Title 24: Where We're Headed with the 2013 Standards

Featuring:
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## Overall Changes in Scope and Application

**Welcome**

### Overall Changes in Scope and Application
- When and Why?
- Additional Scope of Coverage
- New Registration Procedures
- Performance Modeling

<table>
<thead>
<tr>
<th>Category</th>
</tr>
</thead>
<tbody>
<tr>
<td>Low-rise Residential Envelope</td>
</tr>
<tr>
<td>Nonresidential Envelope</td>
</tr>
<tr>
<td>Low-rise Residential Mechanical</td>
</tr>
<tr>
<td>Nonresidential Mechanical</td>
</tr>
<tr>
<td>Residential Lighting</td>
</tr>
<tr>
<td>Nonresidential Indoor Lighting</td>
</tr>
<tr>
<td>Nonresidential Outdoor Lighting</td>
</tr>
</tbody>
</table>
Update Schedule

- May 31, 2012 Business Meeting – Language Adoption
- Jul 1, 2014 Implementation Date

Any projects that apply for permit on or after Jul 1, 2014 will be subject to the 2013 Standards.

- Information and Documents available at:

http://www.energy.ca.gov/title24/2013standards/
Big, bold strategies for energy savings

- **By 2030:**
  - All California new **commercial** construction **zero net energy**
  - Reshape HVAC industry to ensure optimal equipment performance
Section 140.9(b)

Prescriptive Requirements for Commercial Kitchens

- Reduce short-circuiting of kitchen exhaust hoods – replacement air limited to 10% of hood exhaust airflow rate
- Maximum exhaust flow rate requirements – TABLE 140.9–A
- Limitations on heated or cooled makeup air for spaces with exhaust hoods
Section 140.9(b) (cont)

- Kitchens with Type I + Type II exhaust hoods > 5,000 cfm shall have one of the following:
  - At least 50% of replacement air is transfer air
  - Demand ventilation controls on >= 75% of exhaust air system
  - Energy recovery devices with recovery effectiveness >= 40% on at least 50% of total exhaust airflow
  - 75% or more of makeup air volume is unheated or uncooled

- Kitchen exhaust system acceptance testing
Parking Garages

- **Section 120.6(c)**

- Mechanical ventilation systems for enclosed parking garages where the total design exhaust rate for the garage is $\geq 10,000$ cfm
  - Automatically detect contaminant levels and stage fans or modulate fan airflow rates to 50% or less of design capacity provided acceptable contaminant levels are maintained.
  - Have controls and/or devices that will result in fan motor demand of no more than 30 percent of design wattage at 50% of design airflow.
  - One CO sensor per 5,000 sq ft.
Design Review

- All nonresidential, hotel/motel & highrise residential
- Requires a Design Review Kickoff Certificate(s) of Compliance and
- Construction Document Design Review Checklist Certificate(s) of Compliance
- Completed and signed by a licensed professional engineer (PE) or contractor performing work
Design Review

- Buildings less than 10,000 sq ft may be the engineer of record.
- Buildings greater than 10,000 sq ft but less than 50,000 sq ft, shall be a qualified in-house engineer with no other project involvement or a third party engineer.
- Buildings greater than 50,000 sq ft and all buildings with complex mechanical systems, the licensed professional engineer shall be a third party.
Design Review

### Scope & Application

**130.1(b)**
General lighting of enclosed spaces 100 sf or larger with a lighting load that exceeds 0.5 W/sf, have multi level lighting controls from at least one of the following methods: manual dimming, lumen maintenance, tuning, automatic daylighting controls, demand responsive lighting controls. Control steps are in accordance with Table 130.1-A.

**130.1(c)**
Shut off controls are controlled with occupant sensing controls, automatic time-switch control, signal from another building system or other control and are shown for all indoor lighting systems.

**130.1(c)3**
Offices 250 square feet or smaller; multipurpose rooms of less than 1000 square feet, and classrooms and conference rooms of any size, shall be equipped with occupant sensor(s) to shut off the lighting.

