Providing effective energy strategies for buildings and communities

2018 IECC Lighting
12.06.2018
Who we are

We assist buildings and communities in achieving energy efficiency, saving money, and becoming more sustainable.

We are an applied research program at University of Illinois, working in collaboration with 360 Energy Group.

Our goal: Reduce the energy footprint of Illinois.
SEDAC is the Illinois Energy Conservation Code Training Provider

This training program is sponsored by Illinois EPA Office of Energy
Energy Code Assistance

- Technical support
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- Workshops
- Webinars
- Online on-demand training modules
Energy Code Training

SEDAC is the Illinois Energy Conservation Code training provider

The Smart Energy Design Assistance Center (SEDAC), in partnership with the Illinois EPA Office of Energy, provides training to increase awareness of the Illinois Energy Conservation Code and to improve the energy efficiency of new construction and renovation in Illinois. Community code officials, construction professionals and trades, and design professionals such as architects and engineers are invited to participate. SEDAC offers workshops, webinars, online training, resources, and technical support.

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2018 International Energy Conservation Code

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PREFACE

EFFECTIVE USE OF THE INTERNATIONAL ENERGY CONSERVATION CODE

IECC—COMMERCIAL PROVISIONS

CHAPTER 1 [CE] SCOPE AND ADMINISTRATION
Commercial or Residential?

Residential:

- A detached one-family or two-family dwelling
- Any building 3 stories or less above grade that contains multiple dwelling units, where occupants reside on a primarily permanent basis (4 stories or less in Chicago)

Examples:

- Townhouse
- Row house
- Apartment house
- Convent
- Monastery
- Rectory
- Fraternity or sorority house
- Dormitory
- Rooming house
Commercial or Residential?

- 5 story mixed use building with 2 stories of retail stores and 3 stories of apartments in Chicago
- 3 story mixed use building with 1 story of retail stores and 2 stories of apartments in Bloomington
- 5 story single family home
- 3 story hotel
• R404.1 Lighting Equipment (Mandatory)
  • Not less than 90% of the permanently installed lighting fixtures shall contain only high-efficacy lamps*.

• R404.1.1 Lighting Equipment (Mandatory)
  • Fuel gas lighting systems shall not have continuous burning pilot lights.

* High-Efficacy Lamps:
  • 60 lm/W for lamps > 40W
  • 50 lm/W for lamps 15 – 40W
  • 40 lm/W for lamps ≤ 15W

IL Amendments:
- Fixtures ≥ 55 lm/W
- Lamps ≥ 65 lm/W
• **R402.4.5 Recessed Lighting**
  - Recessed luminaires installed in the thermal envelope shall be sealed. IC-rated.
  - Labeled as having an air leakage rate $\leq 2.0$ cfm.
  - Sealed with a gasket or caulked between the housing & interior wall or ceiling covering.
2018 IECC C405 Lighting

• Mandatory Provisions
  • C405.1 General
  • C405.2 Lighting Controls
  • C405.4 Exterior Lighting Power Requirements
• Major Highlights

• Reduced Lighting Power Allowances
• New Choice of Luminaire-Level Lighting Controls (LLLC)
• Broadened Mandatory Control Requirements
• Interior Automatic Lighting Shutoff
• Manual Override Switches
• Daylight-Responsive Interior Lighting Controls
• Special Applications
• Exterior Lighting Control
• Clarifications
2018 IECC Other Commercial Lighting related requirements

• Major Highlights

Additional Energy Efficiency Options:
• C406.3 Reduced Lighting Power: < 90%

• C406.4 Enhanced Digital Lighting Controls:
  - Luminaires configured for continuous dimming
  - Luminaires addressed individually or ≤ 4 luminaires
  - ≤ 8 luminaires be controlled together in a daylight zone
  - Controlled through a digital control system
  - CD to include a Sequence of Operation
  - Functional testing to comply with C408
Major Highlights

C408.3 Functional Testing of Lighting Controls

- Prior to passing final inspection, registered design professional shall provide evidence that lighting controls have been tested to ensure that control hardware & software are calibrated, adjusted, programmed and in proper working condition in accordance with the construction documents & manufacturer’s instruction.

