Learning Objectives

1. List 2 exemptions to meeting lighting and power requirements.
2. Name at least 3 mandatory requirements for interior lighting controls.
3. Describe 3 options for meeting the interior light reduction requirement.
4. Recall the daylight zone definitions under skylights and adjacent to vertical fenestration.
5. Calculate an interior lighting power allowance.
6. Describe when the additional lighting power allowance can be applied.
7. Explain when exterior lighting controls are required.
8. Recall the number of zones for exterior lighting power densities.
Commercial provisions contained in Chapter 5… with reference to ASHRAE 90.1-2007

Covers lighting controls and power density for interior and exterior

Major changes in the 2009 version

✓ Daylight zone control
✓ New exterior lighting zones
The IECC Code Compliance Process

Must the Project Comply with the IECC?

- Comply with the Envelope Requirements
  - Section 502
  - 90.1 Section 5

- Comply with the Mechanical/SWH Requirements
  - Sections 503 and 504

- Comply with the Power & Lighting Requirements
  - IECC Section 505
  - 90.1-2007 Section 9

- Document Compliance with the IECC
- Plan Review
- Inspection

IECC Section 506 Building Performance Method
What’s Covered Under Electrical Power and Lighting Systems Requirements?

Mandatory Interior Lighting requirements

✓ Required Controls
✓ Wattage/Efficiency Limits

Interior Lighting Power Allowances (watts/ft²)

Exterior Lighting Controls

✓ Required Controls
✓ Lamp Efficiency

Exterior Lighting Power Allowances (watts/ft²)

Electric Metering
When do the Lighting and Power Requirements Apply?

- Original Installed Lighting System in a New Building, Addition, or Tenant Build-out
- Existing Lighting System that is Altered
- Change in Occupancy that Increases Energy
- Change in Occupancy that requires less LPD as shown in table 505.3.2

Exceptions:
- Historic buildings
  - State or National listing
  - Eligible to be listed
- Alterations where less than 50% of the luminaires in a space are replaced and installed interior power lighting is not increased
- Lighting within dwelling units
  - Where $\geq$ 50% of permanently installed fixtures include high-efficacy lamps
High-Efficacy Lamps

Defined in the 2009 IECC as:

- Compact fluorescent lamps, T-8 or smaller diameter linear fluorescent lamps, or lamps with a minimum efficacy based on lamp wattage

<table>
<thead>
<tr>
<th>Lamp Wattage</th>
<th>Efficacy</th>
</tr>
</thead>
<tbody>
<tr>
<td>&gt; 40 watts</td>
<td>60 lumens/watt</td>
</tr>
<tr>
<td>15-40 watts</td>
<td>50 lumens/watt</td>
</tr>
<tr>
<td>&lt; 15 watts</td>
<td>40 lumens/watt</td>
</tr>
</tbody>
</table>
Connected Interior Lighting Power must not exceed Interior Lighting Power Allowance

1. Calculate Interior Lighting Power Allowance
   - Building Area type allowance
   - Additional allowances
2. Calculate proposed connected lighting power
   - Wattage calculation “rules”
   - Exempted lighting
3. Compare values: proposed wattage must be less than or equal to allowed wattage
Interior Lighting Power Allowance

Building Area Type

✓ **Note**: Alternate standard ASHRAE/IESNA 90.1-2007 provides whole building and space-by-space options
First, choose an appropriate “Building Area Type” from the allowance table (505.5.2)

✓ “Building Area” includes all spaces that are associated with that business or function type. For example a space with:
  • Corridors,
  • Restrooms,
  • A lobby, and
  • Office space

…would be considered an Office Building Area Type

Then...multiply the lighting power density (W/ft^2) by the total building square footage to get allowed watts for compliance
A 200,000 ft\(^2\) office building that contains corridor, restrooms, break rooms and a lobby is given 1.0 W/ft\(^2\) for the entire building.