**130.1(c)6**
Lighting in corridors and stairwells shall be controlled by occupant sensing controls that separately reduce lighting power in each space by at least 50% when the area is unoccupied.

**130.1(e)**
For buildings greater than 10,000 sf, demand response controls should be included to reduce total building lighting power by a minimum of 15%.

### Daylight Area

**140.3(c)**
Daylight areas required for conditioned or unconditioned spaces greater than 5,000 ft² of roof area and with ceiling height greater than 15 feet are shown on building plans and meet requirements of this section.

### Daylight Controls

**130.1(d)2**
All skylit daylit zones, primary sidelit daylit zones and secondary sidelit daylit zone are shown on plans. Controls of skylit and sidelit zones are independent and provide multi-level lighting in accordance with Table 130.1-A. Plans should indicate that general lighting power is reduced by a minimum of 63% when daylight illuminance is 130% of design illuminance.
Commissioning

- Section 120.8 (moved from Green Building Standard)
- All nonresidential buildings $\geq 10,000$ sq ft
  - Owner’s or owner representative’s project requirements
  - Basis of design
  - Design phase design review
  - Commissioning measures shown in the construction documents
  - Commissioning plan
  - Functional performance testing
  - Documentation and training
  - Commissioning report
Electrical Power Distribution

Section 130.5(b)

- Minimum requirement for separation of electrical load

<table>
<thead>
<tr>
<th>Load Type</th>
<th>Services &lt;= 50kVA</th>
<th>50 kVA &lt; Services &lt;= 250kVA</th>
<th>250 kVA &lt; Services &lt;= 1000 kVA</th>
<th>Services &gt; 1000 kVA</th>
</tr>
</thead>
<tbody>
<tr>
<td>Lighting</td>
<td>A</td>
<td>D</td>
<td>D</td>
<td>D</td>
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<tr>
<td>HVAC Systems</td>
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<td>Domestic Hot Water</td>
<td>A</td>
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<td>Plug Loads</td>
<td>A</td>
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<td>D</td>
<td></td>
</tr>
<tr>
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<td>A</td>
<td>A</td>
<td>A</td>
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</tr>
<tr>
<td>Appliances 25 kVa or higher</td>
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</tr>
<tr>
<td>Load Centers 25 kVa or higher</td>
<td>A</td>
<td>D</td>
<td>D</td>
<td></td>
</tr>
<tr>
<td>Renewable Power Source</td>
<td>Each Group</td>
<td>Each Group</td>
<td>Each Group</td>
<td>Each Group</td>
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<tr>
<td>Renewable Loads</td>
<td>A</td>
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<td>A</td>
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<tr>
<td>Charging Stations</td>
<td>A</td>
<td>A</td>
<td>A</td>
<td>A</td>
</tr>
</tbody>
</table>

A: Aggregated load  
D: All loads disaggregated (see standard for details)
Compliance Forms

- NRCC-ELC-01-E
  - Certificate of Compliance: Disaggregation of Electrical Circuits

<table>
<thead>
<tr>
<th>Switchboard, motor control center, panelboard or subpanel</th>
<th>Electrical Service that supplies that switchboard or panel</th>
<th>Electrical Service Rating</th>
<th>Field Inspector</th>
</tr>
</thead>
<tbody>
<tr>
<td>A</td>
<td>B</td>
<td>C</td>
<td>D</td>
</tr>
<tr>
<td>Designation/location in building/description</td>
<td>Designation/location in building/description</td>
<td>kVA</td>
<td>☐ ☐</td>
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</tbody>
</table>

2013 Title 24 Standards
Section 130.5(d)

In all buildings, both controlled and uncontrolled 120 volt receptacles shall be provided in:

- Private offices
- Open office areas
- Reception lobbies
- Conference rooms
- Kitchenette in office spaces
- Copy rooms
# Nonresidential Envelope

## Welcome

## Overall Changes in Scope and Application

### Low-rise Residential Envelope

- Nonresidential Envelope
  - Fenestration & Insulation
  - Cool Roofs
  - Air Barriers
  - Daylighting
  - Solar Zones

