Project Name and Address	**Authority Having Jurisdiction**
Name:	Enforcement Agency:
Address:	Permit Number:
City, Zip:	Permit Application Date:

Building:	Floor:	Room:	Control/tag:

☐ Construction inspection and functional testing comply ☐ Does not comply	Date Submitted to AHJ:

Intent:	The purpose of these tests 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. Reference NRCC-MCH-E for nonresidential (including nonresidential spaces in high-rise multifamily) building permits. Submit one Certificate of Acceptance for each system that must demonstrate compliance. Reference 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 *Note: transcritical CO2 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 75F to 80F, where high pressure CO2 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 75F to 80F, where the high-pressure CO2 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.* *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.*

Table A: Construction Inspection - Air-Cooled and Adiabatic Gas Coolers

Step	Entry	Item	Code Reference
1.0	☐ Pass ☐ Fail	Verify the control system gas cooler saturated condensing temperature (SCT) setpoint is at or below 60°F, or 70°F for systems with a design saturated suction temperature (SST) of greater than, or equal to 30°F.	NA7.20.1.1.1(a)
2.0	☐ Pass ☐ Fail	Verify accuracy of refrigerant pressure-temperature conversion and consistent use of either temperature or pressure for the controlled variable setpoint in the control system.	NA7.20.1.1.1(b)
3.0	☐ Pass ☐ Fail	Verify that the subcritical condensing temperature has an equivalent pressure.	NA7.20.1.1.1(b)1
4.0	☐ Pass ☐ Fail	Verify the gas cooler outlet temperature sensor reads accurately (Use at least two readings).	NA7.20.1.1.1(c)
5.0	☐ Pass ☐ Fail	Verify the discharge pressure sensor reads accurately (Use at least two readings).	NA7.20.1.1.1(d)
6.0	☐ Pass ☐ Fail	Verify the ambient dry bulb temperature sensor reads accurately (Use at least two readings).	NA7.20.1.1.1(e)
7.0	☐ Pass ☐ Fail	Verify the ambient dry bulb temperature sensor is not mounted in direct sunlight or is provided with a suitable solar shield.	NA7.20.1.1.1(f)
8.0	☐ Pass ☐ Fail	Verify that all sensor readings used by the gas cooler controller display correct values at the controller, as well as derived values.	NA7.20.1.1.1(g)
9.0	☐ Pass ☐ Fail	Verify that all fan motors are operational and rotating in the correct direction.	NA7.20.1.1.1(h)
10.0	☐ Pass ☐ Fail	Verify that gas cooler fan speed controls are operational and controlling all gas cooler fan motors in unison.	NA7.20.1.1.1(i)
11.0	☐ Pass ☐ Fail	Verify that all speed controls operate automatically in response to changes in pressure, gas cooler outlet temperature, and ambient dry bulb or precool air temperature.	NA7.20.1.1.1(j)
12.0	☐ Pass ☐ Fail	Verify the installation of the gas cooler holdback valve, which may be located near the inlet of the intermediate pressure vessel or near the outlet of the gas cooler.	NA7.20.1.1.1(k)
13.0	☐ Pass ☐ Fail	Check "Pass" if construction inspection **complies** with all requirements. Check "Fail" if construction inspection **does not comply** with all requirements.	N/A

Table B: Functional Testing - Gas Cooler (Option A: Control Range Operation)
Planning: The system cooling load must be sufficiently high, and ambient conditions sufficiently below the critical point, to operate subcritically with all gas cooler fans in operation and observe controls in average conditions. Account for weather conditions in scheduling testing by, if necessary, artificially increasing or decreasing evaporator loads in order to perform the Functional Testing at typical system conditions.