<table>
<thead>
<tr>
<th>Building Area Type</th>
<th>W/ft(^2)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Office</td>
<td>1.0</td>
</tr>
<tr>
<td>Penthouse</td>
<td>0.5</td>
</tr>
<tr>
<td>Police/Fire Station</td>
<td>1.3</td>
</tr>
<tr>
<td>Religious Building</td>
<td>1.3</td>
</tr>
<tr>
<td>Retail</td>
<td>1.5</td>
</tr>
<tr>
<td>School/University</td>
<td>1.2</td>
</tr>
<tr>
<td>Sports Arena</td>
<td>1.1</td>
</tr>
<tr>
<td>Hotel</td>
<td>1.0</td>
</tr>
<tr>
<td>Hospital</td>
<td>1.2</td>
</tr>
<tr>
<td>Library</td>
<td>1.3</td>
</tr>
<tr>
<td>Manufacturing Facility</td>
<td>1.3</td>
</tr>
<tr>
<td>Motel</td>
<td>1.0</td>
</tr>
<tr>
<td>Motion Picture Theater</td>
<td>1.2</td>
</tr>
<tr>
<td>Multi-family</td>
<td>0.7</td>
</tr>
<tr>
<td>Museum</td>
<td>1.1</td>
</tr>
<tr>
<td>Parking Garage</td>
<td>0.3</td>
</tr>
<tr>
<td>Penitentiary</td>
<td>1.0</td>
</tr>
<tr>
<td>Performing Arts Theater</td>
<td>1.6</td>
</tr>
<tr>
<td>Police/Fire Station</td>
<td>1.0</td>
</tr>
<tr>
<td>Post Office</td>
<td>1.1</td>
</tr>
<tr>
<td>Religious Building</td>
<td>1.3</td>
</tr>
<tr>
<td>Retail</td>
<td>1.5</td>
</tr>
<tr>
<td>School/University</td>
<td>1.2</td>
</tr>
<tr>
<td>Sports Arena</td>
<td>1.1</td>
</tr>
<tr>
<td>Town Hall</td>
<td>1.1</td>
</tr>
<tr>
<td>Transportation</td>
<td>1.0</td>
</tr>
<tr>
<td>Warehouse</td>
<td>0.8</td>
</tr>
</tbody>
</table>

Office: 200,000 ft\(^2\)
1.0 W/ft\(^2\) = 200,000 W
How is an allowance determined if the building has more than one Building Area Type?

Example – A building contains the following area types

- Museum: 40,000 ft²
- Retail: 5,000 ft²
- Cafeteria: 10,000 ft²

Use the more specific building area type where more than one area type exists in the building.

Sum the individual *(lighting power density X area square footage)* values for Total Power Allowance.
Multiple Occupancy Building Example

Museum: 40,000 ft$^2$
  at 1.1 W/ft$^2$ = 44,000 W

Cafeteria: 10,000 ft$^2$
  at 1.4 W/ft$^2$ = 14,000 W

Retail: 5,000 ft$^2$
  at 1.5 W/ft$^2$ = 7,500 W

Total watts allowed = 65,500 W
Additional Interior Lighting Power Allowance =

1000 watts +
(Retail Area 1 x 0.6 W/ft²) +
(Retail Area 2 x 0.6 W/ft²) +
(Retail Area 3 x 1.4 W/ft²) +
(Retail Area 4 x 2.5 W/ft²),

Where:

✓ **Retail Area 1** = the floor area for all products not listed in Retail Area 2, 3 or 4.
✓ **Retail Area 2** = the floor area used for the sale of vehicles, sporting goods and small electronics.
✓ **Retail Area 3** = the floor area used for the sale of furniture, clothing, cosmetics and artwork.
✓ **Retail Area 4** = the floor area used for the sale of jewelry, crystal, and china.
Exception:
Other merchandise categories may be included in Retail Areas 2 through 4 above, provided that justification documenting the need for additional lighting power based on visual inspection, contrast, or other critical display is approved by the authority having jurisdiction.
Sum the wattage of all proposed connected lighting power

This must include all lighting that is part of the design for the space including:

- ✓ Overhead lighting
- ✓ Task lighting
- ✓ Decorative lighting
Lighting wattage must be calculated in accordance with Section 505.5.1

