

STANDARD COMMISSIONING PROCEDURE FOR COMMERCIAL REFRIGERATION SYSTEMS

BUILDING NAME: _____ **APPLICATION #:** _____
BUILDING ADDRESS: _____

NAME & FIRM OF PERSON(S) DOING TEST: _____
DATE(S) OF TEST: _____

General Notes:

1. This is a generic test procedure for commercial refrigeration systems. Its main emphasis is on energy conserving features of these systems. If the complexity, configuration, or other aspects of a specific project require substitute tests or additional tests, explain on the comments sheets, and attach the additional test procedures and field data. Attach all relevant functional performance verification sheets, and always attach the final signed and dated procedure certification page.
2. In all test sections, circle or otherwise highlight any responses that indicate deficiencies (i.e. responses that don't meet the criteria for acceptance). Acceptance requires correction and retest of all deficiencies, as defined in each test section under "Criteria for Acceptance" or "Acceptance". Attach all retest data sheets. Complete the Deficiency Report Form for all deficiencies.
3. This Commissioning Procedure does not address fire and life safety, refrigerant leak monitoring, or basic equipment safety controls. It also does not address most of the inspections that are typically done during system startup by the refrigeration contractor.
4. To ensure that this Commissioning Procedure will not damage any equipment or affect any equipment warranties, have the equipment manufacturer's representative review any interventive test procedures prior to execution.

PRE-VERIFICATION INSPECTION:

This section is to be completed by the owner or refrigeration contractor prior to calling the Commissioning Agent to the site for testing.

Criteria for Acceptance: A "No" answer to any question in this section indicates that the refrigeration systems are not ready for further commissioning.

| INSPECTION ITEM | RESPONSE (add sheets as necessary to adequately describe) |
|--|--|
| 1. Are all refrigeration equipment, including compressors, condensers, cases, computer control system, etc. on site, operational, and adjusted to final condition? | |
| 2. Are all HVAC equipment, including heating and heat recovery coils, VFDs, etc. on site, operational, & adjusted to final condition? | |
| 3. Have all refrigerated display cases been fully stocked for at least 2 weeks? | |
| 4. | |

CONTACTS (Write name, firm, address, and phone number for each contact):

Store Manager, name: _____
 address _____
 phone _____

Refrigeration Contractor, name: _____ firm: _____
 address _____
 phone _____

Name of Pre-Verification Inspector: _____ Firm: _____
 Signature: _____ Date: _____

REFRIGERATION SYSTEMS, INSTALLED CHARACTERISTICS (From field inspection. Note under response if the feature as installed differs in any way from the design documents. If an item does not apply, write "NA" for not applicable.):

Criteria for Acceptance: Installed characteristics must be in accordance with submittals as approved by designer and/or owner.

| DESCRIPTION | RESPONSE (add sheets as necessary to adequately describe) |
|--|--|
| 1. Type of system (uneven parallel, singles, etc.) | |
| 2. Compressor type (recip, high efficiency recip, screw, scroll, etc.). Note if any compressors are equipped with variable frequency drives. | |
| 3. Number of racks / number of suction circuits. Identify each rack & suction circuit as low, medium, or high temperature. | |
| 4. Condenser type (air cooled, water cooled, evaporative) | |
| 5. If water cooled condenser, what is the water source (tower, well, etc.)? List the water-side equipment. | |
| 6. Is system equipped with computer controls? If so, state manufacturer, model, and systems controlled (refrigeration racks, cases, HVAC, lighting, etc.) | |
| 7. Are case anti-condensate heaters automatically controlled? What is the control method (store humidity, door temp, etc.)? | |
| 8. Is there heat recovery from the refrigeration compressors to the HVAC system? What is the backup heat source (e.g. gas, electricity)? | |
| 9. Is there heat recovery from the refrigeration compressors to the hot water system? What is the backup heat source (e.g. gas, electricity)? | |
| 10. Do the systems have floating head pressure control? Are the setpoints less than 80°F? If not, explain why. | |
| 11. Do the systems have floating suction pressure control? | |
| 12. Do rack and case models, capacities, configurations, etc. match the design R/S sheet? Describe any discrepancies. Attach copy of as-installed R/S sheet. | |
| 13. Are the case evaporator fans equipped with high efficiency motors? | |
| 14. Is there a maintenance log on site? | |
| 15. Will refrigeration system maintenance be by contract or by owner's staff? | |
| 16. | |