- Documentation Requirements: Construction documents shall specify that Drawings (location & catalogue # of each equipment), Manuals & Report are provided to the owner within 90 days of the receipt of Certificate of Occupancy.
IECC 2018
Section 405
Lighting Systems
C405.1 General

Dwelling Units within Multi-family Buildings
• R404.1

All Other Dwelling Units
• R404.1
• or C405.2.4 & C405.3

Sleeping Units
• C405.2.4 & R404.1
• or C405.2.4 & C405.3

R404.1: High-efficacy Lights
C405.2.4: Specific App Control
C405.3: Interior LP Requirements
C405.2 Lighting Controls

C405.2 Lighting Control (Choose one)

- C405.2.1: Occupancy Control
- C405.2.2: Time-switch Control
- C405.2.3: Daylight Control
- C405.2.4: Specific App Control
- C405.2.5: Manual Control
- C405.2.6: Exterior Lighting Control

Image courtesy of Cree
C405.2 Lighting Controls

(Choose one)

Lighting Controls
- C405.2.1
- C405.2.2
- C405.2.3
- C405.2.4
- C405.2.5
- C405.2.6

LLLC shall independently capable of:

- Monitoring occupancy to brighten or dim lighting
- Monitoring electric & daylight to brighten or dim electric lights
- Configuration & reconfiguration of performance parameters (dim setpoints, timeouts, wireless zoning...)

This page contains a list of lighting control provisions, starting with C405.2.1 and extending through C405.2.6. The main focus is on LLLC (Lighting Load and Lighting Control) systems, which are capable of monitoring and controlling lighting based on occupancy and natural light, as well as adjusting performance parameters.
C405.2.1
Occupant Sensor Controls
C405.2.1 Occupant Sensor Controls

• Required at
  • Classrooms/lecture/training rooms
  • Conference/meeting/multipurpose rooms
  • Copy/print rooms
  • Lounges/breakrooms
  • Enclosed offices
  • **Open plan office areas**
  • Restrooms
  • Storage rooms
  • Locker rooms
  • Other spaces 300 sf or less that are enclosed by floor-to-ceiling height partitions
  • Warehouse storage areas
C405.2.1.2 Occupant Sensor Cntrl Function in Warehouse

- Must reduce lighting power by at least 50% when unoccupied.

- Controls must cover aisleways and open areas. Control for each aisleway shall be independent and shall not control beyond the aisleway.

Image from http://luxreview.com
C405.2.1.2 Occupant Sensor Cntrl Function in Open Plan Offices (≥ 300 sf)

- Zones limited to 600 sf
- Turn off general lights in all zones within **20 minutes** of occupants leaving
- Must reduce lighting power by at least **80%** in a reasonably uniform pattern within 20 minutes after no occupancy
- Daylight responsive controls may activate fixtures only if occupants present

Image from https://www.focalpointlights.com
C405.2.1.2 Occupant Sensor Cntrl Function in Other Areas

- Auto-off within **20 minutes** of occupants leaving
- Manual on or can be auto-on if not more than **50%** power
  - Exception: Full auto-on permitted in *public corridors, stairways, restrooms, primary building entrance areas and lobbies, and areas where manual-on operation would endanger the safety or security of the room or building occupants.*
- Shall incorporate manual control to allow occupants to turn lights off
C405.2.2

Time-switch Controls
C405.2.2 Time-switch Controls

• Required at
  • Areas without occupancy sensor controls

• Exception:
  Areas with a manual control (C405.2.2.2) where
  - Patient care is directly provided
  - Automatic shutoff would endanger occupant safety or security
  - Lighting is intended for continuous operation
  - In shop and laboratory classrooms
Each space with time-switch controls shall be provided with a manual control for light reduction in accordance with C405.2.2.2.

Time-switch controls shall comply with the following:

- Have a minimum 7-day clock & capable of 7 daily schedule
- Holiday shutoff (skip schedule for 24 hrs)
- Program backup for at least 10 hrs if power is disrupted
- Have override switch:
  - Shall be manual
  - Override for max. of 2 hrs
  - Individual override switch may not cover more than 5,000 sf
C405.2.2.2 Light-reduction Controls

- **Manual Controls**
  - Allows occupants to reduce lighting by at least 50% in reasonably uniform pattern:
    - Control all lamps or luminaires
    - Dual switching of alternate rows of luminaires, alternate luminaires, or alternate lamps
    - Switching of middle lamp luminaires independent of the outer lamps
    - Switching each luminaire or each lamp

![Diagram of Manual Controls](image)
C405.2.3
Daylight-responsive Controls
C405.2.3 Daylight Controls

• Required in the following spaces:
  • > 150 W of general lighting within sidelit zones
  • > 150 W of general lighting within toplit zones