- Screw lamp holders: maximum labeled wattage of the luminaire
- Low voltage lighting: transformer wattage
- Line voltage track:
  1. specified wattage with minimum of 30 W/linear ft OR
  2. wattage limit of system’s circuit breaker OR
  3. wattage limit of other permanent current limiting devices
- Other: manufacturer’s rated wattage of lamp and associated ballast
Exemptions to Proposed Lighting Power Calculation

Connected power for following not included in calculations:

- Professional sports arena playing field
- Sleeping unit lighting
- Emergency lighting automatically off during normal building operation
- Lighting in spaces specifically designed for use by occupants with special lighting needs including visual impairment and other medical and age related issues
- Lighting in interior spaces specifically designated as a registered interior historic landmark
- Casino gaming areas
- Lighting equipment used for the following exempt if in addition to general lighting and controlled by an independent control device
  - Task lighting for medical and dental procedures
  - Display lighting for exhibits in galleries, museums and monuments
Exemptions to Proposed Lighting Power Calculation

✓ Theatrical, stage, film, and video production
✓ Used for photographic processes
✓ Integral to equipment or instrumentation installed by manufacturer
✓ Plant growth or maintenance
✓ Advertising or directional signage
✓ Food warming and food prep equipment (in restaurant buildings and areas)
✓ Lighting equipment that is for sale
✓ Lighting demonstration equipment in lighting education facilities
✓ Approved because of safety or emergency considerations, exclusive of exit lights
✓ Integral to both open and glass-enclosed refrigerator and freezer cases
✓ In retail display windows when the display is enclosed by ceiling-height partitions
✓ Furniture-mounted supplemental task lighting controlled by automatic shutoff
What if My Proposed Design Does Not Meet Code?

Check calculations

- Appropriate area type allowances used?
- Actual lighting equipment wattages used?

...and design

- Reasonable illuminance levels provided?
- Efficient light sources used?

Use alternate Standard 90.1-2007*

Use total Building Performance Method

*Section 501.2 Application requires 90.1 to be used in its entirety (Envelope, Lighting, Mechanical) if used as an alternate compliance path
Independent Lighting Control required for each space surrounded by floor-to-ceiling partitions

- Must be located in the space served, - OR -
- Switched from a remote location
  - Must have indicator that identifies the lights served and their status (off or on)

Exemptions

- Security or emergency areas that must be continuously lighted
- Lighting in stairways or corridors that are elements of the means of egress

Intent: Allow occupants to control unneeded lighting!
Light Reduction Controls must allow the occupant to reduce connected lighting

- By at least 50%
- In a reasonably uniform illumination pattern

**Intent:** Allow occupants to moderate light levels to save energy!
Light Reduction Control Options

- Controlling all lamps or luminaires
- Dual switching of alternate rows of luminaires, alternate luminaires or lamps
- Switching middle lamp luminaires independently from the outer lamps
- Each luminaire or each lamp
Light Reduction Control Not required for the following:

- Areas with only one luminaire
- Areas controlled by occupancy sensor
- Corridors, storerooms, restrooms or public lobbies
- Sleeping units
- Spaces with $<0.6 \text{ w/ft}^2$
Automatic lighting shutoff control device required in all buildings larger than 5,000 ft$^2$

**Building Defined:**
- “Any structure used or intended for supporting or sheltering any use or occupancy”
- Building area surrounded by exterior walls and fire walls

**Exempted spaces**
- Sleeping units
- Lighting for patient care
- When an automatic shutoff would endanger occupant safety or security
Automatic Lighting Shutoff Compliance Options

1. Control lights on a scheduled basis *(automatic time switch)*
   - Time-of-day controller
   - Controls ≤ 25,000 ft² and not more than one floor, or

2. Occupant sensor
   - Turn lights off within 30 minutes of occupant leaving the space

3. Signal from another control or alarm that indicates the area is unoccupied
Interior Lighting Control

505.2.2.2.1 Occupant Override

✓ Readily accessible
✓ Within view of the lights or area controlled
✓ Manually operated
✓ ≤ 2 hour override
  - The override allows lighting to remain on no more than 2 hours when override is initiated
✓ Controls an area ≤ 5,000 ft²
✓ **Exemptions**
  - Can be over 2 hour override in malls and arcades, auditoriums, single-tenant retail space, industrial facilities and arenas when using captive key override
  - Override in malls and arcades, auditoriums, single-tenant retail space, industrial facilities and arenas can cover up to 20,000 ft²
Feature that turns off all loads for 24 hours then resumes the normally scheduled operation