### Low-rise Residential Mechanical

### Nonresidential Mechanical

### Residential Lighting

### Nonresidential Indoor Lighting

### Nonresidential Outdoor Lighting
Fenestration

- Window Prescriptive Requirements
- Area Weighted Performance Ratings

### Windows (40% Max Area)

<table>
<thead>
<tr>
<th>Type</th>
<th>Max U-Factor</th>
<th>Max RSHGC</th>
<th>Min VT</th>
</tr>
</thead>
<tbody>
<tr>
<td>Fixed</td>
<td>0.36</td>
<td>0.25</td>
<td>0.42</td>
</tr>
<tr>
<td>Operable</td>
<td>0.46</td>
<td>0.22</td>
<td>0.32</td>
</tr>
<tr>
<td>Curtainwall</td>
<td>0.41</td>
<td>0.26</td>
<td>0.46</td>
</tr>
<tr>
<td>Doors</td>
<td>0.45</td>
<td>0.23</td>
<td>0.17</td>
</tr>
</tbody>
</table>

RSHGC: Relative Solar Heat Gain Coefficient, which takes into account overhang benefits

VT: Visible Transmittance rating for overall daylight transmittance of product including frame, **OR**

Use NA-6-3 formula to account for the frame

\[
VT = VT_f \times VT_c
\]

\[
VT_c = \text{Center of Glass VT}
\]

\[
VT_f = \text{from Appendix NA-6}
\]
**Fenestration**

- Skylight Prescriptive Requirement
- Area Weighted Performance Ratings

<table>
<thead>
<tr>
<th>Skylights (5% Max Area)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Type</td>
</tr>
<tr>
<td>Glass, Curb</td>
</tr>
<tr>
<td>Glass, No Curb</td>
</tr>
<tr>
<td>Plastic</td>
</tr>
</tbody>
</table>

2013 Title 24 Standards
Mandatory Insulation

- Maximum U-Factors
- Roofs
  - Metal buildings: 0.098 (R-11)
  - Wood framed & Other: 0.075 (R-19 wood framing)
- Walls
  - Metal building: 0.113 (R-13)
  - Metal framed: 0.105 (R-8 Rigid over framing)
  - Light Mass wall: 0.44
  - Heavy Mass wall: 0.69
  - Wood framed: 0.110 (R-11)
  - Spandrel Panels: 0.28
Mandatory Insulation

- Maximum U-Factors (cont)

- Raised Floors
  - Mass Floors: 0.269 or 3” lightweight concrete
  - Lightweight: 0.071 (R-11)
Alterations Mandatory Insulation

- Section 141.0(b) Maximum U-Factors
- Walls
  - Metal building: 0.113 (R-13)
  - Metal framed: 0.217 (R-13)
  - Wood framed: 0.110 (R-11)
  - Spandrel Panels: 0.28 (R-4)
Alterations Mandatory Insulation

- Roofs
- Does not apply if roof already has R-7

TABLE 141.0-C INSULATION REQUIREMENTS FOR ROOF ALTERATIONS

<table>
<thead>
<tr>
<th>Climate Zone</th>
<th>Continuous Insulation</th>
<th>U-factor</th>
<th>Continuous Insulation</th>
<th>U-factor</th>
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<tbody>
<tr>
<td></td>
<td>Nonresidential</td>
<td></td>
<td>High-Rise Residential</td>
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</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>and Guest Rooms of</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>Hotel/Motel</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>Buildings</td>
<td></td>
</tr>
<tr>
<td>1</td>
<td>R-8</td>
<td>0.082</td>
<td>R-14</td>
<td>0.055</td>
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<td>2</td>
<td>R-14</td>
<td>0.055</td>
<td>R-14</td>
<td>0.055</td>
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<td>R-8</td>
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<td>R-14</td>
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<td>10-16</td>
<td>R-14</td>
<td>0.055</td>
<td>R-14</td>
<td>0.055</td>
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</table>
Alterations Mandatory Insulation

- Maximum U-Factors (cont)

- Raised Floors
  - Mass Floors: 0.111 (R-6)
    - Only applies to Hirise Res, Hotel/Motel
  - Lightweight: 0.071 (R-11)
## Additions and Alterations

