

## ***Nonresidential Appendix NA7 – 2008***

# **Appendix NA7-2008 – Acceptance Requirements for Nonresidential Buildings**

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### ***NA7.1 Purpose and Scope***

This appendix defines acceptance procedures that must be completed on certain controls and equipment before the installation is deemed to be in compliance with the Standards. These requirements apply to all newly installed equipment for which there are acceptance requirements in new and existing buildings. The procedures apply to nonresidential, high-rise residential and hotel/motel buildings as defined by the California Energy Commission's Energy Efficiency Standards for Nonresidential Buildings.

The purpose of the acceptance tests is to assure:

1. The presence of equipment or building components according to the specifications in the compliance documents.
2. Installation quality and proper functioning of the controls and equipment to meet the intent of the design and the Standards.

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### ***NA7.2 Introduction***

Acceptance requirements are defined as implementation of targeted inspection checks and functional and performance testing to determine whether specific building components, equipment, systems, and interfaces between systems conform to the criteria set forth in the Standards and to related construction documents (plans or specifications). Acceptance requirements improve code compliance effectiveness and help meet the expected level of performance.

Prior to signing a Certificate of Acceptance the installing contractor, engineer of record or owners agent shall be responsible for reviewing the plans and specifications to assure they conform to the acceptance requirements. Persons eligible to sign the Certificate of Acceptance are those responsible for its preparation; and licensed in the State of California as a civil engineer, mechanical engineer, licensed architect or a licensed contractor performing the applicable work or a person managing work on a structure or type of work described pursuant to Business and Professions Code sections 5537, 5538, and 6737.1.

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### ***NA7.3 Responsible Party***

The installing responsible party shall certify compliance with the acceptance requirements. They shall be responsible for performing data analysis, calculation of performance indices, and crosschecking results with the requirements of the Standard. They shall be responsible for issuing a Certificate of Acceptance as well as copies of all measurement and monitoring results for individual test procedures to the enforcement agency. The enforcement agency shall not release a final Certificate of Occupancy until a Certificate of Acceptance, and all applicable acceptance requirements for code compliance forms, are approved and submitted by the responsible party. A responsible party who is licensed shall record their State of California contractor's license number or their State of California professional registration license number on each Certificate of Acceptance that they issue.

2. Force the time to be between 9:00 p.m. and 9:00 a.m. and simulate a partial or no charge of the tank and simulate no cooling load by setting the indoor temperature set point higher than the ambient temperature. Verify that the TES system starts charging (storing energy).
3. Force the time to be between 6:00 p.m. and 9:00 p.m. and simulate a partial charge on the tank and simulate a cooling load by setting the indoor temperature set point lower than the ambient temperature. Verify that the TES system starts discharging.
4. Force the time to be between noon and 6:00 p.m. and simulate a cooling load by lowering the indoor air temperature set point below the ambient temperature. Verify that the tank starts discharging and the compressor is off.
5. Force the time to be between 9:00 a.m. to noon, and simulate a cooling load by lowering the indoor air temperature set point below the ambient temperature. Verify that the tank does not discharge and the cooling load is met by the compressor only.
6. Force the time to be between 9:00 p.m. and 9:00 a.m. and simulate a full tank charge by changing the sensor that indicates tank capacity to the Energy Management System so that it indicates a full tank capacity. Verify that the tank charging is stopped.
7. Force the time to be between noon and 6:00 p.m. and simulate no cooling load by setting the indoor temperature set point above the ambient temperature. Verify that the tank does not discharge and the compressor is off.

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## **NA7.6 Indoor Lighting Control Systems**

Lighting control testing is performed on:

- Manual daylighting controls.
- Automatic daylighting controls.
- Occupancy sensors.
- Automatic time-switch control.

