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Nonres Compliance Manual Comments - Chapter 13

Additional submitted attachment is included below.



August 2, 2018

California Energy Commission
Building Standards Division
1516 Ninth Street
Sacramento, CA 95814

RE: Docket # 17-BSTD-02, 2019 Nonresidential Compliance Manual to the Energy Standards

The Nonresidential Compliance Manual provides an opportunity to present methods and procedures for conducting a practical, yet thorough, lighting controls acceptance test. It provides the means to translate the Energy Standards requirements into a body of useful information relevant to test planning, execution and documentation. The Compliance Manual is not the code, is not legally binding, and therefore, there exists an opportunity to present the material in a practical, easy to understand format with real-world content and examples.

Unfortunately, Chapter 13 of the 2019 Compliance Manual, is essentially no more than a restatement of the code itself presented in more muddled format. More than 80 percent of the content is just a copy of information from the acceptance test forms or Nonresidential Appendix 7 procedures for completing lighting controls acceptance tests. Because of this, the manual currently provides very little new, meaningful content that would make it a useful tool for individuals hoping to gain direction on practical application and execution of the lighting controls acceptance test requirements.

Apart from this overarching shortfall, the compliance manual material contains numerous errors and omissions. Errors pertain to technical information as well as spelling, grammar and word choice. In addition, the formatting of the material makes it very difficult to read and follow. We have included the most important issues and potential solutions in this document. However, we recommend that Energy Commission consider employing an independent, technical editor with knowledge of the code topic, lighting terminology and procedures in order to eliminate these types of avoidable issues.

In terms of the overall structure of the material, we have developed recommendations that can deliver the added value that we believe the Compliance Manual is intended to provide. Our recommendations include a compilation of material provided by our review team. The review team consisted of more than 60 certified lighting control acceptance test technicians, technician employers, and commissioning providers. Each issue identified is discussed generally, and then followed by an example of the issue and recommended update.



By following our recommendations, the manuals will be more concise, easier to understand, and useful as a complementary tool to the actual lighting controls acceptance test procedures and requirements contained in the Nonresidential Appendix 7 and Section 130.4. We hope that the Energy Commission considers our recommendations and comments with a goal of making Chapter 13 of the Compliance Manual a useful asset for lighting controls acceptance test technicians, test technical employers, enforcement officials and those that employ them on their projects.

Thank you for the opportunity to provide feedback on this important document.

Cori Jackson
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GENERAL COMMENTS and RECOMMENDATIONS

13.1 – Overview

Rewrite this section to specifically speak to lighting controls acceptance tests. The current material is a generalized set of statements made to be inclusive of all forms of acceptance testing. It is used repeatedly throughout Chapters 13 regardless of the type of acceptance test to which the section is intended to apply. Because of the generality of the material, it is misleading and too vague to provide any value to readers interested in learning more about lighting controls acceptance tests. In some cases, use of this content actually leads the reader to believe that use of certified test technicians may not be required for lighting controls acceptance tests.

Note, there are a few instances of content with appropriate specificity. For example, the following statements, taken from Section 13.1.3 Acceptance Test Process, accurately describe requirements pertaining to lighting controls acceptance tests. This level of detail should be utilized throughout Section 13.1.

“Building inspectors will review the NRCA documents during inspection, and can verify certified ATT status by noting whether the NRCA document was completed electronically through an ATTCP. Lighting controls NRCA documents should not be accepted if they are completed by hand or electronically outside the ATTCP online interface.”

13.1.2 - Roles and Responsibilities

There are multiple issues with this section of the manual. Necessary definitions are lacking in specificity or omitted entirely. Also, general language should be eliminated that discusses contractors or installers conducting their own acceptance tests as part of the installation process. With lighting controls, acceptance tests must be completed by certified acceptance test technicians. We understand that in some cases, the installer may also be a certified test technician, but this is the exception not the rule. The compliance manual should discuss completion of the tests assuming they will be conducted by an independent, certified test technician. This eliminates ambiguity on this topic and reinforces the requirements pertaining to certification.