### Fenestration Alteration Table 141.0-A

<table>
<thead>
<tr>
<th>Climate Zone</th>
<th>1</th>
<th>2</th>
<th>3</th>
<th>4</th>
<th>5</th>
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<td><strong>U-Factor</strong></td>
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<td>0.47</td>
<td>0.58</td>
<td>0.47</td>
<td>0.58</td>
<td>0.47</td>
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<td>0.31</td>
<td>0.41</td>
<td>0.31</td>
<td>0.41</td>
<td>0.31</td>
<td>0.31</td>
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<td><strong>VT</strong></td>
<td>Prescriptive</td>
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<table>
<thead>
<tr>
<th>Climate Zone</th>
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<th>10</th>
<th>11</th>
<th>12</th>
<th>13</th>
<th>14</th>
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<tr>
<td><strong>U-Factor</strong></td>
<td>0.47</td>
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<td>0.47</td>
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<td>0.47</td>
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<tr>
<td><strong>RSHGC</strong></td>
<td>0.31</td>
<td>0.31</td>
<td>0.31</td>
<td>0.31</td>
<td>0.31</td>
<td>0.31</td>
<td>0.31</td>
<td>0.41</td>
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<tr>
<td><strong>VT</strong></td>
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</tbody>
</table>
Welcome
Overall Changes in Scope and Application
Low-rise Residential Envelope
Nonresidential Envelope
Low-rise Residential Mechanical
Nonresidential Mechanical
  - Equipment
  - Economizers
  - Fans
  - Controls
Residential Lighting
Nonresidential Indoor Lighting
Nonresidential Outdoor Lighting
HVAC

- New efficiencies for DX equipment
- Implementation on Jan 1, 2015
- Equipment < 65,000 Btuh  14 SEER
Economizers

- Mandatory Fault Detection and Diagnostics (FDD)
  - All air-cooled unitary direct-expansion units with an economizer and
    - Mechanical cooling capacity $\geq 54,000$ Btuh
- Must include a Fault Detection and Diagnostics (FDD) system
- Includes
  - Packaged DX rooftops
  - Split-systems
  - Heat pumps
  - Variable refrigerant flow systems
Economizers

- Prescriptive threshold for economizers lowered
  - Moved from 75,000 Btuh down to 54,000 Btuh (4.5 tons)

AND

- Greater then 1,800 cfm of airflow

- Removed exemptions related to computer equipment and telecommunications
Controls

- Occupancy sensors allowed as a control option for demand control ventilation
- May reduce the ventilation rate to zero
- One sensor per room
- Must do one hour pre-purge prior to normal occupancy
- Requires fan cycle control sequence to maintain the average outdoor air rate over a 2 hr. period
- Must shut off outside air within 30 minutes of vacancy
- If single zone system, must also cycle off the fan
Controls

- Mandatory Occupancy sensor based HVAC control in:
  - Multipurpose rooms less than 1000 sqft
  - Classrooms greater than 750 sqft
  - Conference rooms greater than 750 sqft

- Must automatically setup the cooling set point by 2°F or more and setback the heating temperature set point by 2°F or more

AND

- Automatically reset the minimum required ventilation rate to zero or turn the supply fan off when the zone is unoccupied
Nonresidential Indoor Lighting

Welcome
Overall Changes in Scope and Application
Low-rise Residential Envelope
Nonresidential Envelope
Low-rise Residential Mechanical
Nonresidential Mechanical
Residential Lighting
Nonresidential Indoor Lighting
  ● Mandatory Measures
  ● Power Adjustment Factors
  ● Complete Building Method
  ● Area Category Method
  ● Tailored Method
Nonresidential Outdoor Lighting
Multi-level Controls

- Multi-level controls required in areas > 0.5 w/sqft and >= 100 sqft
- Each luminaire shall be controlled by at least one of the following methods:
  - Manual dimming
  - Lumen maintenance
  - Tuning
  - Automatic daylighting controls
  - Demand responsive lighting controls