### **NA7.6.1 Automatic Daylighting Controls Acceptance**

#### **NA7.6.1.1 Construction Inspection**

Prior to Functional testing, verify and document the following:

- All control devices (photocontrols) have been properly located, field-calibrated and set for appropriate set points and threshold light levels.
- Installer has provided documentation of setpoints, setting and programming for each device.
- Luminaires located in primary or secondary sidelit zone(s) or in skylit area(s) are controlled separately from non-daylit areas. Compare location of daylighting controlled luminaires against description of sidelit and skylit zones on the building plans.
- Luminaires located in primary or secondary sidelit zone(s) are controlled separately from skylit area(s)
- The location where calibration adjustments are made is remote from photosensor.
- In spaces with ceiling heights greater than 11 feet, the location where calibration adjustments are made is readily accessible to authorized personnel.

### NA7.6.1.2 Functional testing

All photocontrols serving more than 5,000 square feet of daylit area shall undergo functional testing. Photocontrols that are serving smaller spaces may be sampled as follows:

For buildings with up to five (5) photocontrols, all photocontrols shall be tested. For buildings with more than five (5) photocontrols, sampling may be done on spaces with similar sensors and cardinal orientations of glazing. If the first photocontrol in the sample group passes the functional test, the remaining building spaces in the sample group also pass. If the first photocontrol in the sample group fails the functional test, the rest of the photocontrols in the group shall be tested. If any tested photocontrol fails the functional test, it shall be repaired, replaced or adjusted until it passes the test.

For each photocontrol to be tested do the following:

#### *Continuous Dimming Control Systems*

This requirement is for systems that have more than 10 levels of controlled light output in a given zone.

Step 1: Identify the minimum daylighting location in the controlled zone (Reference Location). This can be identified using either the illuminance method or the distance method.

#### *Illuminance Method*

- Turn OFF controlled lighting and measure daylight illuminance within zones illuminated by controlled luminaires.
- Identify the Reference Location; this is the task location with lowest daylight illuminance in the zone illuminated by controlled luminaires. This location will be used for illuminance measurements in subsequent tests.
- Turn controlled lights back ON.

#### *Distance Method*

- Identify the task location within the zone illuminated by controlled luminaires that is farthest away from daylight sources. This is the Reference Location and will be used for illuminance measurements in subsequent tests.

Step 2: No daylight test. Simulate or provide conditions without daylight. Verify and document the following:

- Automatic daylight control system provides appropriate control so that electric lighting system is providing full light output unless otherwise specified by design documents.
- Document the reference illuminance, which is the electric lighting illuminance level at the reference location identified in Step 1.
- Light output is stable with no discernable flicker.

Step 3: Full daylight test. Simulate or provide bright conditions. Verify and document the following:

- Lighting power reduction is at least 65 percent under fully dimmed conditions and light output is stable with no discernable flicker.
- Only luminaires in daylit zones are affected by daylight control.

Step 4: Partial daylight test. Simulate or provide bright conditions where illuminance (fc) from daylight only at the Reference Location is between 60 percent and 95 percent of Reference Illuminance (fc) documented in Step 2. Verify and document the following:

- Measure that the combined illuminance of daylight and controlled electric lighting (fc) at the reference location is no less than the electric lighting illuminance (fc) at this location during the no daylight test documented in Step 2.
- Measure that the combined illuminance of daylight and controlled electric lighting (fc) at the Reference Location is no greater than 150 percent of the reference illuminance (fc) documented in Step 2.

- Light output is stable with no discernable flicker.

#### *Stepped Switching or Stepped Dimming Control Systems*

This requirement is for systems that have no more than 10 discrete steps of control of light output.

If the control has three steps of control or less, conduct the following tests for all steps of control. If the control has more than three steps of control, testing three steps of control is sufficient for showing compliance.

Step 1: Identify the minimum daylighting location(s) in the controlled zone

If lighting controls are staged so that one stage is closer to the daylight source, identify a minimum daylighting location for each stage of control. If all stages of control are equally close to the daylight source, select a single minimum daylighting location representing all stages of the control. This minimum daylighting location for each stage of control is designated as the reference location for that stage of control and will be used for illuminance measurements in subsequent tests. The reference location can be identified using either the illuminance method or the distance method.

