| **DOCKETED** |
|---------------|----------------|
| **Docket Number:** | 13-ATTCP-01 |
| **Project Title:** | Acceptance and Training Certification |
| **TN #:** | 214346-4 |
| **Document Title:** | Fourth Amendment - Application for Approval of NLCAA as Lighting Controls Acceptance Test Technician Provider |
| **Description:** | N/A |
| **Filer:** | Patty Paul |
| **Organization:** | NLCAA |
| **Submitter Role:** | Public |
| **Submission Date:** | 11/2/2016 2:30:03 PM |
| **Docketed Date:** | 11/1/2016 |
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?
   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 HID
   Magnetic and Electronic Ballasts: Crest Factor
   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
Lockout/Tagout and PPE
  Avoiding “Deprogramming” Controls

Reference Documents
  Contents of the 4 Reference Documents
  Where to find the Reference Documents
  Insuring you have the most recent revisions
2013 Building Energy Efficiency Standards
  Definitions, Compliance Process, Design, Mandatory Controls, Acceptance
2013 Reference Appendices
  Acceptance Tests, Installation Tests
2012 Appliance Efficiency Regulations
  Functional Requirements of Lighting Controls
  Insuring devices have been Certified to the Energy Commission
2013 Nonresidential Compliance Manual
  Acceptance Forms, Compliance Forms, Installation Forms
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
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

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

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?
NLCAA Acceptance Test Technician Employer Class Outline

Introduction
  Why advanced lighting and Title 24?
  Quality and Complaint Policies and Procedures
  Form Reviews and Field Inspections
  Acceptance Test Technician Employer

Reference Documents
  Contents of the 4 Reference Documents
  Insuring you have the most recent revisions
  Where to find the Reference Documents
  2013 Building Energy Efficiency Standards
    Definitions, Compliance Process, Design, Mandatory Controls, Acceptance
  2013 Reference Appendices
    Acceptance Tests, Installation Tests
  2012 Appliance Efficiency Regulations
    Functional Requirements of Lighting Controls
    Insuring devices have been certified to the Energy Commission
  2013 Nonresidential Compliance Manual
    Acceptance Forms, Compliance Forms, Installation Forms

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
  Part-ON
  Where Required
  Vacancy-Sensors

Shut-OFF Controls Acceptance Procedures
  Review: Where Required

Automatic Daylighting Controllers
  Overview
  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
    Review of Open and Closed Loop Daylighting Systems
    Review of Open and Closed Loop Sensor Locations
Functional Testing
   No-Daylight Test
   Full-Output Test
   Full-Daylight Test
   Partial-Daylight Test

Outdoor Lighting Controls
   Types of Outdoor Lighting Controls
   Where Required and Exceptions
   Part-Night Controls: Definition
   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

Demand Responsive Controls
   Where Required and Exceptions
   Area-Weighted Average
   Acceptance Testing
      Full Output Test
      Minimum Output Test
   Special Cases: Daylit Spaces

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

Summary
   Who Signs the Forms?
Lighting Controls Acceptance Test Technician Class Outline

Introduction
  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 HID
  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
  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
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 Building Energy Efficiency Standards
    Definitions, Compliance Process, Design, Mandatory Controls, Acceptance
  2016 Reference Appendices
    Acceptance Tests, Installation Tests
  2015 Appliance Efficiency Regulations
    Functional Requirements of Lighting Controls
    Insuring devices have been Certified to the Energy Commission
  2016 Nonresidential Compliance Manual
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
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
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
- Shut-OFF Controls
- Timers
- Part-Night Timers
- Part-Night Motion or Time-Based System
- Automatic Scheduling Systems

Summary

Who Signs the Forms?
Lighting Controls Acceptance Test Employer Class Outline

Introduction
- Quality and Complaint Policies and Procedures
- Acceptance Test Technician
- Acceptance Test Employer

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 Building Energy Efficiency Standards
  - Definitions, Compliance Process, Design, Mandatory Controls, Acceptance
- 2016 Reference Appendices
  - Acceptance Tests, Installation Tests
- 2015 Appliance Efficiency Regulations
  - Functional Requirements of Lighting Controls
  - Insuring devices have been Certified to the Energy Commission
- 2016 Nonresidential Compliance Manual

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

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
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
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

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
  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
Institutional Tuning
   How Accomplished
   Acceptance Testing
   Filling out NRCA-LTI-05-A

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

Summary
   Who Signs the Forms?