**Lumen Maintenance** will maintain constant light output as lamp ages.

**Tuning** is the ability to set maximum light levels at a lower level than full power.
Occumant Sensors

- Occupant sensors to reduce power by 50%
- Aisles and open areas in warehouses
  - Must control that particular aisle
  - 40% power reduction if LPD is less than 80% of Area Category allowance
- Library book stack aisles
  - 10 feet or longer that are accessible from only one end
  - 20 feet or longer that are accessible from both ends
- Lighting installed in corridors and stairwells
Occupant Sensors

Section 130.1(c)7B

- Stairwells and common area corridors which provide access to guestrooms and dwelling units of high-rise residential buildings and hotel/motels

- Parking garages, parking areas and loading and unloading areas.
  - At least one control step between 20 percent and 50 percent
  - No more than 500 watts together.

Nonresidential Indoor Lighting
Skylit Zone Definition

- 0.7 times ceiling height in each direction from the edge of the rough opening of the skylight

![Diagram showing skylit zone definition with dimensions and calculations]
Primary Sidelit Zone Definition

- One window head height deep into the area
- Includes window width plus 0.5 times window head height wide on each side of the rough opening of the window
Automatic Daylighting Controls

Section 130.1(d)2

- Required in skylit zones
- Required in primary sidelit zones
- Zones documented on plans
- Luminaires in each type of zone must be controlled separately
- Photosensors are not readily accessible to unauthorized personnel

Exceptions:

Less than 120 watts of lighting
Less than 24 sqft of glazing
Parking Garage Daylighting

- Automatic daylighting controls required
- Parking garage area with combined total of 36 square feet or more of glazing or opening
- Does not apply if sidelit zone has less than 60 watts of lighting
Demand Responsive Lighting Controls

- In prior standard, only applied to retail.
- Now applies to all buildings larger than 10,000 sqft.
- Must automatically provide either:
  - A 15% reduction in lighting power via dimming; or
  - A reduction in lighting by one level below full ON in accordance with Table 130.1-A via stepped dimming or stepped switching
- Table 130.1-A shown on next slide
Alterations

- Screw base adapters are not recognized, even if permanent.
- Luminaires and luminaire housings manufactured with incandescent screw base sockets shall be classified only as incandescent. Field modifications, including hard wiring of an LED module, shall not be recognized.
- Replacement of lamps in a luminaire manufactured or rated for use with linear fluorescent lamps, with linear lamps of a different technology such as linear LED lamps, shall not be recognized.
Alterations

- Lighting System Alterations shall include alterations where an existing lighting system is modified, luminaires are replaced, or luminaires are disconnected from the circuit, removed and reinstalled, whether in the same location or installed elsewhere.

- Subject to Table 141.0-E

- Exception: Alterations that qualify as a Luminaire Modification-in-Place (definition to follow)
## Alterations

**Table 141.0-E Requirements for Luminaire Alterations**

<table>
<thead>
<tr>
<th>Quantity of existing affected luminaires per Enclosed Space</th>
<th>Resulting Lighting Power for Each Enclosed Space</th>
<th>Applicable Mandatory Control Provisions for Each Enclosed Space</th>
<th>Multi-level Lighting Control Requirements for Each Altered Luminaire</th>
</tr>
</thead>
<tbody>
<tr>
<td>Sum total &lt; 10% of existing luminaires</td>
<td>Existing lighting power is permitted</td>
<td>Existing provisions are permitted</td>
<td>Existing controls are permitted</td>
</tr>
<tr>
<td>Sum total ≥ 10% of existing luminaires</td>
<td>≤ 85% of allowed lighting power per Section 140.6 Area Category Method</td>
<td>§130.1(a), (c)</td>
<td>Two level lighting control or §130.1(b)</td>
</tr>
<tr>
<td></td>
<td>&gt; 85% of allowed lighting power per Section 140.6 Area Category Method</td>
<td>§130.1(a), (c), (d)</td>
<td>§130.1(b)</td>
</tr>
</tbody>
</table>

**Notes:**

1. Affected luminaires include any luminaire that is changed, replaced, removed, relocated; or, connected to, altered or revised wiring, except as permitted by EXCEPTIONS 1 and 2 to Section 141.0(b)2iii:
2. Two level lighting control shall have at least one control step between 30 and 70% of design lighting power in a manner providing reasonably uniform illuminations
3. Daylight controls in accordance with Section 130.0(d) are required only for luminaires that are altered.