• Exceptions:
  • Health care facilities where patient care is directly provided
  • Lighting required for specific application control per C405.2.4
  • Sidelit zones on 1st floor above grade in Group A-2 (assembly uses for food/drink) and Group M (mercantile) occupancies
  • New bldg with TCLP ≤ LPA adj
C405.2.3 Daylight Controls

- **TCLP** (Total Connected Lighting Power)
  
  \[ \text{TCLP} = \text{LVL} + \text{BLL} + \text{LED} + \text{TRK} + \text{Other} \]

Where:

- **LVL** = Rated W of luminaires (max. W installed) for line voltage lamps
- **BLL** = Rated input W of ballast or transformers for luminaires incorporating ballasts or transformer
- **LED** = Rated W of LEDs with drivers
- **TRK** = one of the following for track systems:
  - W of luminaires but not less than 8 W per linear ft
  - W limit of other permanent current-limiting devices
  - W limit of the transformer
- **Other** = W of all other not covered previously
C405.2.3 Daylight Controls

• **LPA adj** (Adjusted Interior Lighting Power Allowance)
  
  \[ LPA \text{ adj} = LPA \text{ norm} \times (1.0 - 0.4 \times \frac{UDZFA}{TBFA}) \]

Where:

- **LPA norm** = Normal Interior Lighting Power Allowance (C405.3.2)
- **UDZFA** = Uncontrolled Daylight Zone Floor Area
- **TBFA** = Total Building Floor Area included in the LPA calc
C405.2.3 Daylight Controls

- LPA adj Exception
  - 40% less than the normal power allowance for daylit areas

Example Office 1:
200,000 sf total area
100,000 sf daylit zones
LPD: 0.79 W/sf
LPA: 158,000 W

LPA adj
= 158,000 W x (1.0 – 0.4x100,000/200,000)
= 158,000 W x 0.8
= 126,400 W (20% less)

Example Office 2:
200,000 sf total area
50,000 sf daylit zones
LPD: 0.79 W/sf
LPA: 158,000 W

LPA adj
= 158,000 W x (1.0 – 0.4x50,000/200,000)
= 158,000 W x 0.9
= 142,200 W (10% less)
C405.2.3.1 Daylight Control Functions

- Toplit zones to be controlled independently of sidelit zones
- Be configured to be calibrated from within the space
- Calibration mechanism to be in a location with ready access
- Dim continuously from full to ≤ 15% in offices, classrooms, labs & library reading rooms
- Configured to completely shut off all lights
- Sidelit zones facing different cardinal orientations to be controlled independently
  Exception: < 150 W in each space can be controlled together
C405.2.3.2 Sidelit Zones

- Floor area adjacent to vertical fenestration
- Area of fenestration $\geq 24$ sf
- Visible Transmittance $\geq 0.20$
C405.2.3.2 Sidelit Zones
C405.2.3.3 Toplit Zones

- Floor area underneath a roof fenestration
- No buildings block direct sunlight hitting the fenestration at the peak solar angle
- \( \frac{VT \times \text{area of roof opening}}{\text{toplit zone area}} \geq 0.008 \)
C405.2.4
Specific Application Controls
C405.2.4 Specific App Controls

- (Occupancy sensor or Time-switch) + Manual control required in:
  - Display and Accent area
  - Lighting in display cases
  - Supplemental task lighting
  - Lighting equipment for sale or demonstration

- Sleeping Units
  - Automatically switch off all permanently installed luminaires & switched receptacles within 20 min. after no occupancy
  Exception: Keycard controlled switches & receptacles
  Patient care space
C405.2.4 Specific App Controls

- **Dwelling Units:**
  - Occupant sensor control (C405.2.1) or light-reduction controls (C405.2.2.2)

- **Lighting for Nonvisual Application (Plant, Food Warming):**
  - Time-switch control (C405.2.2.1) independent of other lighting within the space

Image courtesy of DOE

Image courtesy of Quora
C405.2.5
Manual Controls
C405.2.5 Manual Controls

- Occupants must have ready access

- Located where the controlled lights are visible, or shall identify the area served by the lights and indicate their status

Image courtesy of https://nwlightingnetwork.com
C405.2.6
Exterior Lighting Controls
C405.2.6 Exterior Lighting Controls

Exterior Lighting
C405.2.6.1
C405.2.6.3
C405.2.6.4

Decorative Lighting
C405.2.6.1
C405.2.6.2
C405.2.6.4

Façade & Landscape Lighting
C405.2.6.1: Daylight Shutoff
C405.2.6.2: Decorative Lighting Shutoff
C405.2.6.3: Lighting Setback
C405.2.6.4: Time-switch Function
C405.2.6 Exterior Lighting Controls

