



Code and Best Practice Daylighting and Control Systems

Lighting Legend

\$ *Manual Control Switch*

\$_D *Dimmer Switch*

\$_⌚ *Automatic Lighting Control*

⊙ *Occupancy Sensor*

◇ *Photosensor*



Light off



1 Lamp on



2 Lamps on



Light on



Dimmed Light

505.2 Interior Lighting Controls – Basic Control

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)

Intent: Allow occupants to control unneeded lighting!

Exemptions

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

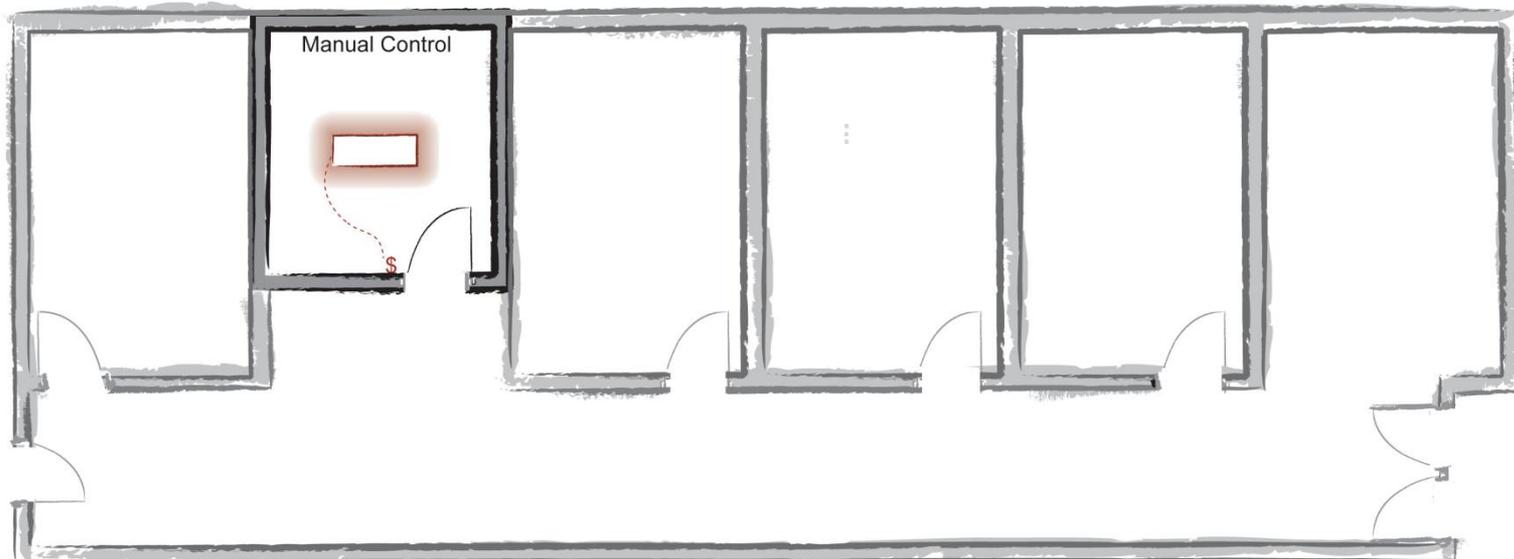
Section 505

Lighting Requirements

Interior Lighting Controls

505.2

- Enclosed Space
- At least one switch within the area or controlled remotely



505.2.2.1 Light Reduction Controls

Light Reduction Controls must allow the occupant to reduce connected lighting

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

Note: Alternate Standard ASHRAE/IESNA 90.1-2007 does not require Light Reduction Control

Intent: Allow occupants to moderate light levels to save energy!

Light Reduction Control Options

Controlling all lamps or luminaires (e.g. dimming)

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 *Exceptions*

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 (see 505.2.3)
- ✓ Spaces with <0.6 w/ft²