COMMENTS ON INSTALLED CHARACTERISTICS ITEMS (add more sheets as needed):

CONTROLS CALIBRATION:

Controls calibration tests: Perform the following calibration verifications by slowly adjusting the setpoint of each thermostat, humidistat, etc. until the controlled response begins (i.e. contact make or break). Note the setpoint when that occurs, and note the reading on a calibrated thermometer (or other instrument as required) held in close proximity. For sensors, compare the sensor input to the computer refrigeration control system (CRCS) to the field measurement. Check calibration on a sampling of case temperature sensors (approximately 25% of total number of cases), and comment if case temperatures are colder than necessary or warmer than advisable. Use the blank lines for other sensors and stats.

Criteria for Acceptance: If sensor or stat is out of calibration by more than ± 3 degrees F or 5% relative humidity, note that as a deficiency and report it for correction. Note additional acceptance criteria for case temperatures.

| UNIT # | | | | | | |
|--|--|--|--|--|--|--|
| 1. For anti-sweat heater control: Space humidity or dewpoint sensor, setpoint when controlled action occurs, or computer input signal | | | | | | |
| 2. Anti-sweat heater control: Space humidity or dewpoint, measured | | | | | | |
| 3. For HVAC humidity control: Space humidity or dewpoint sensor, setpoint when controlled action occurs, or computer input signal | | | | | | |
| 4. HVAC humidity control: Space humidity or dewpoint, measured | | | | | | |
| 5. Other, stpt @ make/brk or CRCS input (describe point tested): _____ | | | | | | |
| 6. Other, measured: | | | | | | |
| 7. Other, stpt @ make/brk or CRCS input (describe point tested): _____ | | | | | | |
| 8. Other, measured: | | | | | | |
| 9. Other, stpt @ make/brk or CRCS input (describe point tested): _____ | | | | | | |
| 10. Other, measured: | | | | | | |
| CASE # | | | | | | |
| 42. Case temperature sensor, input to control system (screen value) | | | | | | |
| 43. Case temperature, measured near sensor | | | | | | |
| 44. Is measured case temperature lower than required for product? Acceptance: No more than 10 F deg below minimum product requirement. ¹ | | | | | | |
| CASE # | | | | | | |
| 45. Case temperature sensor, input to control system (screen value) | | | | | | |
| 46. Case temperature, measured near sensor | | | | | | |
| 47. Is measured case temperature lower than required for product? Acceptance: No more than 10 F deg below minimum product requirement. ¹ | | | | | | |

¹ Minimum product requirements as defined in 1994 ASHRAE Refrigeration Handbook, Chapter 31, Table 1.

COMMENTS ON CONTROLS CALIBRATION ITEMS (add more sheets if needed):

| ITEM # | COMMENT |
|--------|---------|
| _____ | _____ |
| _____ | _____ |
| _____ | _____ |
| _____ | _____ |
| _____ | _____ |

Anti-Condensate Heater Control: Complete calibration tests #1 - 2 prior to completing this section. Perform the following tests by monitoring and /or observing the anti-condensate heaters under actual operation. CRCS trend logs of CRCS output signals are not acceptable as proof of operation, unless you have first verified and documented that the output signals accurately represent actual operation. If attached data and graphs sufficiently prove proper operation of the anti-condensate heater controls, it is not necessary to fill in the following table.

