STATE OF CALIFORNIA

ADIABATIC CONDENSERS AND CONDENSER FAN MOTOR VARIABLE SPEED CONTROL

CEC-NRCA-PRC-16-F (Revised 01/20) CALIFORNIA ENERGY COMMISSION

CERTIFICATE OF ACCEPTANCE		NRCA-PRC-16-F
Adiabatic Condensers and Condenser Fan Motor Variable Speed Control		(Page 1 of 3)
Project Name:	Enforcement Agency:	Permit Number:
Project Address:	City:	Zip Code:
System Name or Identification/Tag:	System Location or Area Served:	

Compliance Results: ◯ Complies ◯ Does Not Comply	Enforcement Agency Use: Checked by/Date

Intent:	This document is used to demonstrate compliance with acceptance requirements in §120.6(a)7 and Reference Nonresidential Appendix NA7.10.3.3 for adiabatic condensers and condenser fan motor variable speed control. Attach additional sets of pages 1 through 2, as required, for all systems that must be tested.

A. Construction Inspection

Building:	Floor:	Room/Area/Zone:	Control/System:

Prior to Functional Testing, verify and document all of the following

☐	a.	Verify the control system minimum Saturated Condensing Temperature (SCT) setpoint is at or below 70°F.
☐	b.	Verify the control system maximum SCT setpoint (if used) is at or near the system design SCT.
☐	c.	Verify accuracy of refrigerant pressure-temperature conversions and consistent use of either temperature or pressure for the controlled variable setpoint in the control system.
☐	d.	Verify the discharge pressure sensor (or condenser pressure if used) reads accurately, using a National Institute of Standards and Technology (NIST) traceable reference pressure gauge or meter. At the minimum, the discharge pressure sensor accuracy shall be verified at two different pressures within the typical operating range. Calibrate if needed. Replace if outside manufacturers recommended calibration range and retest.
☐	e.	Verify the ambient dry bulb temperature using a NIST traceable instrument, including verification of at least two different ambient readings. Calibrate if needed. Replace if outside manufacturer's recommended calibration range and retest.
☐	f.	Verify all ambient dry bulb temperature sensors are not mounted in direct sunlight or is provided within a suitable solar shield.
☐	g.	Verify that all sensor readings used by the condenser controller convert or calculate to the correct conversion units and are displayed at the controller (e.g., observed pressure reading is correctly converted to appropriate saturated temperature, etc.).
☐	h.	Verify that all fan motors are operational and rotating in the correct direction.
☐	i.	Verify that all condenser fan speed controls operate automatically in response to changes in both pressure (SCT) and ambient temperature.

Construction Inspection Compliance: ◯ Complies ◯ Does Not Comply

B. Functional Testing

Building:	Floor:	Room/Area/Zone:	Control/System:

The system cooling load must be sufficiently high, and ambient conditions sufficiently below design conditions, to operate with all condenser fans in operation and observe controls in average conditions. Be cognizant of weather conditions in scheduling testing and, if necessary and possible, arrange to artificially increase or decrease evaporator loads in order to perform the Functional Testing at typical system conditions. The functional test shall be performed in dry mode.

Step 1: Verify mechanical controls and other strategies will not affect tests.

☐	a.		Verify condenser pressure low-limit holdback and/or bypass regulating valves, if any, are set below the minimum SCT setpoint. Condenser pressure controls valves will cause fans to operate at 100% speed if they are not set below the minimum SCT value. In warm weather, this may require setting out of range, and deferring valve settings until cold weather allows valves to be adjusted.
☐	b.		Turn off any heat reclaim controls and any intermittent defrost pressure offset strategies that would affect condenser setpoint control.
☐	c.		Verify adiabatic mode switching setpoints. If necessary for test, temporarily change the adiabatic mode setpoint such that the condenser operates in dry mode. Verify that the adiabatic pads are completely dry before beginning tests.

Step 2: Operate in control range and verify.

☐	a.		Verify the condenser control value is operating in the variable setpoint control range, i.e. above the minimum SCT setpoint and below the maximum SCT setpoint.
		i.	If necessary, increase or decrease the system load.
		ii.	If necessary, during low load or low ambient conditions with system observed at the minimum SCT, temporarily adjust the minimum SCT to a lower value, if the refrigeration system design will allow, or increase the control TD to result in a higher control value.

