DOCKETED

Docket Number:	13-ATTCP-01
Project Title:	Acceptance and Training Certification
TN #:	215156-4
Document Title:	Final Fourth Amendment
Description:	N/A
Filer:	Jack Yapp
Organization:	NLCAA
Submitter Role:	Applicant
Submission Date:	1/4/2017 2:45:13 PM
Docketed Date:	1/4/2017

FOURTH AMENDMENT

NOTE: … to the *APPLICATION FOR APPROVAL OF NLCAA, (THE NATIONAL LIGHTING CONTRACTORS ASSOCIATION OF AMERICA), AS A LIGHTING CONTROLS ACCEPTANCE TEST TECHNICIAN PROVIDER. (Rev 04)*

… Consists of replacing the following APPLICATION Sections:

Attachment 2 – (**Lighting Controls Acceptance Test Technician Class Outline**)

Attachment 3 - (NLCAA **Acceptance Test Technician Employer Class Outline**)

Lighting Controls Acceptance Test Technician Class Outline

Introduction
- ~~Why advanced lighting and Title 24?~~ Contents of This Handbook
- Quality and Complaint Policies and Procedures
- Acceptance Test Technician

Modern Lighting Technologies
- Past Technologies
- Luminance and Illuminance
- Units of Interest
  - Lumen Output
  - Footcandles and Lux
  - Absolute vs. Relative Illuminance Measurement
    - Proper Use of Lightmeters
    - Lightmeter Types
- IES Lighting Levels and Title 24
- Lamp Types Review
  - Incandescent
  - Fluorescent
  - Induction
  - HID
  - LED
- Lamp Specifications
  - Correlated Color Temperature
  - Color Rendering
  - Lamp Markings
  - DOE Information Labels
- Ballasts and Drivers
  - Fluorescent Ballasts: BF and BEF
  - Starting Fluorescents and ID
  - ~~Magnetic and Electronic Ballast: Crest Factor~~
  - Institutional Tuning
  - Lumen Maintenance
  - Fluorescent Dimming
  - LED Drivers: Dimming

Controlling Luminaires
- 0-10V Dimming Ballasts and Drivers
- Digital Dimming Ballasts and Drivers
  - Installing and Testing
    - Wiring Techniques
    - Heat Dissipation
    - Grounding
    - Initial Testing

Lighting Controls

- Area Controls ~~and 130.1 (a)~~
- Switching Schemes
  - Line Voltage
  - Low Voltage
  - Relays, Power Packs, Power Pack Logic Functions
  - Shut-OFF Controls and 130.1 (b)
    - Automatic Time Switches
    - Occupancy sensors
      - Technologies and Applications
- Dimming Controls and 130.1 (c)
  - Phase Dimmers
  - 0-10V and Digital Controls
  - Zones, Groups, and Scenes
- Daylight Harvesting and 130.1 (d)
  - Photosensors vs. Photo-controllers
  - Open and Closed Loop Systems Introduction
- Automated Demand Response and 130.1 (e)
  - The Demand Response Signal
- Title 20 and Lighting Systems
  - Lighting Systems
  - Large Lighting Systems

Working with Lighting Controls

- Safety
- Avoiding Equipment Damage
- Test Equipment Types and Use
  - Test Equipment Ratings
  - Test Equipment Safety
- Lock-out/Tag-out and PPE
- Avoiding "Deprogramming" Controls

Reference Documents

- Why advanced lighting and Title 24?
- Contents of the 4 Reference Documents
- Where to find the Reference Documents
- Insuring you have the most recent revisions
- 2016 ~~2013~~ Building Energy Efficiency Standards
  - Definitions, Compliance Process, Design, Mandatory Controls, Acceptance
- 2016 ~~2013~~ Reference Appendices
  - Acceptance Tests, Installation Tests
- 2015 ~~2012~~ Appliance Efficiency Regulations
  - Functional Requirements of Lighting Controls
  - Insuring devices have been Certified to the Energy Commission
- 2016 ~~2013~~ Nonresidential Compliance Manual
  - Acceptance Forms, Compliance Forms, Installation Form

Regulation and Certification
- Title 20
- Certified to the Commission

Introductory Subjects
- The Percent Reduction Formula
- Percentages

Compliance Process
- The Compliance Process
- Examination of Forms
  - Compliance Forms
  - Installation Forms
  - Acceptance Forms
- Definitions

Title 24 Controls
- Where Required and Exceptions
- Lighting Power Density
  - Design methods
    - Prescriptive methods
    - Performance method
      - Trade-offs
- Interlocked Lighting Systems

Area Controls
- Where Required and Exceptions

Multi-Level Controls
- Minimum Control Steps by Technology and Wattage
- Uniformity Requirements by Technology and Wattage
- Where Required and Exceptions
  - Dimming Controls

Acceptance Testing Overview
- Purpose of Acceptance Testing
- When Required
- Construction Inspections
- Functional Testing
- Acceptance Forms

Shut-OFF Controls
- Introduction: Timers and Occupancy sensors
- Power Adjustment Factors (PAF)
  - Calculating and Verifying
  - Acceptance Testing

Timers
- Automatic Time-Switches
- Astronomical Time-Switch
  - Where Realized by an EMCS or Lighting Control System

- **Occupancy Sensors**
  - **Part-OFF**
    - **Why Required**
  - **Part-ON**
    - **Why Utilized**
  - **Where Required**
  - **Vacancy Sensors**
    - **Where Realized by an EMCS or Lighting Control System**
- **Shut-OFF Controls Acceptance Procedures**
  - **Acceptance tests**
    - **Filling Out NRCA-LTI-02-A**
  - **Review: Where Required**

Demand Responsive Controls

- **Where Required and Exceptions Area Weighted Average Acceptance Testing**
  - **Full Output Test**
  - **Minimum Output Test**
- **Special Case: Daylit Spaces**

Automatic Daylighting Controllers

- **Review of Closed-Loop Lighting Systems**
- **Introduction**
- **Overview of Common Daylighting Systems**
- **Definitions**
- **Daylit Zones**
  - **Definitions**
  - **Order of Precedence**
  - **Location of Daylit Zones on Plans**
- **Fixtures Located in Daylit Zones**
- **Zones Illuminated by Controlled Luminaires**
- **Acceptance Testing**
  - **Construction Inspection**
  - **EMCS or Lighting Control System Installation Inspections**
  - **Stepped or Continuously Dimmed System?**
  - **Photosensor Location and System Type: (Open or Closed) Loop?**
  - **Review of Open and Closed Loop Daylighting Systems**
- **Reference Location**
  - **Locating**
  - **Special Case: Parking Garages**

- **Acceptance Testing of Automatic Daylighting Systems**
  - **Functional Testing**
    - **Closed-Loop Systems**
      - **No Daylight Test**
      - **Full Output Test**
      - **Full Daylight Test**
        - **Power Reduction Calculation**
      - **Partial Daylight Test**
    - **Open-Loop Systems**
      - **No Daylight Test**
      - **Sensor Ratio Full**
      - **Daylight Test**
        - **Power Reduction Calculation (Stepped)**
        - **Power Reduction Calculation (Continuous)**
      - **Partial Daylight Test**
        - **Continuous**
        - **Stepped**

Institutional Tuning

- **How Accomplished**
- **Acceptance Testing**
  - **Filling out NRCA-LTI-05-A**

Outdoor Lighting Controls

- **Types of Outdoor Lighting Controls**
- **Where Required and Exceptions Part-**
- **Night Controls: Definition**
- **Part-Night Controls: Extended Definition per §110.9 (b) 5.**
- **Acceptance Testing**
  - **Construction Testing**
  - **Location of Outdoor Controls**
  - **Functional Testing**
    - ~~**Motion**~~
    - ~~**No Motion**~~
  - **Shut-OFF Controls**
  - **Timers**
  - **Part-Night Timers**
  - **Part-Night Motion or Time-Based System**
  - **Automatic Scheduling Systems**

~~Demand Responsive Controls~~

- ~~**Where Required and Exceptions**~~
- ~~**Area Weighted Average**~~
- ~~**Acceptance Testing**~~
  - ~~**Full Output Test**~~
  - ~~**Minimum Output Test**~~
- ~~**Special Case: Daylit Spaces**~~

Summary

- **Who Signs the Forms?**

Lighting Controls Acceptance Test Employer Class Outline

Introduction

- ~~Why advanced lighting and Title 24?~~
- Quality and Complaint Policies and Procedures
- ~~Form Review and Field Inspections~~
- ~~Acceptance Test Technician Employer~~
- Acceptance Test Technician
- Acceptance Test Employer

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- Contents of the 4 Reference Documents
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  - Functional Requirements of Lighting Controls
  - Insuring devices have been Certified to the Energy Commission
- 2016 ~~2013~~ Nonresidential Compliance Manual
  - Acceptance Forms, Compliance Forms, Installation Forms

Regulation and Certification

- Title 20
- Certified to the Commission

Introductory Subjects

- The Percent Reduction Formula
- Percentages

Compliance Process

- The Compliance Process
- Examination of Forms
  - Compliance Forms
  - Installation Forms
  - Acceptance Forms
- Definitions

Title 24 Controls

- Where Required and Exceptions
- Lighting Power Density
  - Design methods
    - Prescriptive methods
    - Performance method
      - Trade-offs
- Interlocked Lighting Systems

Area Controls
- Where Required and Exceptions

Multi-Level Controls
- Minimum Control Steps by Technology and Wattage
- Uniformity Requirements by Technology and Wattage
- Where Required and Exceptions
  - Dimming Controls

Shut-OFF Controls
- Introduction: Timers and Occupancy sensors
- Power Adjustment Factors (PAF)
  - Calculating and Verifying
  - Acceptance Testing

~~Acceptance Testing Overview~~
- ~~Purpose of Acceptance Testing~~
- ~~When Required~~
- ~~Acceptance Forms~~

Timers
- Automatic Time-Switches
- Astronomical Time-Switch

Occupancy Sensors
- Part-OFF
  - Why Required
- Part-ON
  - Why Utilized
- Where Required
- Vacancy Sensors

Shut-OFF Controls Acceptance Procedures
- Acceptance tests
  - Filling Out NRCA-LTI-02-A
- Review: Where Required

Automatic Daylighting Controllers
- Review of Closed-Loop Lighting Systems
- Introduction
- Overview of Common Daylighting Systems Definitions
- Daylit Zones
  - Definitions
  - Order of Precedence
  - Location of Daylit Zones on Plans
- Fixtures Located in Daylit Zones
- Zones Illuminated by Controlled Luminaires
- ~~Reference Location~~
  - ~~Special Case: Parking Garages~~
- Acceptance Testing
  - Construction Inspection
  - Stepped or Continuously Dimmed System?

- Photosensor Location and System Type: (Open or Closed) Loop?
- Review of Open and Closed Loop Daylighting Systems
- Review of Open and Closed Loop Sensor Locations
- Reference Location
- Locating
- Special Case: Parking Garages
- ~~Functional Testing~~
- ~~No Daylight Test~~
- ~~Full Output Test~~
- ~~Full Daylight Test~~
- ~~Partial Daylight Test~~
- Acceptance Testing of Automatic Daylighting Systems
- Functional Testing
- Closed-Loop Systems
- No Daylight Test
- Full Output Test
- Full Daylight Test
- Power Reduction Calculation
- Partial Daylight Test
- Open-Loop Systems
- No Daylight Test
- Sensor Ratio Full
- Daylight Test
- Power Reduction Calculation (Stepped)
- Power Reduction Calculation (Continuous)
- Partial Daylight Test
- Continuous
- Stepped

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- Types of Outdoor Lighting Controls
- Where Required and Exceptions Part-
- Night Controls: Definition
- Part-Night Controls: Extended Definition per §110.9 (b) 5.
- Acceptance Testing
- Construction Testing
- Location of Outdoor
- Controls Functional Testing
- ~~Motion~~
- ~~No Motion~~
- Shut-OFF Controls
- Timers
- Part-Night Timers
- Part-Night Motion or Time-Based System
- Automatic Scheduling Systems

Demand Responsive Controls

- Where Required and Exceptions
- Area Weighted Average
- Acceptance Testing
  - Full Output Test
  - Minimum Output Test
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- How Accomplished
- Acceptance Testing
  - Filling out NRCA-LTI-05-A

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- Safety
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- Who Signs the Forms?

#End of Document