- **Daylight Shutoff**

- **Decorative Lighting Shutoff**
  - Building façade and landscape lighting shall automatically shutoff ≤ 1 hr after business closing to ≤ 1 hr before opening

- **Lighting Setback**
  - Total wattage reduced by ≥ 30% by switching or dimming during one of the following:
    - From not later than midnight to not earlier than 6 am
    - From ≤ 1 hour after business closing to ≤ 1 hour before opening
    - During any time where activity has not been detected for ≥ 15 min

- **Time-switch Control**
  - Same as interior time-switch
C405.3
Interior Lighting
C405.3 Interior Lighting

- Methods for determining power allowance (choose one)
  - Building area method
  - Space by space method w/ additional allowances for special use lighting

- 2014 NEC 220.12 Exception Requirements
  - Power monitoring system for total general lighting load of building
  - Power monitoring system alarms if load exceeds values in energy code
  - Demand factors specified in 220.42 not applied to general lighting load
C405.3 Interior Lighting

- The following are excluded from interior load calculation
  - TV broadcast lighting
  - Emergency lighting that is off during normal operation
  - Exit signs
  - Lighting for occupants with special needs such as visual impairment
  - Casino gaming areas
  - Mirror lighting in dressing rooms
  - Task lighting for medical or dental purposes
  - Display lighting for galleries, museums, and monuments
  - Lighting for theatrical purposes
  - Lighting for photographic processes
  - Lighting integral to equipment installed by manufacturer
  - Task lighting for plant growth
  - Food Warming
  - Lighting equipment for sale
  - Advertising or directional signage
C405.3 Interior Lighting

• Building Area Method
  • Floor area for each building type listed in Table C405.3.2(1) times the value in that table for that area
  • Area: All contiguous spaces that accommodate or are associated with a single building area type
  • Where used, each building area type shall be treated as a separate area
## C405.3 Interior Lighting

<table>
<thead>
<tr>
<th>Type of Occupancy</th>
<th>2015 IECC Table C405.3.2(1) (W/SF)</th>
<th>2018 IECC Table C405.3.2(1) (W/SF)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Automotive facility</td>
<td>0.80</td>
<td>0.71</td>
</tr>
<tr>
<td>Convention Center</td>
<td>1.01</td>
<td>0.76</td>
</tr>
<tr>
<td>Courthouse</td>
<td>1.01</td>
<td>0.90</td>
</tr>
<tr>
<td>Dining: Bar lounge/leisure</td>
<td>1.01</td>
<td>0.90</td>
</tr>
<tr>
<td>Dining: cafeteria/fast food</td>
<td>0.90</td>
<td>0.79</td>
</tr>
<tr>
<td>Dining: family</td>
<td>0.95</td>
<td>0.78</td>
</tr>
<tr>
<td>Dormitory</td>
<td>0.57</td>
<td>0.61</td>
</tr>
<tr>
<td>Performing Arts Center</td>
<td>1.39</td>
<td>1.18</td>
</tr>
</tbody>
</table>
### C405.3 Interior Lighting

<table>
<thead>
<tr>
<th>Type of Occupancy</th>
<th>2015 IECC (W/SF)</th>
<th>2018 IECC (W/SF)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Library</td>
<td>1.19</td>
<td>0.78</td>
</tr>
</tbody>
</table>

- **Example Library: 200,000 SF**
  - What would be the 2015 limit?
  - What would be the 2018 limit?
  - What is the difference?
  - (238,000-156,000)

- How many amps would the 2018 lighting consume using 277V lighting? (82,000W)
### C405.3 Interior Lighting

<table>
<thead>
<tr>
<th>Type of Occupancy</th>
<th>2015 IECC (W/SF)</th>
<th>2018 IECC (W/SF)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Library</td>
<td>1.19</td>
<td>0.78</td>
</tr>
</tbody>
</table>

- **Example Library: 200,000 SF**
  - Given the difference of 82,000W, how many tons of air conditioning is this?
  - \((3.412 \text{ BTU/h/W} \& 12,000 \text{ BTU/h/ton})\)
  - \(82,000 \times \frac{3.412}{12,000}\)
C405.3 Interior Lighting

- **Space-by-Space Method**
  - Floor area for each space type listed in Table C405.3.2(2) times the value in that table for that space
  - Tradeoffs between spaces are allowed
  - Additional allowance provided for specific lighting functions if using automatically controlled separate from the general lighting and only for the purpose specified. Additional allowances can not be traded
### C405.3 Interior Lighting

<table>
<thead>
<tr>
<th>Type of Occupancy</th>
<th>2018 IECC Table C405.3.2(2) (W/SF)</th>
<th>2015 IECC Table C405.3.2(2) (W/SF)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Healthcare facility-exam room</td>
<td>1.68</td>
<td>1.66</td>
</tr>
<tr>
<td>Healthcare facility-imaging room</td>
<td>1.06</td>
<td>1.51</td>
</tr>
<tr>
<td>Healthcare facility-medical supply room</td>
<td>0.54</td>
<td>0.74</td>
</tr>
<tr>
<td>Healthcare facility-nursery</td>
<td>1.00</td>
<td>0.88</td>
</tr>
<tr>
<td>Healthcare facility-nurse’s station</td>
<td>0.81</td>
<td>0.71</td>
</tr>
<tr>
<td>Healthcare facility-operating room</td>
<td>2.17</td>
<td>2.48</td>
</tr>
<tr>
<td>Healthcare facility-patient room</td>
<td>0.62</td>
<td>0.62</td>
</tr>
<tr>
<td>Healthcare facility-physical therapy room</td>
<td>0.84</td>
<td>0.91</td>
</tr>
</tbody>
</table>
### C405.3 Interior Lighting

<table>
<thead>
<tr>
<th>Additional Allowance for sales area</th>
<th>2018 IECC Table C405.3.2(2) (W/SF)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Base Allowance</td>
<td>1000 watts</td>
</tr>
<tr>
<td>Vehicles, sporting goods, small electronics</td>
<td>0.45</td>
</tr>
<tr>
<td>Furniture, clothing, cosmetics, artwork</td>
<td>1.05</td>
</tr>
<tr>
<td>Jewelry, crystal, china</td>
<td>1.87</td>
</tr>
<tr>
<td>Other</td>
<td>0.45</td>
</tr>
</tbody>
</table>

**Allowances based on square foot of sales area for each category**
C405.3 Determining Connected Load

- Maximum fixture wattage label
- Ballast input wattage
- Transformer input wattage
- Track lighting
  - IECC: 8W/ft (previously 30 W/ft)
  - AHRAE 90.1: 30 W/ft
  - NEC: 150W/2ft
C405.4
Exterior Lighting
C405.4 Exterior Lighting

• The following are excluded from exterior load calculation
  • Lighting approved because of safety considerations
  • Emergency lighting that is off during normal operation
  • Exit signs
  • Specialized signal, directional, and marker associated with transportation
  • Advertising and directional signage
  • Integral to equipment and installed by manufacturer
  • Theatrical purpose lighting
  • Athletic playing areas
  • Temporary lighting
  • Industrial production, material handing, transportation sites, and associated storage areas
  • Theme elements in theme/amusement parks
  • Used to highlight features of art, monuments, and national flag
  • Lighting for water features and swimming pools
  • Lighting controlled within dwelling units complying with R404.1
C405.4 Exterior Lighting

- Exterior Power Allowance
  - Sum of the base plus the individual areas that are to be illuminated as specified in Table C405.4.2(2) using the zones found in Table C405.4.2(1)

<table>
<thead>
<tr>
<th>Zone</th>
<th>2018 IECC Table C405.4.2(1) Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>National &amp; State Parks, forest land, rural areas</td>
</tr>
<tr>
<td>2</td>
<td>Predominantly residential zoning, neighborhood business district, light industrial with limited night-time use, residential mixed use areas</td>
</tr>
<tr>
<td>3</td>
<td>All Other areas</td>
</tr>
<tr>
<td>4</td>
<td>High activity commercial in major metropolitan areas designated by the local land use planning authority</td>
</tr>
<tr>
<td>Exterior Allowance</td>
<td>Zone 1</td>
</tr>
<tr>
<td>---------------------------</td>
<td>--------</td>
</tr>
<tr>
<td>Base Allowance</td>
<td>350</td>
</tr>
<tr>
<td>Parking/drives</td>
<td>0.03</td>
</tr>
<tr>
<td>Walkways &lt;10’ wide</td>
<td>0.5</td>
</tr>
<tr>
<td>Walkways, other</td>
<td>0.1</td>
</tr>
<tr>
<td>Landscaping</td>
<td>0.03</td>
</tr>
<tr>
<td>Entry canopies</td>
<td>0.2</td>
</tr>
<tr>
<td>Loading docks</td>
<td>0.35</td>
</tr>
<tr>
<td>Open sales lots</td>
<td>0.2</td>
</tr>
</tbody>
</table>
## Exterior Allowance Zone 1 Zone 2 Zone 3 Zone 4

<table>
<thead>
<tr>
<th>Exterior Allowance</th>
<th>Zone 1</th>
<th>Zone 2</th>
<th>Zone 3</th>
<th>Zone 4</th>
</tr>
</thead>
<tbody>
<tr>
<td>Base Allowance</td>
<td>350</td>
<td>400</td>
<td>500</td>
<td>900 W</td>
</tr>
<tr>
<td>Parking/drives</td>
<td>0.03</td>
<td>0.04</td>
<td>0.06</td>
<td>0.08 W/SF</td>
</tr>
<tr>
<td>Walkways &lt;10’ wide</td>
<td>0.5</td>
<td>0.5</td>
<td>0.6</td>
<td>0.7 W/LF</td>
</tr>
<tr>
<td>Walkways, other</td>
<td>0.1</td>
<td>0.1</td>
<td>0.11</td>
<td>0.14 W/SF</td>
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<tr>
<td>Landscaping</td>
<td>0.03</td>
<td>0.04</td>
<td>0.04</td>
<td>0.04 W/SF</td>
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<tr>
<td>Entry canopies</td>
<td>0.2</td>
<td>0.25</td>
<td>0.4</td>
<td>0.4 W/SF</td>
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<tr>
<td>Loading docks</td>
<td>0.35</td>
<td>0.35</td>
<td>0.35</td>
<td>0.35 W/SF</td>
</tr>
<tr>
<td>Open sales lots</td>
<td>0.2</td>
<td>0.2</td>
<td>0.35</td>
<td>0.5 W/SF</td>
</tr>
</tbody>
</table>

**C405.4 Exterior Lighting**
## C405.4 Exterior Lighting

<table>
<thead>
<tr>
<th>Exterior Allowance</th>
<th>Zone 1</th>
<th>Zone 2</th>
<th>Zone 3</th>
<th>Zone 4</th>
</tr>
</thead>
<tbody>
<tr>
<td>Building Façade</td>
<td>0</td>
<td>0.075</td>
<td>0.113</td>
<td>0.15 W/SF</td>
</tr>
<tr>
<td>ATM and night depository</td>
<td></td>
<td>135W per site plus 45W per additional ATM</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Inspection station at guarded facility</td>
<td></td>
<td></td>
<td></td>
<td>0.5 W/SF of area</td>
</tr>
<tr>
<td>Drive-up window</td>
<td></td>
<td></td>
<td></td>
<td>200W per drive through</td>
</tr>
<tr>
<td>Parking near 24-hr retail entrance</td>
<td></td>
<td></td>
<td></td>
<td>400W per main entry</td>
</tr>
</tbody>
</table>
## C405.4 Exterior Lighting

<table>
<thead>
<tr>
<th>Exterior Allowance</th>
<th>Zone 3</th>
</tr>
</thead>
<tbody>
<tr>
<td>ATM and night depository</td>
<td>135W per site plus 45W per additional ATM</td>
</tr>
<tr>
<td>Drive-up window</td>
<td>200W per drive through</td>
</tr>
</tbody>
</table>
• Not commonly used due to some additional requirements
  • 8.4.2 Automatic Receptacle Control
  • 8.4.3 Electrical Energy Monitoring

• Generally used if client requests it or for semi-heated spaces as IECC does not have this category (only conditioned or low-energy building)
8.4.2 Automatic Receptacle Control

- At least 50% of all 125V 15, and 20 amp receptacles and at least 25% of branch circuit feeders for modular furniture
  - Private offices, conference rooms, printing/copy rooms, break rooms, classrooms, and individual workstations
- Controlled by:
  - Scheduled control (zones of 1 floor or 5,000 SF, whichever is less)
  - Occupancy sensor
  - Automated control system
- Must be permanently marked to differentiate controlled and non-controlled and distributed uniformly
8.4.2 Automatic Receptacle Control

Image courtesy of Leviton
8.4.3 Electrical Energy Monitoring

- Each of the following must be monitored separately:
  - Total electrical energy
  - HVAC systems
  - Interior lighting
  - Exterior lighting
  - Receptacle circuits
- Individual tenant spaces separately monitored and made available to each tenant
- Recorded every 15 minutes for at least 36 months