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☐	b.	Observe control operation for at least 30 minutes to confirm stable control operation, as shown by condenser fan speed varying as compressor capacity changes, and not ranging from maximum to minimum fan speed or constant "hunting". If required, adjust control response setpoints to achieve stable operation. Since condenser control settings require fine-tuning over time, this is often accomplished using control system history or visual trends, showing one hourly and daily operation.
Step 3: Identify control Temperature Difference.		
☐	a.	Record the current outdoor ambient air dry bulb and refrigeration system condensing temperature/condensing pressure readings from the control system. Note whether discharge pressure or a dedicated condenser pressure sensor is used for condenser pressure control.
☐	b.	Document current head pressure control setpoints, including the Temperature Difference (TD) setpoint.
☐	c.	Calculate and record the actual observed TD, defined as the difference between the dry bulb temperature and the refrigeration system SCT.
☐	d.	Confirm agreement between the current control system TD setpont and the observed TD. If values are different, address and correct controls system methods.
Step 4: Test adjusted control Temperature Difference (Setpoint 1)		
☐	a.	Enter a smaller TD value into the control system sufficient enough to cause an observable response, such as 1 to 2 degrees smaller, but not small enough to cause the system to operate continuously at 100% fan speed. Record this value as TD Test Setpoint 1.
☐	b.	Observe change in control system operation which should include an increase in fan speed and a decrease in condensing temperature.
☐	c.	Allow time for the control system to achieve stable operation.
☐	d.	Document current head pressure control setpoints, including the TD setpoint.
☐	e.	Calculate and record the actual observed TD, defined as the difference between the wet bulb temperature and the refrigeration system SCT.
☐	f.	Confirm agreement between the current control system TD setpoint and the observed TD. If values are different, address and correct control system methods.
Step 5: Test adjusted control Temperature Difference (Setpoint 2)		
☐	a.	Enter a TD value into the control system that is different from TD Test Setpoint1, sufficient enough to cause an observable response. Record this value a TD Test Setpoint2
☐	b.	Observe change in control system operation which should include an increase in fan speed and a decrease in condensing temperature.
☐	c.	Allow time for the control system to achieve stable operation.
☐	d.	Record the current outdoor ambient dry bulb temperature.
☐	e.	Record the current refrigeration system condensing temperature/condensing pressure readings from the control system.
☐	f.	Document current head pressure control setpoints, including the TD setpoint.
☐	g.	Calculate and record the actual observed TD, defined as the difference between the dry bulb temperature and the refrigeration system SCT.
☐	h.	Confirm agreement between the current control system TD setpont and the observed TD. If values are different, address and correct control system methods.
Step 6: Document current minimum condensing temperature setpoint. Using the control system, change the minimum condensing temperature setpoint to a value greater than the current operating condensing temperature. Verify and document the following.		
☐	a.	Condenser fan controls modulate to decrease capacity.
☐	b.	All condenser fans serving common condenser loop modulate in unison.
☐	c.	Condenser fan controls stabilize within a 5 minute period.
Step 7: Restore controls.		
☐	a.	Using the control system, reset the system head pressure controls, fan motor controls and minimum condensing temperature control setpoint to original settings documented in Steps 3 and 6.
Step 8: Restore settings.		
☐	a.	Restore any heat reclaim, floating suction pressure, floating head pressure and defrost functionality. Reset the minimum condensing temperature setpoint to the value documented in Step 6
Functional Testing Compliance: ◯ Complies ◯ Does Not Comply		

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DOCUMENTATION AUTHOR'S DECLARATION STATEMENT

1. I certify that this Certificate of Acceptance documentation is accurate and complete.

Documentation Author Name:	Documentation Author Signature:
Documentation Author Company Name:	Date Signed:
Address:	ATT Certification Identification (If applicable):
City/State/Zip:	Phone:

FIELD TECHNICIAN'S DECLARATION STATEMENT

I certify the following under penalty of perjury, under the laws of the State of California:

1. The information provided on this Certificate of Acceptance is true and correct.
2. I am the person who performed the acceptance verification reported on this Certificate of Acceptance (Field Technician).
3. The construction or installation identified on this Certificate of Acceptance complies with the applicable acceptance requirements indicated in the plans and specifications approved by the enforcement agency, and conforms to the applicable acceptance requirements and procedures specified in Reference Nonresidential Appendix NA7.
4. I have confirmed that the Certificate(s) of Installation for the construction or installation identified on this Certificate of Acceptance has been completed and signed by the responsible builder/installer and has been posted or made available with the building permit(s) issued for the building.

Field Technician Name:	Field Technician Signature:	
Field Technician Company Name:	Position with Company (Title):	
Address:	ATT Certification Identification (if applicable):	
City/State/Zip:	Phone:	Date Signed:

RESPONSIBLE PERSON'S DECLARATION STATEMENT

I certify the following under penalty of perjury, under the laws of the State of California:

1. I am the Field Technician, or the Field Technician is acting on my behalf as my employee or my agent and I have reviewed the information provided on this Certificate of Acceptance.
2. I am eligible under Division 3 of the Business and Professions Code in the applicable classification to accept responsibility for the system design, construction or installation of features, materials, components, or manufactured devices for the scope of work identified on this Certificate of Acceptance and attest to the declarations in this statement (responsible acceptance person).
3. The information provided on this Certificate of Acceptance substantiates that the construction or installation identified on this Certificate of Acceptance complies with the acceptance requirements indicated in the plans and specifications approved by the enforcement agency, and conforms to the applicable acceptance requirements and procedures specified in Reference Nonresidential Appendix NA7.
4. I have confirmed that the Certificate(s) of Installation for the construction or installation identified on this Certificate of Acceptance has been completed and is posted or made available with the building permit(s) issued for the building.
5. I will ensure that a completed, signed copy of this Certificate of Acceptance shall be posted, or made available with the building permit(s) issued for the building, and made available to the enforcement agency for all applicable inspections. I understand that a signed copy of this Certificate of Acceptance is required to be included with the documentation the builder provides to the building owner at occupancy.

Responsible Acceptance Person Name:	Responsible Acceptance Person Signature:	
Responsible Acceptance Person Company Name:	Position with Company (Title):	
Address:	CSLB License:	
City/State/Zip:	Phone:	Date Signed: