coordinate test procedures with the refrigeration or controls contractor, or the facility supervisor for assistance with the manipulation of the control system.
To ensure proper overall system operation, make sure that the system pressure is not held at excessively low or high values for an extended period of time when varying the saturated condensing temperature (SCT) control setpoint. Avoid abrupt changes in pressure. Coordinate with facility operator or refrigeration contractor.

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Inspection Enforcement

- Verify that the minimum condensing temperature control setpoint is at or below 70°F.
- Verify that the master system controller saturated condensing temperature input is the temperature equivalent reading of the condenser pressure sensor.
- Verify all ambient dry bulb temperature sensors used by controller read accurately (or provide an appropriate offset) using temperature standard.
- Verify all temperature sensors used by the controller are mounted in a location that is not exposed to direct sunlight.
- Verify that all sensor readings used by the condenser controller convert or calculate to the correct conversion units (e.g., saturated pressure reading is correctly converted to appropriate saturated temperature, etc.).
- Verify that all fan motors are operational and rotating in the correct direction.
- Verify that all condenser fan speed controls are operational and connected to condenser fan motors serving a common condenser loop in unison.

Acceptance Criteria

- Verify that the condenser control value is operating in the variable setpoint control range (above the minimum SCT setpoint and below the maximum SCT setpoint).
- Observe control operation for at least 30 minutes to confirm stable control operation.
- Confirm current control system temperature difference (TD) setpoint, between ambient dry bulb temperature and refrigeration system saturated condensing temperature, matches the observed temperature difference. Do this for three setpoints.
- Change the minimum condensing temperature setpoint to a value greater than the current operating condensing temperature. Verify condenser fan controls modulate to decrease capacity; all condenser fans serving a common condenser loop modulate in unison; and condenser fan controls stabilize within 5 minutes.

The saturated condensing temperature necessary for adiabatic condensers 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 20°F for systems serving freezers.
- The design dry-bulb temperature plus 30°F for systems serving coolers.