Criteria for Acceptance: As noted under specific test items.

| CASE LINE-UP NAME OR # | | | | | | |
|---|---|---|---|---|---|---|
| 1. Any symptoms of inadequate heater operation (sweating mullions, fogged glass, etc.)? Acceptance: "No" | | | | | | |
| 2. If heater control is by single setpoint, record the humidity or dewpoint setpoint. If control is by proportional cycling, skip to item # 6. | | | | | | |
| 3. Record actual space humidity or dewpoint in the vicinity of the sensor. | | | | | | |
| 4. Change setpoint to 2% RH (or 2 F deg dewpt) below the measured space condition. Are the heaters on? Acceptance: "Yes" | | | | | | |
| 5. Change setpoint to 2% RH (or 2 F deg) above the measured space condition. Are the heaters off? Acceptance: "Yes" | | | | | | |
| 6. If heater control is by cycling on a reset schedule, record programmed upper setpoint (%RH or deg F dewpoint), and % "ON" cycle. | / | / | / | / | / | / |
| 7. Record programmed lower setpoint (%RH or deg F dewpoint), and % "ON" cycle. | / | / | / | / | / | / |
| 8. Measure rel. humidity (or dewpt) near sensor | | | | | | |
| 9. Record CRCS output signal to heaters at time coincident to #8 (% "ON" cycle). | | | | | | |
| 10. Monitor 2 heater circuits and attach graph, or observe with multimeter whether heaters appear to cycle at same % as #9 (% "ON" cycle). Acceptance: Graph or other quantitative evidence of proper cycling over at least 50% of control range. | | | | | | |

Anti-Condensate Heater Control, if other than one of the 2 strategies in the table above:

Criteria for Acceptance: The actual control sequence must be in accordance with submittals as approved by the Designer. Acceptance is based on thorough documented verification of each control mode.

Describe the control sequence if other than one of the two strategies in the table above:

Describe the tests that were done to verify the control sequence:

Conclusions:

Building Name: _____

Heat Recovery Performance Tests, contd.

| SYSTEM DESCRIPTION / # | | | |
|--|---|---|---|
| HVAC SYSTEM HEAT RECOVERY | | | |
| Stage 1, measured values | | | |
| 1. Air temperature entering / leaving | / | / | / |
| 2. If supply fan is driven by a VFD, record % speed | | | |
| 3. Hot gas temp entering / leaving | / | / | / |
| 4. Refrigerant head pressure | | | |
| 5. Condensing temperature | | | |
| 6. Acceptance: The answers to the previous 5 test items must be consistent with efficient heat recovery from compressor discharge gas. | | | |
| Stage 2, measured values (if applicable) | | | |
| 7. Air temperature entering / leaving | / | / | / |
| 8. If supply fan is driven by a VFD, record % speed | | | |
| 9. Hot gas temp entering / leaving | / | / | / |
| 10. Refrigerant head pressure | | | |
| 11. Condensing temperature | | | |
| 12. Increase the supply air temperature setpoint by 10 F deg. Does the backup heat source come on? Was it on prior to the setpoint change, when it should have been locked out? | | | |
| 13. Is the minimum head pressure setpoint automatically raised when HVAC heat recovery is called for? Acceptance: If the backup heat source is gas, the minimum head pressure setpoint may not be automatically raised when HVAC heat recovery is called for. | | | |
| 14. Acceptance: The answers to the previous 7 test items must be consistent with efficient heat recovery from compressor discharge gas. | | | |

COMMENTS ON HVAC HEAT RECOVERY TEST ITEMS (add more sheets if needed):

ITEM # COMMENT

| | |
|-------|-------|
| _____ | _____ |
| _____ | _____ |
| _____ | _____ |
| _____ | _____ |
| _____ | _____ |
| _____ | _____ |
| _____ | _____ |
| _____ | _____ |
| _____ | _____ |
| _____ | _____ |

Building Name: _____

I certify that the data and test results as recorded herein are accurate.

Signature, Commissioning Agent

Date

Firm Name

(Area Code) Phone Number

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