Step	Entry	Functional Test	Code Reference
1.0	☐ Complete ☐ N/A	Verify mechanical controls and other strategies will not affect tests.	NA7.20.1.1.2 Step 1
1.1	☐ Complete ☐ N/A	Turn off any heat reclaim controls and any intermittent defrost pressure offset strategies that would affect gas cooler setpoint control.	NA7.20.1.1.2 Step 1(a)
1.2	☐ Complete ☐ N/A	If testing an adiabatic gas cooler, adjust setpoints to ensure that the gas cooler stays in "dry" mode or "precool" mode consistently throughout test.	NA7.20.1.1.2 Step 1(b)
2.0	☐ Pass ☐ Fail	Operate in control range and verify stable control.	NA7.20.1.1.2 Step 2
2.1	☐ Pass ☐ Fail	Verify the gas cooler control value is operating in the variable setpoint control range, i.e. above the minimum SCT setpoint and below the maximum SCT setpoint (If necessary, increase or decrease system load and if system is observed at the minimum SCT, temporarily adjust the minimum SCT to a lower value, if the refrigeration system design will allow. The control temperature difference (TD) can also be increased to result in a higher control value.)	NA7.20.1.1.2 Step 2(a)
2.2	☐ Pass ☐ Fail	Observe control operation for at least 30 minutes to confirm stable control operation, as shown by gas cooler 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.	NA7.20.1.1.2 Step 2(b)
3.0	No Entry ☐ N/A	If applicable, identify control TD. Note: if controller uses another strategy for controlling gas cooler operation, enter "N/A".	NA7.20.1.1.2 Step 3
3.1	☐ Dry Bulb ☐ Precool	Record the current outdoor ambient dry bulb or precool air temperature. (°F)	NA7.20.1.1.2 Step 3(a)
3.2	☐ °F ☐ Psig	Record the current refrigeration system condensing temperature or condensing pressure readings from the control system. (°F or psig)	NA7.20.1.1.2 Step 3(a)
3.3	☐ Discharge ☐ Gas Cooler	Record whether discharge pressure or a dedicated gas cooler pressure sensor is used for gas cooler pressure control.	NA7.20.1.1.2 Step 3(a)

Step	Entry	Functional Test	Code Reference
3.4		Document current head pressure control setpoint. (psig)	NA7.20.1.1.2 Step 3(b)
3.5	☐ N/A	If applicable, document gas cooler TD setpoint (°F) or enter "N/A."	NA7.20.1.1.2 Step 3(b)
3.6		Calculate and record the actual observed TD, defined as the difference between the ambient dry bulb temperature or precool air temperature and the refrigeration system SCT. (°F)	NA7.20.1.1.2 Step 3(c)
3.7	☐ Pass ☐ Fail ☐ N/A	If applicable, confirm agreement between the current control system TD setpoint and the observed TD.	NA7.20.1.1.2 Step 3(d)
4.0	No Entry ☐ N/A	If applicable, test adjusted control TD.	NA7.20.1.1.2 Step 4
4.1		Enter a smaller TD value into the control system, sufficient to cause an observable response, such as 1-2 degrees smaller, but not small enough to cause system to operate continuously at 100% fan speed. Record this value as TD Test Setpoint 1. (°F)	NA7.20.1.1.2 Step 4(a)
4.2	☐ Pass ☐ Fail	Verify a change in control system operation which should include an increase in fan speed and a decrease in condensing temperature.	NA7.20.1.1.2 Step 4(b)
4.3	No Entry	Allow time for control system to achieve stable operation.	NA7.20.1.1.2 Step 4(c)
4.4		Document current head pressure control setpoint. (psig)	NA7.20.1.1.2 Step 4(d)
4.5	☐ N/A	If applicable, document current gas cooler TD setpoint (°F) or enter "N/A."	NA7.20.1.1.2 Step 4(d)
4.6		Calculate and record the actual observed TD, defined as the difference between the ambient dry bulb temperature or precool air temperature and the refrigeration system SCT. (°F)	NA7.20.1.1.2 Step 4(e)
4.7	☐ Pass ☐ Fail ☐ N/A	If applicable, verify that the current control system TD matches the observed TD.	NA7.20.1.1.2 Step 4(f)
4.8	☐ N/A	If applicable, enter a smaller TD value into the control system (°F), sufficient to cause an observable response, such as 1-2 degrees smaller, but not small enough to cause system to operate continuously at 100% fan speed. Record this value as TD Test Setpoint 2 or enter "N/A."	NA7.20.1.1.2 Step 4(g)
4.9	☐ Pass ☐ Fail	Verify a change in control system operation which should include an increase in fan speed and a decrease in condensing temperature.	NA7.20.1.1.2 Step 4(g)

Step	Entry	Functional Test	Code Reference
4.10	No Entry	Allow time for control system to achieve stable operation.	NA7.20.1.1.2 Step 4(g)
4.11		Document current head pressure control setpoint. (psig)	NA7.20.1.1.2 Step 4(g)
4.12	☐ N/A	If applicable, document current gas cooler TD setpoint (°F) or enter "N/A.".	NA7.20.1.1.2 Step 4(g)
4.13		Calculate and record the actual observed TD, defined as the difference between the ambient dry bulb temperature or precool air temperature and the refrigeration system SCT. (°F)	NA7.20.1.1.2 Step 4(g)
4.14	☐ Pass ☐ Fail ☐ N/A	If applicable, verify that the current control system TD matches the observed TD.	NA7.20.1.1.2 Step 4(g)
5.0	☐ Pass ☐ Fail	Verify that all fans operate in unison.	NA7.20.1.1.2 Step 5
6.0	No Entry	Restore setpoints.	NA7.20.1.1.2 Step 6
6.1	☐	Restore heat reclaim and defrost setpoints.	NA7.20.1.1.2 Step 6(a)
6.2	☐ Restored ☐ N/A	If applicable, restore the minimum condensing temperature setpoints.	NA7.20.1.1.2 Step 6(b)
6.3	☐ Restored ☐ N/A	If applicable, reset adiabatic mode controls to original values.	NA7.20.1.1.2 Step 6(c)
7.0	☐ Pass ☐ Fail	Check Pass if Functional Test Compliance Results complies.	N/A

Table C: Functional Testing - Gas Cooler (Option B: Supercritical Operation)

Planning: Ambient conditions must be sufficiently above the critical point to operate supercritically. Account for weather conditions in scheduling testing by, if necessary, artificially increasing or decreasing evaporator loads in order to perform the Functional Testing at typical system conditions.

Step	Entry	Functional Test	Code Reference
1.0	☐ Complete ☐ N/A	Verify mechanical controls and other strategies will not affect tests.	NA7.20.1.1.3 Step 1
1.1	☐ Complete ☐ N/A	Turn off any heat reclaim controls and any intermittent defrost pressure offset strategies that would affect gas cooler setpoint control.	NA7.20.1.1.3 Step 1(a)
1.2	☐ Complete ☐ N/A	If testing an adiabatic gas cooler, adjust setpoints to ensure that the gas cooler stays in "dry" mode or "precool" mode consistently throughout test.	NA7.20.1.1.3 Step 1(b)
2.0	☐ Pass ☐ Fail	Verify through controls screens that over a 30-minute period of supercritical operation, the gas cooler holdback valve modulates its opening in response to changes in ambient dry bulb or precool temperature.	NA7.20.1.1.3 Step 2
3.0	No Entry	Restore setpoints.	NA7.20.1.1.2 Step 3
3.1	☐ Restored ☐ N/A	Restore heat reclaim and defrost setpoints.	NA7.20.1.1.2 Step 3(a)
3.2	☐ Restored ☐ N/A	If applicable, reset adiabatic mode controls to original values.	NA7.20.1.1.2 Step 3(b)
4.0	☐ Pass ☐ Fail	Check Pass if Functional Test Compliance Results complies.	N/A

Declaration Statement	Signatory
Document Author I assert that this Certificate of Acceptance documentation is accurate and complete.	
Field Technician I assert the following under penalty of perjury, under the laws of the State of California: The information provided on this Certificate of Acceptance is true and correct. I am the person who performed the acceptance verification reported on this Certificate of Acceptance (Field Technician). 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. 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.	
Responsible Person I assert the following under penalty of perjury, under the laws of the State of California: 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. 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). 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. 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. I understand 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, and I will take the necessary steps to ensure this requirement is accomplished. 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, and I will take the necessary steps to ensure this requirement is accomplished.	