1. Include definition of a Certified Acceptance Test Technician. Field technicians appear to be the term used for noncertified individuals who conduct acceptance tests. Remove generalized introductory content that speaks to use of field technicians and replace with customized content appropriate for lighting controls acceptance tests. Use of generalized acceptance test content, which is copy/paste among mechanical, process and lighting control sections of the manual, is confusing and misleading. Speak to the certification requirements for lighting control projects and lighting ATTs only.
2. Include the definition of “responsible party” so that individuals and technicians know who can serve and sign as the responsibility party. Confusion regarding the responsible party is an issue that often arises on project teams. Per the code, the responsible party may be an architect, professional engineer, engineering contractor, or general building contractor.



Eliminate the confusion in this requirement by stating the actual professional classifications that qualify.

3. Rewrite the definition of Acceptance Test Technician Employers. Currently, the definition erroneously states that employers train acceptance test technicians and certify their work. This is not true for lighting controls acceptance tests. Training and certification is only available from certified acceptance test training providers. On a project, the ATE is not responsible for certifying or signing acceptance documents.

13.1.3 – Acceptance Test Process

Include a discussion of the actual practices and sequence of work that occurs on lighting projects. The current descriptions provided for plan review and construction inspection assume ATTs are present during these phases of the work. Acceptance test technicians are, in nearly all cases, called once lighting control systems are installed and the building is ready for occupancy. The current tips regarding speaking with installers prior to or during construction is not feasible. All of our reviewers commented that these recommendations did not reflect reality and were not useful. In addition, include the term “sequence of operations” in lieu of “control sequences”, as the first term in an industry standard.

Example of the issue:

13.1.3 Plan Review

“The responsible person must review the plans and specifications to ensure that they conform to the acceptance requirements, typically done prior to signing the Certificate of Compliance (NRCC). Usually the responsible person for design phase review is the designer, commissioning agent or test technician.”

ATTs never serve as the responsible person for design phase review of lighting projects prior to completion of NRCCs. In addition, NRCCs are often incomplete or inaccurate with respect to required lighting control acceptance tests. Studies show that only about 20 percent of nonresidential lighting systems projects are required by the authority having jurisdiction (AHJ) to comply with Section 130.4 requirements.

Suggested revision:

“The responsible person must review the plans and specifications to ensure that they conform to the acceptance requirements, typically done prior to signing the Certificate of Compliance (NRCC). Usually the responsible person for design phase review of lighting systems is the designer, commissioning agent, architect or general contractor. In practice, however, lighting controls acceptance tests are often overlooked and necessary tests are not accurately reflected on the compliance forms. ATTs should review all lighting plans and schedules to identify controls that require acceptance tests and not rely solely on the forms for this information.”



13.3 - Indoor and Outdoor Lighting Acceptance Tests

Generally, there are several issues that apply to all indoor and outdoor lighting controls acceptance test sections of the manual. We recommend the Energy Commission make the following changes, as required, for Nonresidential Compliance Manual, Chapter 13, Section 13.6.1 through 13.6.6.

1. Remove the table-style lists of acceptance test steps. There is very little new information included and use of the table-style list with checkboxes next to each section constricts the text and makes it less user-friendly. Instead, discuss the general test process in a narrative style while referring readers to Appendix 7 for actual test steps. Include images, diagrams and examples. This will significantly shorten the manual by eliminating unnecessary redundancy, and provide practical information regarding each test to supplement the actual test procedures contained in Appendix 7.
2. Maintain the “AT A GLANCE” concept, with some modifications to improve readability and relevance. We recommend the format contained in Figure 1, which was prepared for the indoor occupancy sensor section of the compliance manual (Section 13.6.1). In this way, the “AT A GLANCE” information becomes most useful for those seeking to understand the basic purpose and building requirements in order to be ready for acceptance testing. Note, acceptance criteria, issues and cautions, and test instrumentation become part of the general narrative (see 1.) that proceeds the “AT A GLANCE” summary and supplements the actual test procedures.
3. Eliminate the “Test Application” section of in the “AT A GLANCE” table. Regardless of whether the controls are installed in new construction, additions or alterations, they require acceptance testing, assuming no exceptions are met. The inclusion of application types leads the reader to believe that acceptance testing is required only for certain project types, regardless of the actual controls installed.
4. In the “AT A GLANCE” section of each test, the values for estimated time to complete are not accurate. Our reviewers consistently commented that these time estimates were generally incorrect. For example the time to conduct a test for an automatic time switch is listed as 2.5 to 8 hours combined for inspection and functional testing. While the tests for automatic daylighting controls, which are much more complex and require significantly more time to complete is listed at just 1.5 to 4 hours. As another example, the outdoor shut-off controls estimated test time is listed as 1-4 hours combined. A survey of our reviewers showed that this test time rarely exceeded 2 hours and most often was completed in less than hour. In addition, it is unclear whether these times apply to a control zone, a device, a group of devices, or all devices in a building.
5. Maintain use of the icons to highlight issues or facts relevant to specific user groups. Make more consistent use of these icons and their placement. Include new information each time they are used and make it specific to the section where it is located instead of repeatedly using the icon to highlight the same fact.
6. Reorder the sections under 13.6 to follow the numbered order of the test procedures contained in Nonresidential Appendix 7 so that readers can more easily map the manual sections to the appendix.



Figure 1. Recommended “AT A GLANCE” summary table and format

AT A GLANCE
Occupancy Sensing Lighting Controls Acceptance Tests Compliance Document: NRCA-LTI-02A
<u>Test and Technology Description</u> The purpose of this test is to ensure that occupant sensors function as required by the Energy Standards. All sensors must meet a minimum set of general device requirements. In addition, for certain spaces, sensors must be programmed to deliver specific control strategies. Under the Energy Standards, occupant sensors are classified into four categories based on the control strategy for which they are programmed. A single sensor may be programmed to deliver one or more control configurations. <ol style="list-style-type: none">1. Occupant Sensor: automatic ON, automatic OFF for all connected lights.2. Partial-ON: all of the controlled lights turn OFF automatically, only part turn back ON automatically. The rest must be turned ON manually.3. Partial-OFF: only part of the controlled lights turned OFF automatically, the rest must be turned OFF manually. All lights are turned ON automatically.4. Vacancy Sensor: All the lights are turned OFF automatically. All must be turned ON manually. Occupant sensors use various sensing technologies to detect motion. The most common sensor types are ultrasonic, passive infrared (PIR), microphonic, or a combination of two of these technologies. A sensor that uses two or more sensing technologies is called a dual-technology sensor.
<u>Who Can Perform the Test</u> A certified Acceptance Test Technician is required to perform this test. For more information on finding a certified ATT, please see: http://www.energy.ca.gov/title24/attcop/providers.html .
<u>When is this Test Required</u> This acceptance test is required for projects that include occupancy sensors to control indoor lighting. For renovation or retrofit projects, if the project includes controls for twenty or fewer luminaires, acceptance tests are not required.
<u>Test Requirements and Process</u> See Energy Standards §130.4 for test requirements. Additional information for alteration projects may be found in §141.0. See Nonresidential Appendix 7, § 7.6.2 for test procedures.
Building Readiness
<u>Optimal Test Conditions</u> Occupancy controls and controlled luminaires must be wired and powered ON. Tests should be conducted when the controlled space is vacant, except for the test technician. For some sensors, occupant activity in surrounding areas is actually preferred as sensor performance under these conditions will be most indicative of actual performance.
<u>Estimated Time to Complete</u> Occupancy sensor acceptance tests may require several hours depending on the number of devices and spaces to be tested. Construction Inspection: up to 0.25 hours per building room or control area. Functional testing: up to 1 hour per device tested.