**Exceptions**

- Retail stores and associated malls
- Restaurants
- Grocery stores
- Places of religious worship
- Theaters
Daylight Zone Definition
Under Skylights

The area under skylights whose horizontal dimension, in each direction, is equal to the skylight dimension plus the smaller of:

- The floor-to-ceiling height, or
- The distance to a ceiling height opaque partition, or
- One-half the distance to adjacent skylights or vertical fenestration (*whichever is least*)
The daylight zone depth is assumed to be 15 feet into the space or to the nearest ceiling height opaque partition, whichever is less.

The daylight zone width is assumed to be:

- the width of the window plus 2 feet on each side, or
- the window width plus distance to opaque partitions, or
- the window width plus one-half the distance to adjacent skylight or vertical fenestration, whichever is least.
Daylight Zones
✓ Must have individual control of the lights independent of general area lighting

Contiguous daylight zones adjacent to vertical fenestration
✓ Can be controlled by a single controlling device if the zone doesn’t include areas facing more than two adjacent orientations (i.e., north, east, south, west)

Daylight zones under skylights > 15 ft from the perimeter
✓ Must be controlled separately from daylight zones adjacent to vertical fenestration

Exception
✓ Daylight spaces 1) enclosed by walls or ceiling height partitions and 2) containing two or fewer light fixtures
  • not required to have a separate switch for general area lighting

Note: required controls may be manual or automatic
Interior Lighting Control

505.2.3 Sleeping Unit Lighting Control

- Applies to hotels, motels, boarding houses, or similar
- Master switch required at each room or main room entry
- Must control all permanently wired luminaires or switched receptacles

Exceptions: bathrooms

![Diagram of Standard Room and Suite]
Tandem Wiring for all Odd Numbered Lamp Configurations

**Exceptions**

- Where electronic high frequency ballasts are used
- Luminaires on emergency circuits
- Luminaires with no available pair in the same area
Exit Signs

505.4

Exit Signs

✓ Internally illuminated exit signs shall not exceed 5 watts per side
Connected Exterior Lighting Power must not exceed Exterior Lighting Power Allowance

1. Calculate exterior lighting power allowance
   - Lighting power densities by exterior function and by applicable lighting zone

2. Calculate proposed connected lighting power
   - Wattage calculation “rules”
   - Exempted lighting

3. Compare values: proposed wattage must be less than or equal to allowed wattage
What areas are covered under exterior lighting allowances?

✓ ** Tradable surfaces**

Common exterior lighted needs that can be traded for other needs.

- For example, wattage allowed for parking lot lighting can be “traded” and used for canopy lighting.

✓ ** Nontradable surfaces**

Less common exterior lighted needs that **cannot** be traded for other needs.

- These applications have more specific security or task illuminance needs.
Tradable Surfaces

- Uncovered parking lots and areas
- Walkways (under and over 10 feet wide)
- Stairways
- Pedestrian tunnels
- Main building entrances and exits
- Other doors
- Entry canopies
- Free-standing and attached sales canopies
- Open sales areas
- Street frontage sales areas
Nontradable Surfaces

- Building facades
- Automated teller machines and night depositories
- Entrances and gatehouse inspection stations at guarded facilities
- Loading areas for law enforcement, fire, ambulance and other emergency vehicles
- Drive-up windows/doors
- Parking near 24-hour retail entrances
## Exterior Lighting Zones

Table 505.6.2(1)

<table>
<thead>
<tr>
<th>Lighting Zone</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Developed areas of national parks, state parks, forest land, and rural areas</td>
</tr>
<tr>
<td>2</td>
<td>Areas predominantly consisting of residential zoning, neighborhood business districts, light industrial with limited nighttime use and residential mixed use areas</td>
</tr>
<tr>
<td>3</td>
<td>All other areas</td>
</tr>
<tr>
<td>4</td>
<td>High-activity commercial districts in major metropolitan areas as designated by the local land use planning authority</td>
</tr>
</tbody>
</table>
Exterior Lighting Zones
Table 505.6.2(1)
## Exterior Lighting Zones

<table>
<thead>
<tr>
<th></th>
<th>Zone 1</th>
<th>Zone 2</th>
<th>Zone 3</th>
<th>Zone 4</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Base Site Allowance</strong></td>
<td>500 W</td>
<td>600 W</td>
<td>750 W</td>
<td>1300 W</td>
</tr>
<tr>
<td>** Tradable Surfaces**</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Uncovered Parking Areas</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Parking areas and drives</td>
<td>0.04 W/ft²</td>
<td>0.06 W/ft²</td>
<td>0.10 W/ft²</td>
<td>0.13 W/ft²</td>
</tr>
<tr>
<td><strong>Building Grounds</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Walkways less than 10 feet wide</td>
<td>0.7 W/linear foot</td>
<td>0.7 W/linear foot</td>
<td>0.8 W/linear foot</td>
<td>1.0 W/linear foot</td>
</tr>
<tr>
<td>Plaza areas</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Special Feature Areas</td>
<td>0.14 W/ft²</td>
<td>0.14 W/ft²</td>
<td>0.16 W/ft²</td>
<td>0.2 W/ft²</td>
</tr>
<tr>
<td>Stairways</td>
<td>0.75 W/ft²</td>
<td>1.0 W/ft²</td>
<td>1.0 W/ft²</td>
<td>1.0 W/ft²</td>
</tr>
<tr>
<td>Pedestrian Tunnels</td>
<td>0.15 W/ft²</td>
<td>0.15 W/ft²</td>
<td>0.2 W/ft²</td>
<td>0.3 W/ft²</td>
</tr>
</tbody>
</table>
## Exterior Lighting Zones con’t

<table>
<thead>
<tr>
<th>Tradable Surfaces</th>
<th>Zone 1</th>
<th>Zone 2</th>
<th>Zone 3</th>
<th>Zone 4</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Building Entrances and Exits</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Main entries</td>
<td>20 W/linear foot of door width</td>
<td>20 W/linear foot of door width</td>
<td>30 W/linear foot of door width</td>
<td>30 W/linear foot of door width</td>
</tr>
<tr>
<td>Other doors</td>
<td>20 W/linear foot of door width</td>
<td>20 W/linear foot of door width</td>
<td>20 W/linear foot of door width</td>
<td>20 W/linear foot of door width</td>
</tr>
<tr>
<td>Entry Canopies</td>
<td>0.25 W/ft²</td>
<td>0.25 W/ft²</td>
<td>0.4 W/ft²</td>
<td>0.4 W/ft²</td>
</tr>
<tr>
<td><strong>Sales Canopies</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Free-standing and attached</td>
<td>0.6 W/ft²</td>
<td>0.6 W/ft²</td>
<td>0.8 W/ft²</td>
<td>1.0 W/ft²</td>
</tr>
<tr>
<td><strong>Outdoor Sales</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Open areas (including vehicle sales lots)</td>
<td>0.25 W/ft²</td>
<td>0.25 W/ft²</td>
<td>0.5 W/ft²</td>
<td>0.7 W/ft²</td>
</tr>
<tr>
<td>Street frontage for vehicle sales lots in addition to “open area” allowance</td>
<td>No allowance</td>
<td>10 W/linear foot</td>
<td>10 W/linear foot</td>
<td>30 W/linear foot</td>
</tr>
</tbody>
</table>
### Exterior Lighting Zones con’t