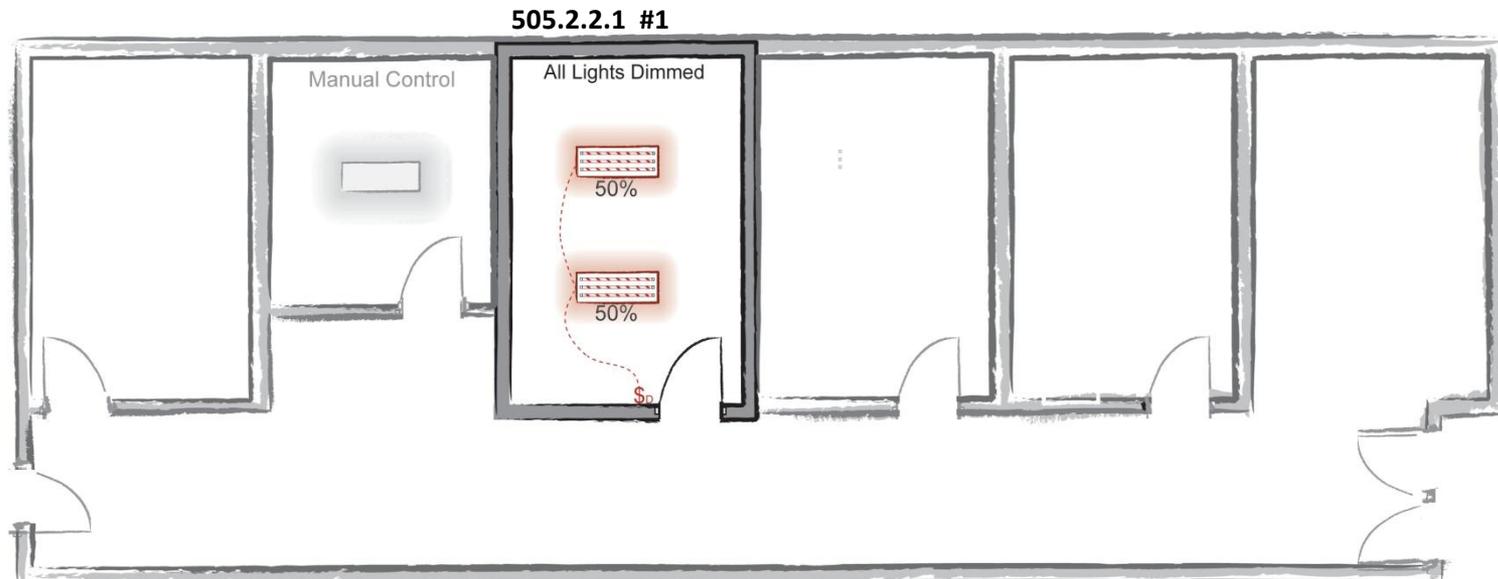


Section 505

Lighting Requirements

Light Reduction Controls

- 505.2.2.1**
- Enclosed Space
 - At least two switches within the area, or a dimming switch, or an occupancy sensor
 - Must allow for lighting reduction of at least 50%

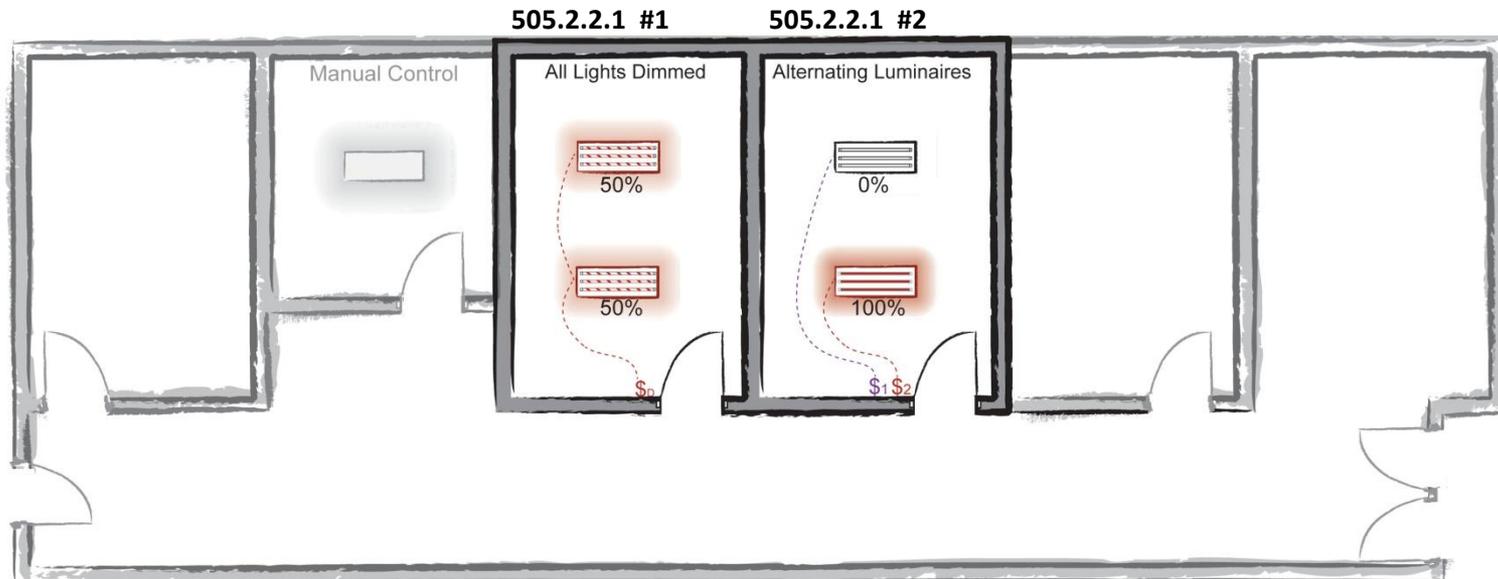


Section 505 Lighting Requirements

Light Reduction Controls

505.2.2.1

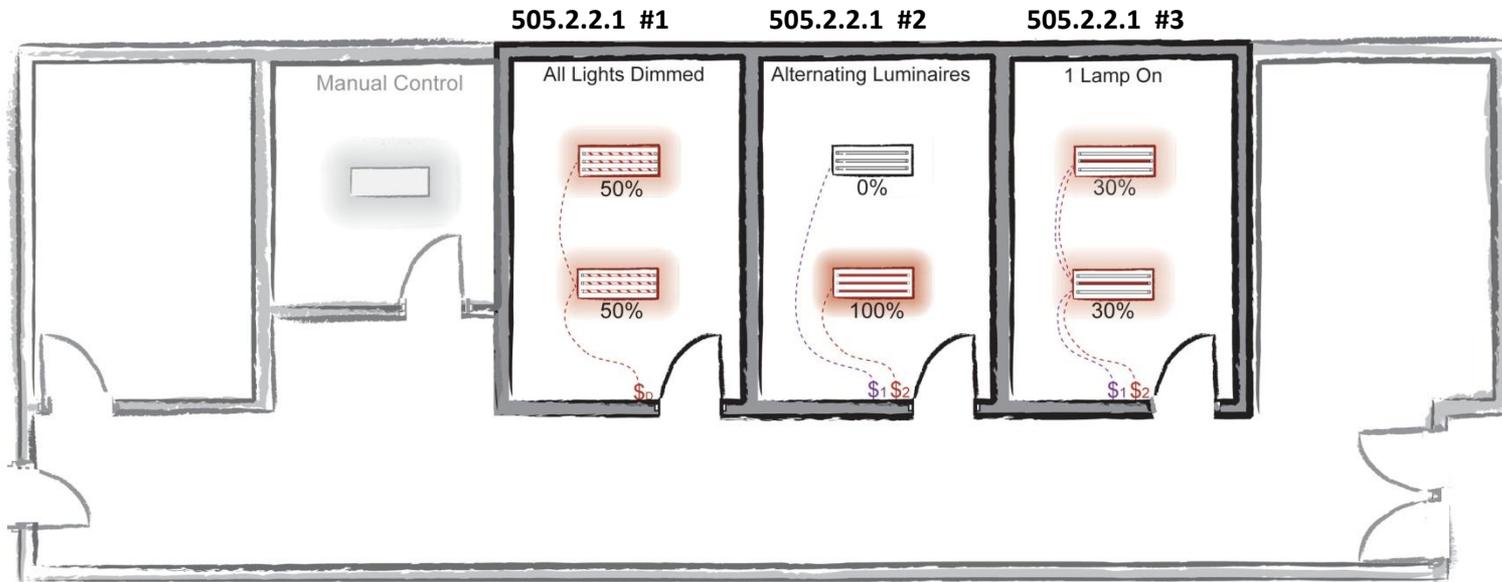
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Section 505 Lighting Requirements

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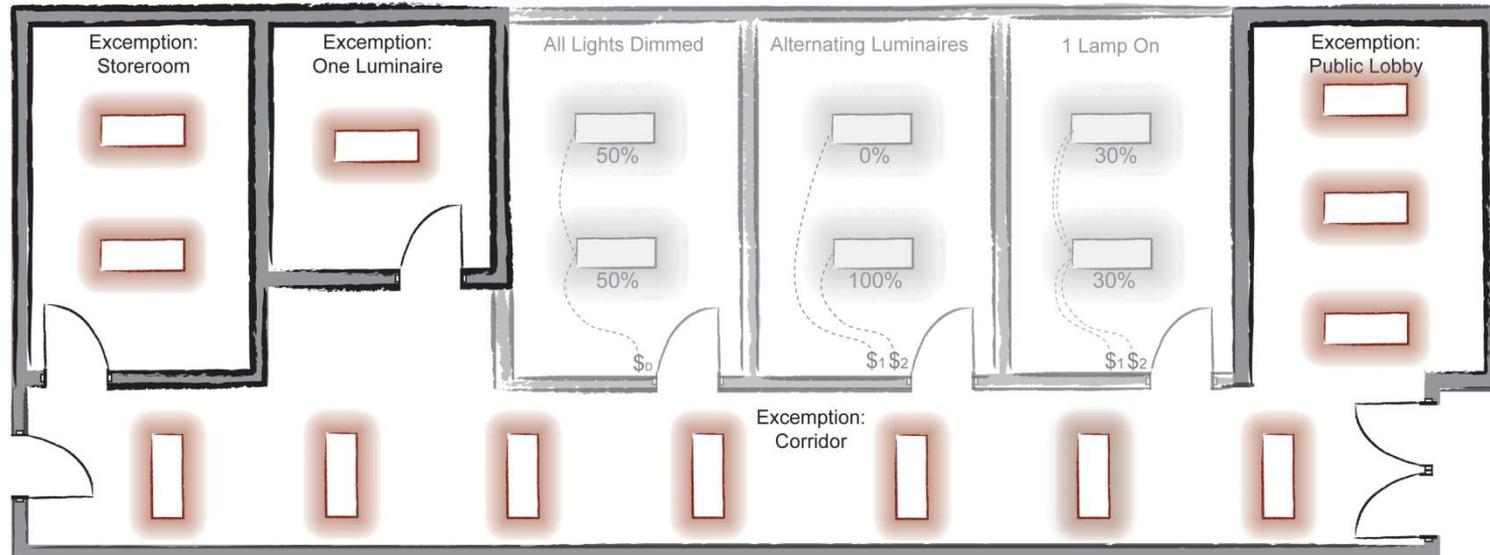


Section 505 Lighting Requirements

Light Reduction Controls Exemptions

505.2.2.1

- Areas that have only one luminaire
- Areas controlled by occupant sensor
- Spaces that use less than .6 watts/sq ft
- Storerooms
- Corridors
- Restrooms
- Sleeping Units



505.2.2.3 Daylight Zone Control- Vertical Fenestration

The daylight zone depth is assumed to be 15 feet into the space or to the nearest wall, 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

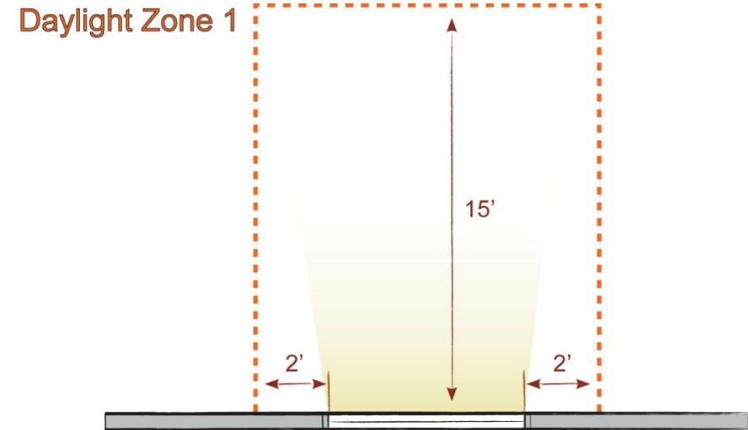
Daylight Zone Control- Vertical Fenestration

Perpendicular from vertical fenestration:

15'

Parallel to vertical fenestration:

2'



Daylight Zone Control- Vertical Fenestration

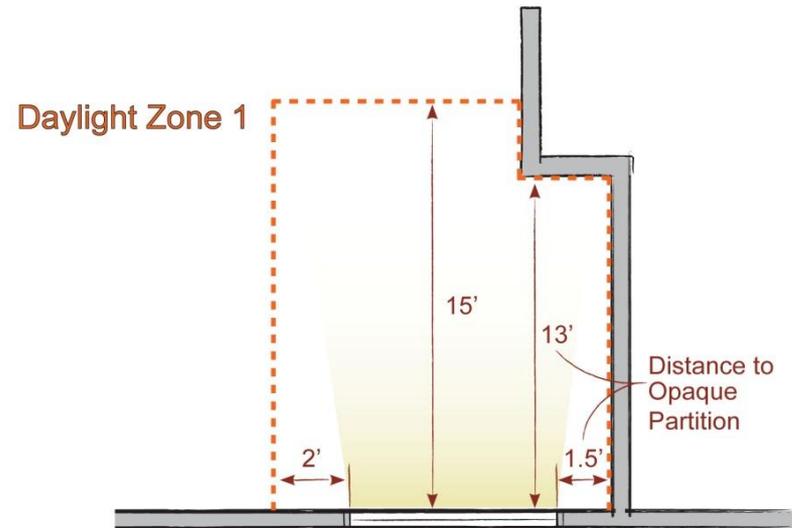
Perpendicular from vertical fenestration:

15'

Parallel to vertical fenestration:

2'

or to opaque partition



Daylight Zone Control- Vertical Fenestration

Perpendicular from vertical fenestration:

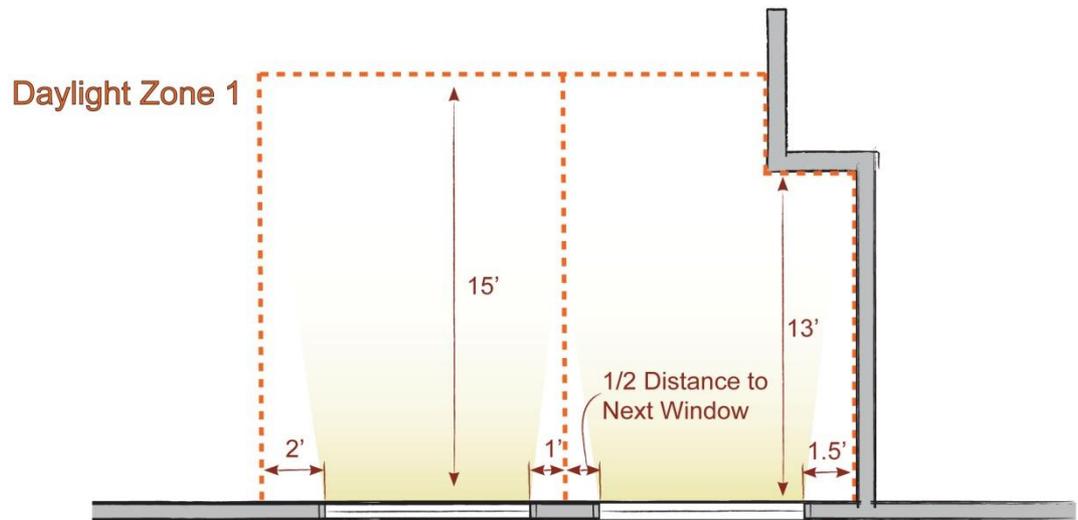
15'

Parallel to vertical fenestration:

2'

or to opaque partition

***or* halfway to adjacent window**



Daylight Zone Control- Vertical Fenestration

Perpendicular from vertical fenestration:

15'

or halfway to skylight

Parallel to vertical fenestration:

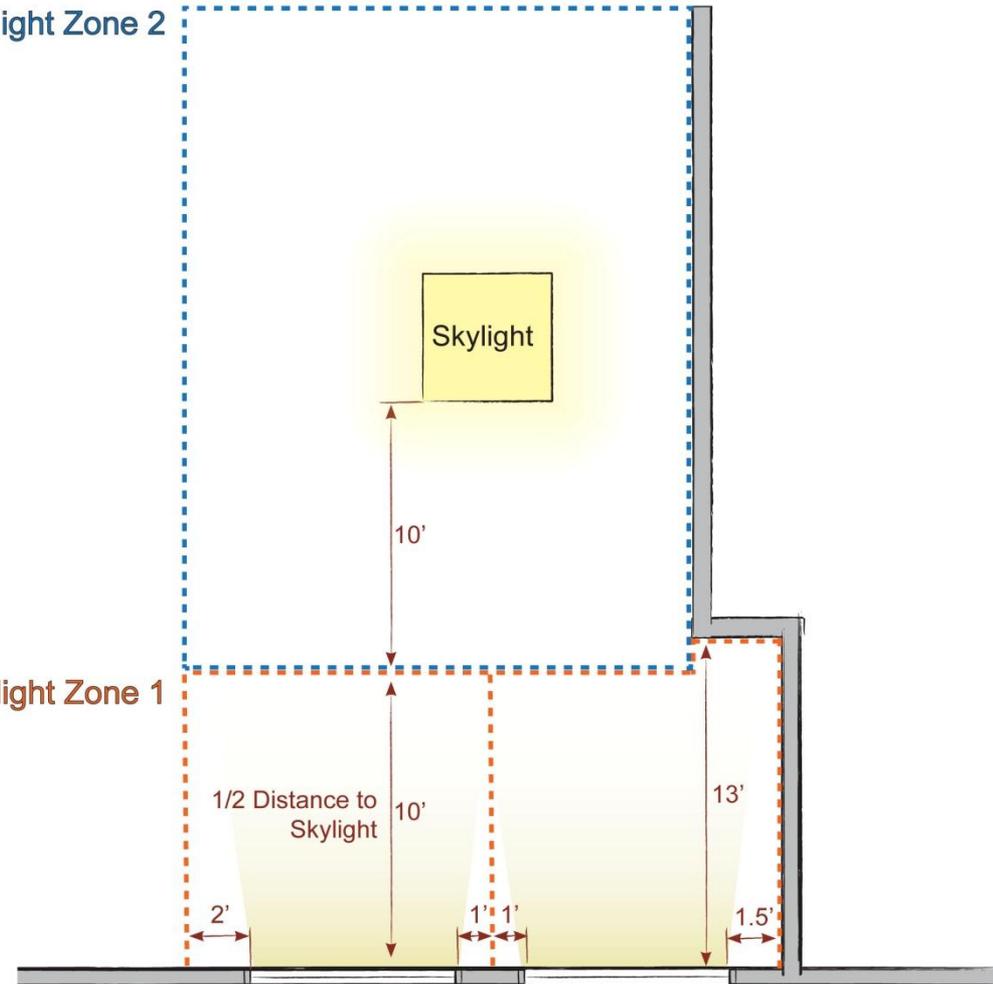
2'

**or halfway to adjacent window
or to opaque partition**

- ✓ *the window width plus one-half the distance to adjacent skylight or vertical fenestration, whichever is least*

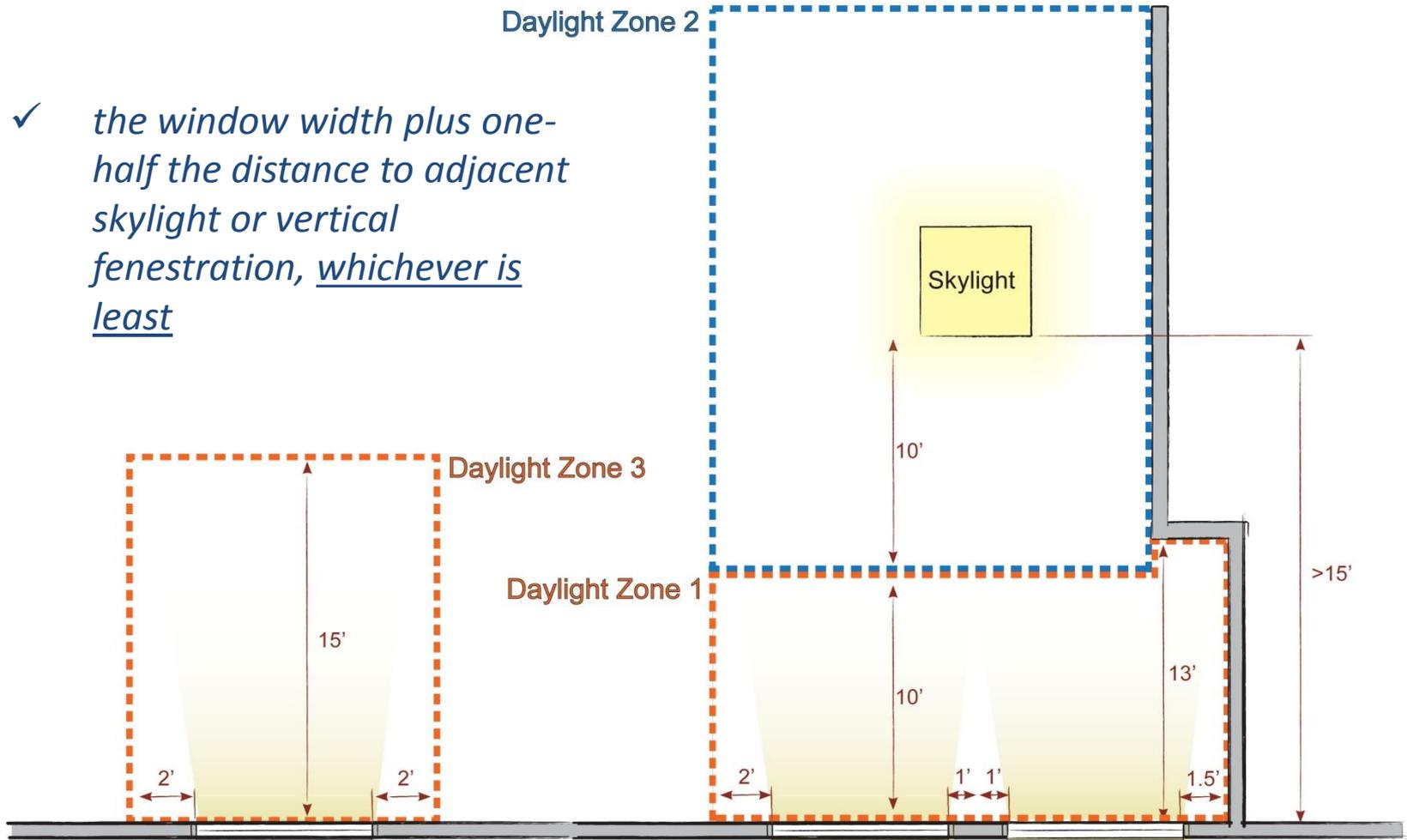
Daylight Zone 2

Daylight Zone 1



Daylight Zone Control- Vertical Fenestration

- ✓ *the window width plus one-half the distance to adjacent skylight or vertical fenestration, whichever is least*



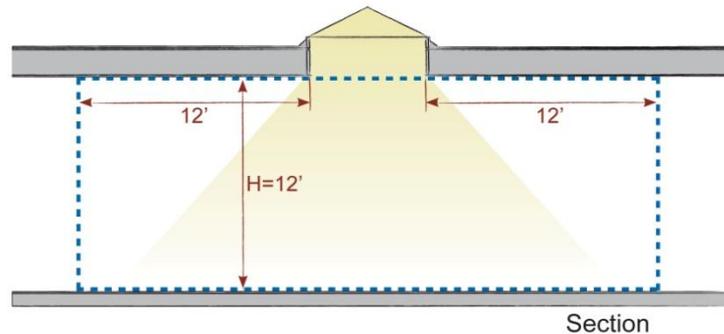
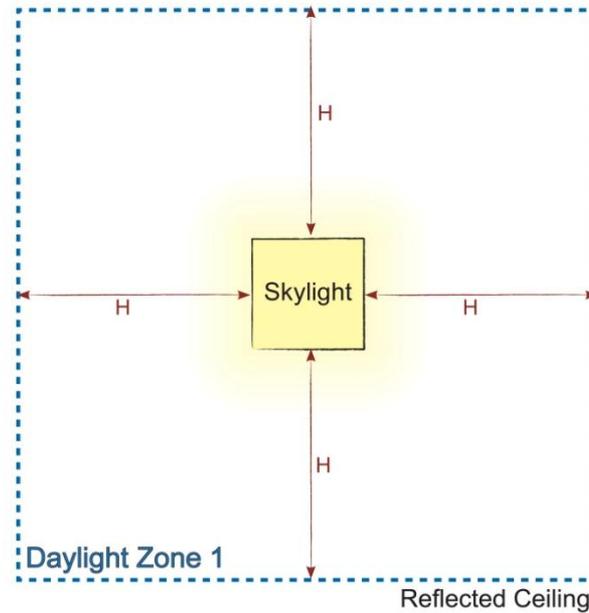
505.2.2.3 Daylight Zone Control- Under Skylight