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130.1(a) = Area Control
130.1(b) = Multi-level Control
130.1(c) = Automatic Shut Off Control
130.1(d) = Daylighting Control
130.1(e) = Demand Response Control
130.0(d) = Mfg. Instructions
To qualify as a Luminaire Modification-in-Place, lighting systems shall be modified in only one or more of the following methods:

- Replacing lamps and/or ballasts.
- Changing the number or type of light source in a luminaire including socket renewal, removal or relocation of sockets.
- Changing the optical system of a luminaire.
- Installing lighting control systems devices.
- Replacement of whole luminaires one for one in which the only electrical modification involves disconnecting the existing luminaire and reconnecting the replacement luminaire.
### Alterations

**TABLE 141.0-F-Requirements for Luminaire Modifications-in-Place**

For compliance with this Table, building space is defined as any of the following:
1. A complete single story building
2. A complete floor of a multi floor building
3. The entire space in a building of a single tenant under a single lease
4. All of the common, not leasable space in single building

<table>
<thead>
<tr>
<th>Quantity of affected luminaires per Building Space per annum</th>
<th>Resulting Lighting Power per Each Enclosed Space Where ≥ 10% of Existing Luminaires are Luminaire Modifications-in-Place</th>
<th>Applicable mandatory control provisions for each enclosed space(^1)</th>
<th>Applicable multi-level lighting control requirements for each modified luminaire(^2)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Sum total &lt; 40 Luminaire Modifications-in-Place</td>
<td>Existing lighting power is permitted</td>
<td>Existing provisions are permitted</td>
<td>Existing controls are permitted</td>
</tr>
<tr>
<td>Sum total ≥ 40 Luminaire Modifications-in-Place</td>
<td>(\leq 85%) of allowed lighting power per Section 140.6 Area Category Method</td>
<td>§130.1(a), (c)</td>
<td>Two level lighting control(^3) Or §130.1(b)</td>
</tr>
<tr>
<td></td>
<td>(&gt; 85%) of allowed lighting power per Section 140.6 Area Category Method</td>
<td>§130.0(d)(^4) §130.1(a), (c), (d)(^4)</td>
<td>§130.1(b)</td>
</tr>
</tbody>
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1. Control requirements only apply to enclosed spaces for which there are Luminaire Modifications-in-Place.
2. Multi-level controls are required only for luminaires for which there are Luminaire Modifications-in-Place.
3. Two level lighting control shall have at least one control step between 30% and 70% of design lighting power in a manner providing reasonably uniform illuminations
4. Daylight controls in accordance with Section 130.0(d) are required only for luminaires that are modified-in-place.

130.1(a) = Area Control  
130.1(b) = Multi-level Control  
130.1(c) = Automatic Shut Off Control  
130.1(d) = Daylighting Control  
130.1(e) = Demand Response Control  
130.0(d) = Mfg. Instructions
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Motion Sensors

- All luminaires with mounting heights less than 24’ above the ground
- Motion sensor required
- Reduce lighting power of each luminaire by at least 40 percent but not exceeding 80 percent

**OR**

- Provide continuous dimming
- Shall employ auto-on functionality
- Maximum of 1,500 watts of lighting power shall be controlled together
Motion Sensors

- Exceptions to motion sensors
  - Sales Frontage
  - Sales Lots
  - Sales Canopies
  - Building Facades
  - Ornamental Hardscape
  - Dining
  - Pole-mounted luminaires <= 75 watts
  - Non-pole mounted luminaires <= 30 watts
  - Linear lighting <= 4 watts per linear foot of luminaire
Questions?

This concludes the Title 24 Standards Training.

Please be sure to complete your evaluation sheets so we can plan future events.