6. With today's digitally addressable lighting systems, the idea that a circuit may be used as a proxy for a control zone is obsolete. Luminaires located on different electrical circuits may be controlled together as a single zone. We recommend that all instances of "circuit" be replaced with "luminaire" or "lighting zone", as appropriate.

Example of the issue:

13.6.2 Automatic Time Switch Lighting Controls Acceptance

"This test ensures all non-exempt lights, per §130.1(c)1, are automatically turned off at a predetermined time and individual lighting circuits can be manually enabled, if necessary, during scheduled OFF periods."

Suggested revision:

"This test ensures all non-exempt lights, per §130.1(c)1, are automatically turned off at a predetermined time and individual lighting zones can be manually enabled, if necessary, during scheduled OFF periods."

7. While certain buildings may utilize a building automation system (BAS) that includes lighting controls, this is more often not the case. In order to accurately describe all types of control systems, replace the use of "BAS" with "lighting control system". According to our reviewers, in addition, the use of the term BAS is uncommon. When such a system is present, it is referred to as an energy management system (EMS).

Example of the issue: Section 13.6.1 Occupancy Sensing Lighting Controls Acceptance

"Test Conditions: Document the initial conditions before override or manipulation of the BAS."

Suggested revision:

"Test Conditions: Document the initial conditions before override or manipulation of the lighting control system."

RECOMMENDATIONS & COMMENTS ON SPECIFIC TEST SECTIONS

13.6.1 – Occupancy Sensing Lighting Controls Acceptance

- Add narrative to discuss acceptance criteria, necessary test instrumentation and supplies, cautions and issues. Eliminate step-by-step tables. Refer readers to the Appendix for specific test procedures and steps.
- Discuss considerations for microphonic sensors. The technology can increase false-on triggers if not properly positioned. One of the top sensors in use comes with microphonics enabled by default. ATTs need to be aware of the issues surrounding the technology.
- Discuss optimal test procedures for occupancy sensors. While the procedures allow for sampling, in some areas such as stairwells, we recommend all sensors be tested for safety



purposes. The compliance manual provides an opportunity to discuss this possibility outside of the legal requirements of the code.

- Discuss the types of obstacles (furniture, partitions, etc.) that reduce the detection area of occupancy sensors. Currently the manual states only that “obstacles” should be avoided and no further information is given.
- Identify the measures that ATTs can perform to correct common problems, vs. those they cannot. For example, the manual currently says that sensors should be placed no closer than 4’ from an HVAC diffuser and this “should be avoided”. However, the technician, unless they are a certified electrician, cannot move the sensor to remedy this deficiency. The manual should include a recommended practice for the ATT to use when this issue is encountered such as, “If the sensor is located within four feet of an HVAC diffuser or other permanent obstruction that reduces sensor performance causing it to fail the acceptance test, the ATT should contact the installation lead or other point person who can move the sensor to correct the issue.”
- Provide a narrative on how to test for various types of occupancy sensing strategies such as partial-ON, partial-OFF and vacancy sensors. Don’t just repeat a list of the same test steps for each type. This creates pages of repetitious information where the value add gets buried.
- On the compliance document NRCA-LTI-02-A add a checkbox to ensure ATTs verify the sensor is listed in the CEC database. Discuss this requirement in the narrative.

13.6.2 – Automatic Time Switch Lighting Controls Acceptance

- Add narrative to discuss acceptance criteria, necessary test instrumentation and supplies, cautions and issues. Eliminate step-by-step tables. Refer readers to the Appendix for specific test procedures and steps.
- Discuss programmed schedules as a concept, discuss procedures for verifying schedules are programmed in the unit and remove requirements to test for “acceptable” settings. Acceptability is a factor of the building and owner, and an operating schedule is often not provided to the ATT prior to testing.

13.6.3 – Automatic Daylighting Control Acceptance

- Add narrative to discuss acceptance criteria, necessary test instrumentation and supplies, cautions and issues. Eliminate step-by-step tables. Refer readers to the Appendix for specific test procedures and steps.
- Add discussion of daylight dimming to OFF to earn a PAF.
- Discuss cardinal orientation of window glazing and its impacts on testing.
- Revise figure 13-10 or eliminate. This figure is very difficult to decipher.
- Maintain figures on daylit zones and diagrams showing dimming/switching curves. Expand narrative to discuss the tests for these types of spaces without resorting to a step-by-step checklist.
- Discuss the Illuminance Method, Distance Method, and various tests generally instead of step-by-step instructions, repeated for various types of daylighting systems.



- Discuss additional steps needed during the construction inspection that can make the tests go much smoother. For example, although daylighting may be clearly identified on the contract documents, often obstructions to daylight penetration (i.e. landscaping, adjacent structures, buildings, etc.) may be present on a project. The acceptance test technician must verify conditions during the construction inspection which must be addressed prior to acceptance testing.

13.6.4 – Demand Responsive Controls Acceptance

- Add narrative to discuss acceptance criteria, necessary test instrumentation and supplies, cautions and issues. Eliminate step-by-step tables. Refer readers to the appendix for specific test procedures and steps.
- Discuss new requirements pertaining to use of an OpenADR-compliant virtual end node (VEN). Use of a VEN is the only way to receive an ADR signal from a utility and ATTs cannot test for this in projects where no VEN is connected to the lighting system. This is touched on somewhat indirectly in the “Simulating a Demand Response Event” section, but it needs expansion and more detail. Reference Appendix D of the Nonresidential Manual that contains excellent information on demand response systems and testing.
- Rewrite reference to the minimum dimming requirement as “at least a 15% reduction from full output”. The wording states that systems must “reduce” so state the minimum amount the systems must reduce by. Currently, everything is discussed as “no more than 85% of full output”. This optional, albeit correct, statement is difficult to understand upon first read.

13.6.5 – Lighting Controls Installed to Earn a Power Adjustment Factor for Institutional Tuning

- Add narrative to discuss acceptance criteria, necessary test instrumentation and supplies, cautions and issues. Eliminate step-by-step tables. Refer readers to the Appendix for specific test procedures and steps.
- Remove allowance for observation of tuning in only one space/area to serve as observance of all tuned systems. Tuning levels for all systems should be checked to verify compliance.
- Discuss that procedures for these acceptance tests is located in the installation section of the Nonresidential Appendix 7 and not in the acceptance test section. This organization often causes confusion.

13.6.6 – Outdoor Lighting Shut-off Controls

- Add narrative to discuss acceptance criteria, necessary test instrumentation and supplies, cautions and issues. Eliminate step-by-step tables. Refer readers to the Appendix for specific test procedures and steps.
- With respect to issues and concerns, which is currently listed as “None”, many exist. It can very challenging to collect light level readings in areas controlled by occupancy sensors in order to verify percent reductions. Technicians are often ill-equipped to deal with this test and resort to a visual verification of dimming, regardless of dimming level. Recording illuminance meters, meters with leads that allow the operator to stand at a distance, and



data loggers are all types of equipment that can be employed to properly conduct these tests.

- With respect to properly programming time switches or use of photocells to extinguish lighting during the day, discuss the need to verify that systems are powered from the panel. Some projects will simply turn off the circuits controlling all outdoor lighting so that the lighting appears “off” during the day when the ATT is on site.
- Clearly define the requirements of a part-night control and discuss the various combinations of controls that may be used to achieve required control strategies.

13.21 – Energy Management Control System

- There is negligible information on how to deal with EMCS serving as a lighting control system. Add narrative to discuss this configuration and the correct forms to use for acceptance tests. The 2019 Compliance Manual, Chapter 13.21, actually refers people only to the mechanical acceptance form when testing an EMCS. This form contains no information on lighting functions and certified ATTs do not use this form for lighting system testing. This section should refer users to the proper acceptance test sections and forms for lighting control systems.