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 windows

Daylight Zone Control- Under Skylight

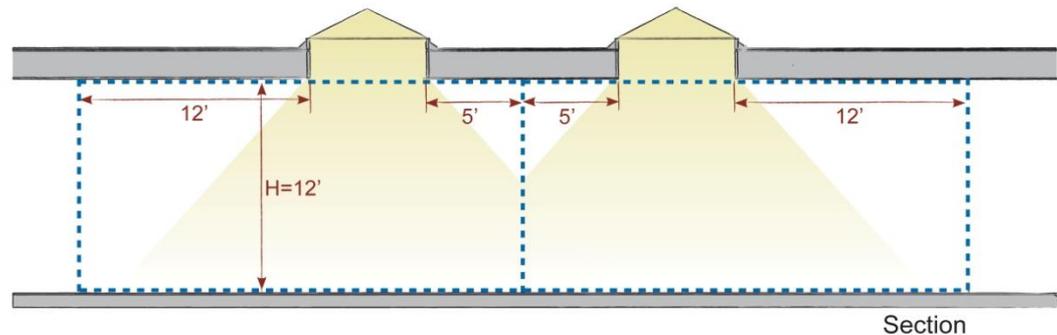
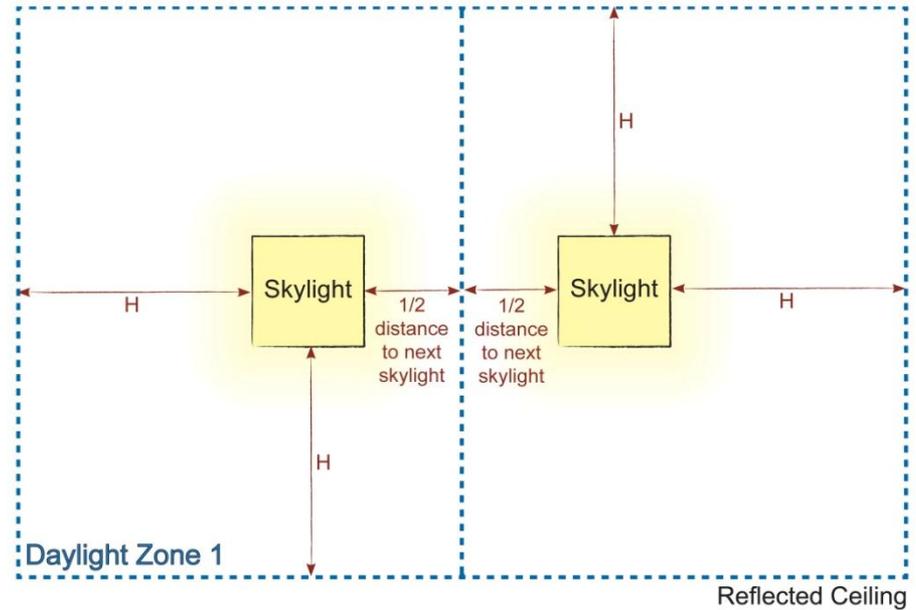
Horizontal distance from skylight:
floor-to-ceiling height



Daylight Zone Control- Under Skylight

Horizontal distance from skylight:
floor-to-ceiling height

**or half the distance
to adjacent skylight**

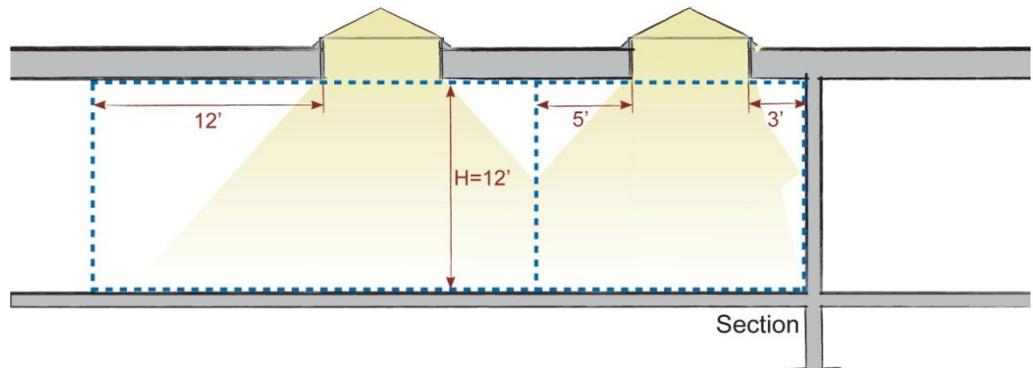
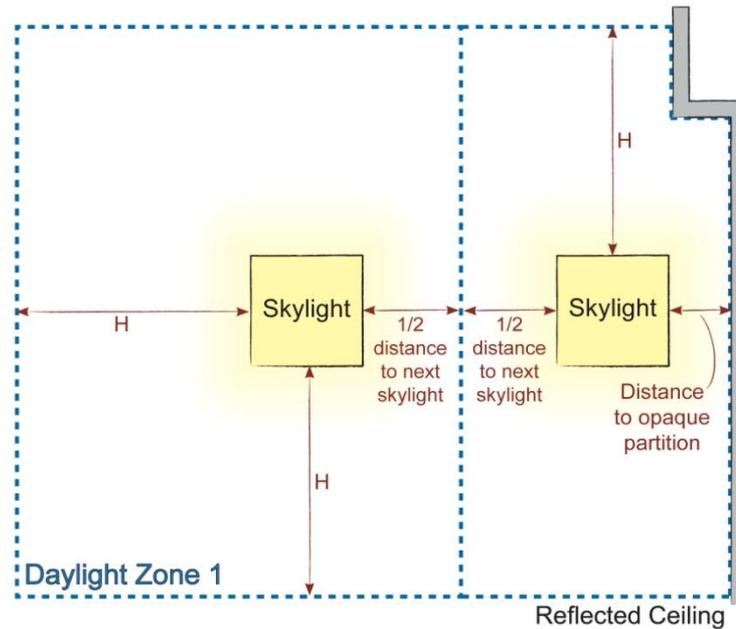


Daylight Zone Control- Under Skylight

Horizontal distance from skylight:
floor-to-ceiling height

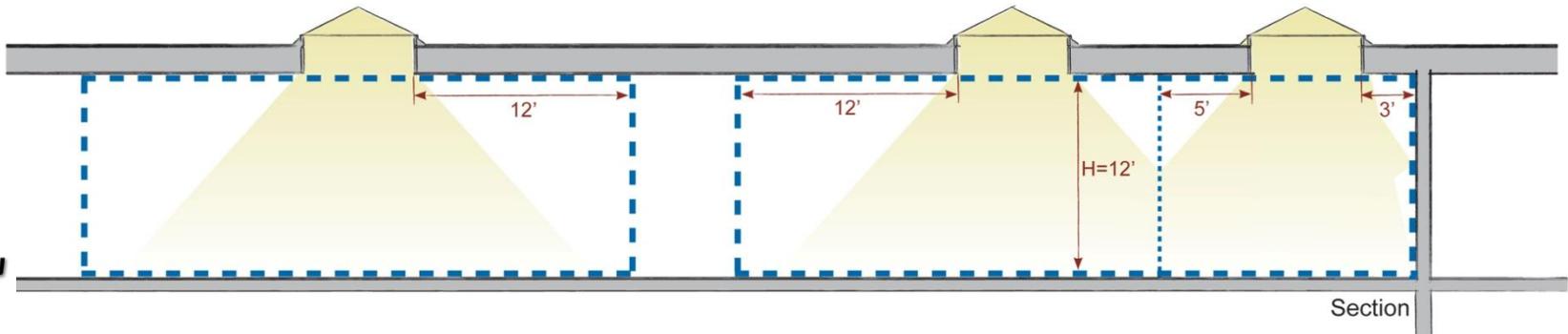
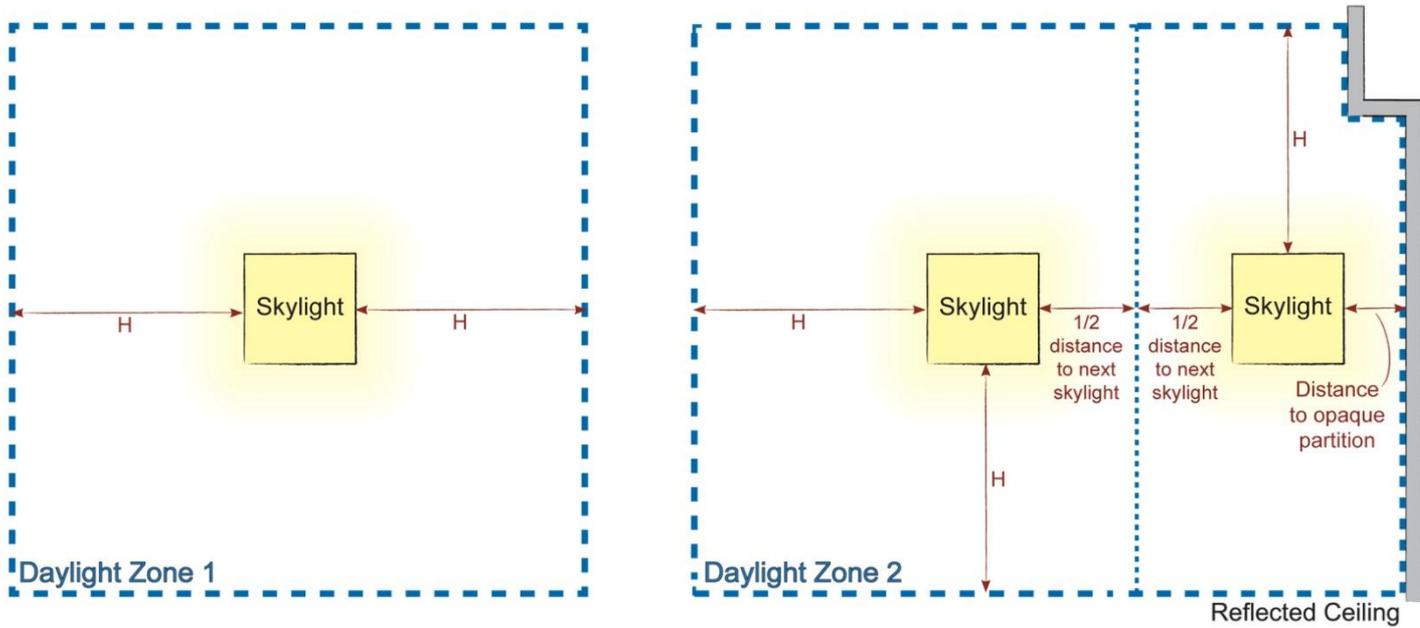
or half the distance
to adjacent skylight

or the distance to
opaque partition





Daylight Zone Control- Under Skylight



505.2.2.3 Daylight Zone Control

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 cardinal 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