<table>
<thead>
<tr>
<th>Non-Tradable Surfaces</th>
<th>Building Facades</th>
<th>0.1 W/ft² for each illuminated wall or surface or 2.5 W/linear foot for each illuminated wall or surface length</th>
<th>0.15 W/ft² for each illuminated wall or surface or 3.75 W/linear foot for each illuminated wall or surface length</th>
<th>0.2 W/ft² for each illuminated wall or surface or 5.0 W/linear foot for each illuminated wall or surface length</th>
</tr>
</thead>
<tbody>
<tr>
<td>Automated teller machines and night depositories</td>
<td>270 W per location plus 90 W per additional ATM per location</td>
<td>270 W per location plus 90 W per additional ATM per location</td>
<td>270 W per location plus 90 W per additional ATM per location</td>
<td>270 W per location plus 90 W per additional ATM per location</td>
</tr>
<tr>
<td>Entrances and gatehouse inspection stations at guarded fac.</td>
<td>0.75 W/ft² of covered and uncovered area</td>
<td>0.75 W/ft² of covered and uncovered area</td>
<td>0.75 W/ft² of covered and uncovered area</td>
<td>0.75 W/ft² of covered and uncovered area</td>
</tr>
<tr>
<td>Loading areas for law enforcement, fire, ambulance and other emergency service vehicles</td>
<td>0.5 W/ft² of covered and uncovered area</td>
<td>0.5 W/ft² of covered and uncovered area</td>
<td>0.5 W/ft² of covered and uncovered area</td>
<td>0.5 W/ft² of covered and uncovered area</td>
</tr>
<tr>
<td>Drive-up windows/doors</td>
<td>400 W per drive-through</td>
<td>400 W per drive-through</td>
<td>400 W per drive-through</td>
<td>400 W per drive-through</td>
</tr>
<tr>
<td>Parking near 24-hour retail entrances</td>
<td>800 W per main entry</td>
<td>800 W per main entry</td>
<td>800 W per main entry</td>
<td>800 W per main entry</td>
</tr>
</tbody>
</table>
What if My Proposed Exterior Lighting Does Not Meet Code?

Check calculations
- Appropriate surface allowances used?
- Actual lighting equipment wattages used?

…and design
- Reasonable illuminance levels provided?
- Efficient light sources used?
- Re-design the project

Use alternate Standard 90.1-2007*

Use total Building Performance Method

*Section 501.2 Application requires 90.1 to be used in its entirety (Envelope, Lighting, Mechanical) if used as an alternate compliance path
For dusk-to-dawn lighting: astronomical time switch or photosensor

For all other: astronomical time switch OR photosensor + time switch

All time switches must have at least 10 hour battery backup
Exterior Efficiency Requirement
505.6.1

Building grounds lighting luminaires over 100 watts must have source efficacy of at least 60 lumens per watt.

<table>
<thead>
<tr>
<th>Light Source</th>
<th>Typical System Efficacy Range in LPW (varies depending on wattage and lamp type)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Incandescent</td>
<td>10-18</td>
</tr>
<tr>
<td>Halogen incandescent</td>
<td>15-20</td>
</tr>
<tr>
<td>Compact fluorescent (CFL)</td>
<td>35-60</td>
</tr>
<tr>
<td>Linear fluorescent</td>
<td>50-100</td>
</tr>
<tr>
<td>Metal halide</td>
<td>50-90</td>
</tr>
</tbody>
</table>

**Exceptions**

- ✓ Controlled by motion sensor
- ✓ Any of the exterior lighting power allowance exceptions
- ✓ As approved for a historical, safety, signage, or emergency consideration
Exterior Grounds Lighting Controls

505.6.1 Using the Evaluation Checklists

Exterior grounds lighting over 100 W provides >60 lm/W unless on motion sensor or fixture is exempt from scope of code or from external LPD.
The following lighting does not need to be included in the proposed lighting calculation:

- Specialized signal, directional, and marker lighting associated with transportation
- Advertising signage or directional signage
- Lighting integral to *equipment* or instrumentation and installed by its *manufacturer*
- Lighting for theatrical purposes, including performance, stage, film production, and video production
- Lighting for athletic playing areas
- Temporary lighting
- Lighting for industrial production, material handling, transportation sites, and associated storage areas
- Theme elements in theme/amusement parks
- Lighting used to highlight features of public monuments and registered *historic* landmark structures or *buildings*
Separate metering required for each dwelling unit
Section Review: Lighting

1. What are 2 exemptions to meeting lighting and power requirements?
2. What are 3 mandatory requirements for interior lighting controls?
3. What are 3 options for meeting the interior light reduction requirement?
4. What are the daylight zone definitions under skylights and adjacent to vertical fenestration?
5. How do you calculate a lighting power allowance?
6. When can the additional lighting power allowance be applied?
7. When are exterior lighting controls required?
8. How many zones are there for exterior lighting power densities?