#### *Illuminance Method*

- Turn OFF controlled lighting and measure daylight illuminances within a zone illuminated by controlled luminaires.
- Identify the reference location; this is the task location with lowest daylight illuminance in the zone illuminated by controlled luminaires. This location will be used for illuminance measurements in subsequent tests.
- Turn controlled lights back ON.

#### *Distance Method*

- Identify the task location within the zone illuminated by controlled luminaires that is farthest away from daylight sources. This is the reference location and will be used for illuminance measurements in subsequent tests.

Step 2: No daylight test. Simulate or provide conditions without daylight for a stepped switching or stepped dimming control system. Verify and document the following:

- If the control is manually adjusted (not self commissioning), make note of the time delay and override time delay or set time delay to minimum setting. This condition shall be in effect through step 4.
- Automatic daylight control system turns ON all stages of controlled lights
- Stepped dimming control system provides reduced flicker over the entire operating range per §119(f)2.
- Document the reference illuminance which is the electric lighting illuminance level measured at the reference location identified in Step 1.

Step 3: Full daylight test. Simulate or provide bright conditions. Verify and document the following:

- Lighting power reduction of controlled luminaires is at least 65 percent
- Only luminaires in daylit zones (toplit zone, primary sidelit zone and secondary sidelit zone) are affected by daylight control.

Step 4: Partial daylight test. For each control stage that is tested in this step, the control stages with lower setpoints than the stage tested are left ON and those stages of control with higher setpoints are dimmed or controlled off. Simulate or provide conditions so that each control stage turns on and off or dims. Verify and document the following for each control stage:

- The measured illuminance contribution from the control stage tested at its corresponding reference location.

- The total daylight and electric lighting illuminance level measured at its reference location just after the stage of control dims or shuts off a stage of lighting:
  1. The total measured illumination shall be no less than the reference illuminance measured at this location during the no daylight test documented in Step 2.
  2. The total measured illumination shall be no greater than 150 percent of the reference illuminance.
- The control stage shall not cycle on and off or cycle between dim and undimmed while daylight illuminance remains constant.
- Only luminaires in daylit zones (toplit zone, primary sidelit zone, and secondary sidelit zone) are affected by daylight control.

Step 5: Verify time delay.

- Verify that time delay automatically resets to normal mode within 60 minutes.
- Set normal mode time delay to at least three minutes.
- Confirm that there is a time delay of at least 3 minutes between the time when illuminance exceeds the setpoint for a given dimming stage and when the control dims or switches off the controlled lights.

## **NA7.6.2 Occupancy Sensor Acceptance**

### **NA7.6.2.1 Construction Inspection**

Prior to Functional testing, verify and document the following:

- Occupancy sensor has been located to minimize false signals:
  - No closer than four (4) feet from a HVAC diffuser.
  - PIR sensor pattern does not enter into adjacent zones.
- Occupancy sensors do not encounter any obstructions that could adversely affect desired performance.
- Ultrasonic occupancy sensors do not emit audible sound.

### **NA7.6.2.2 Functional testing**

For buildings with up to seven (7) occupancy sensors, all occupancy sensors shall be tested. For buildings with more than seven (7) occupancy sensors, sampling may be done on spaces with similar sensors and space geometries. If the first occupancy sensor in the sample group passes the acceptance test, the remaining building spaces in the sample group also pass. If the first occupancy sensor in the sample group fails the acceptance test the rest of the occupancy sensors in that group must be tested. If any tested occupancy sensor fails it shall be repaired, replaced or adjusted until it passes the test.

For each sensor to be tested do the following:

Step 1: For a representative sample of building spaces, simulate an unoccupied condition. Verify and document the following:

- Lights controlled by occupancy sensors turn off within a maximum of 30 minutes from the start of an unoccupied condition per §119(d).
- The occupant sensor does not trigger a false "on" from movement in an area adjacent to the space containing the controlled luminaires or from HVAC operation.
- Signal sensitivity is adequate to achieve desired control.

Step 2: For a representative sample of building spaces, simulate an occupied condition. Verify and document the following:

- Status indicator or annunciator operates correctly.