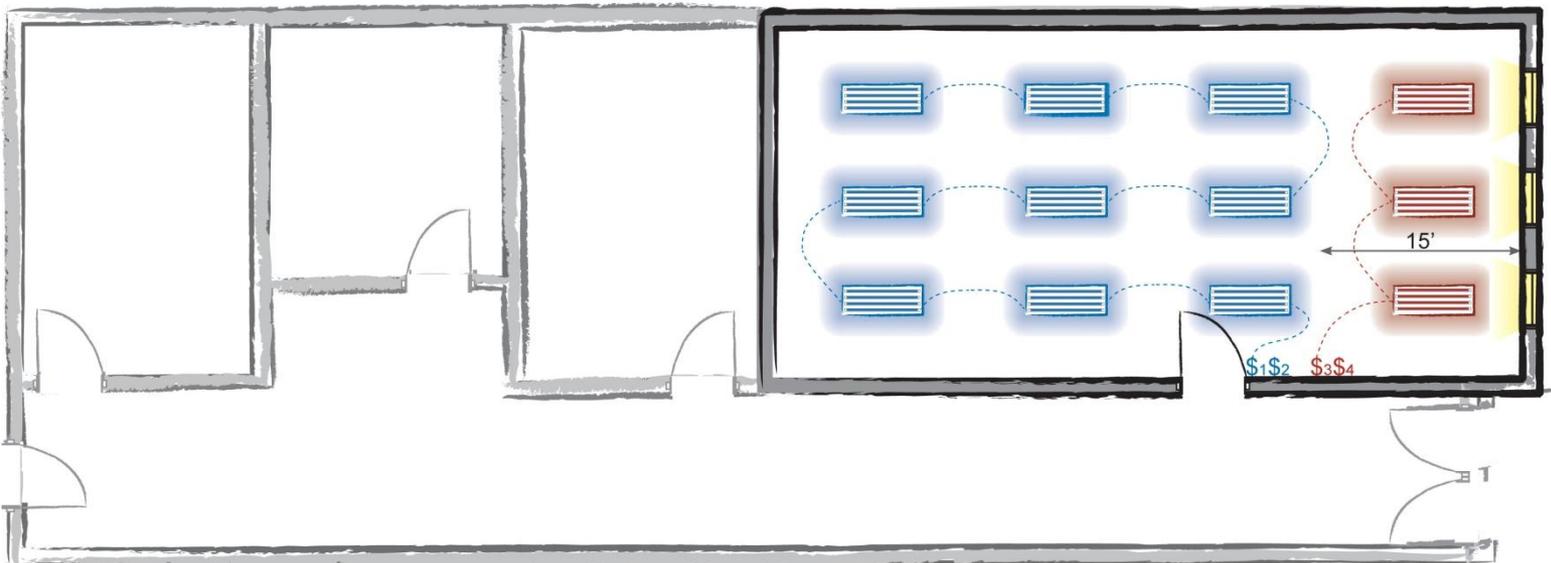
Section 505

Lighting Requirements

Daylight Zone Control

505.2.2.3

- 1 window wall
- **1 daylight zone switch**
- 1 daylight zone 50% reduction switch
- **1 general area switch**
- 1 general area 50% reduction switch
- 4 switches total



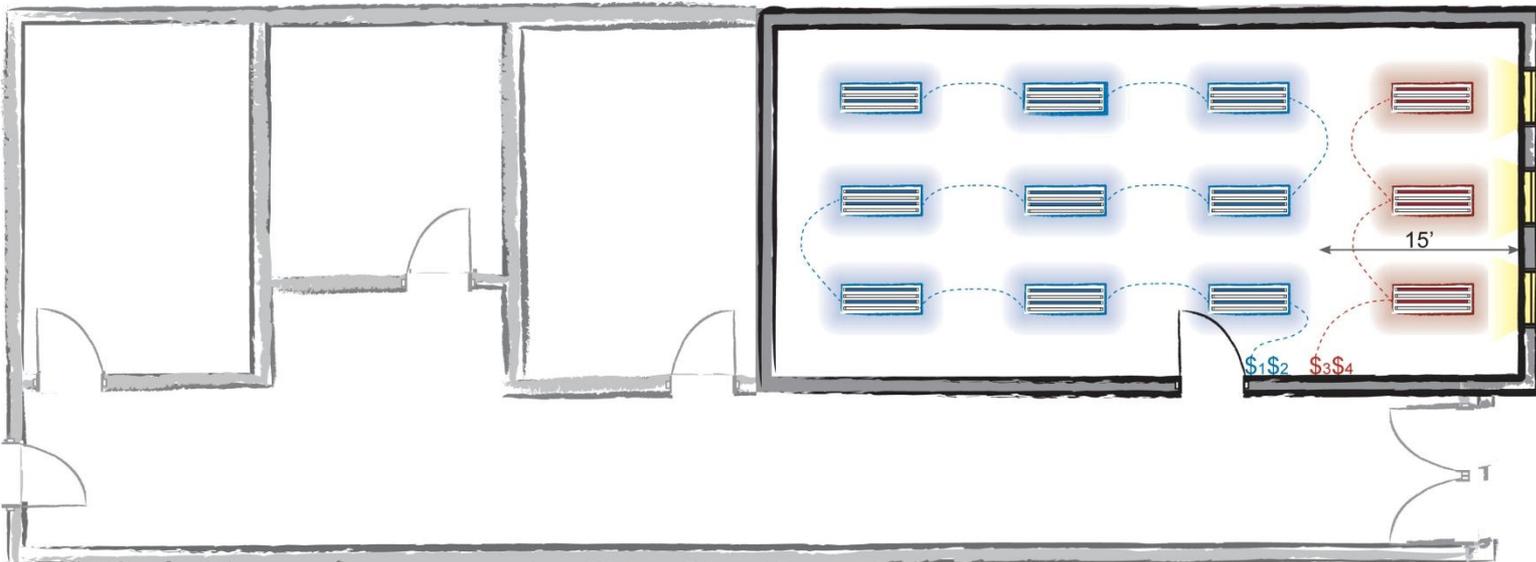
Section 505

Lighting Requirements

Daylight Zone Control

505.2.2.3

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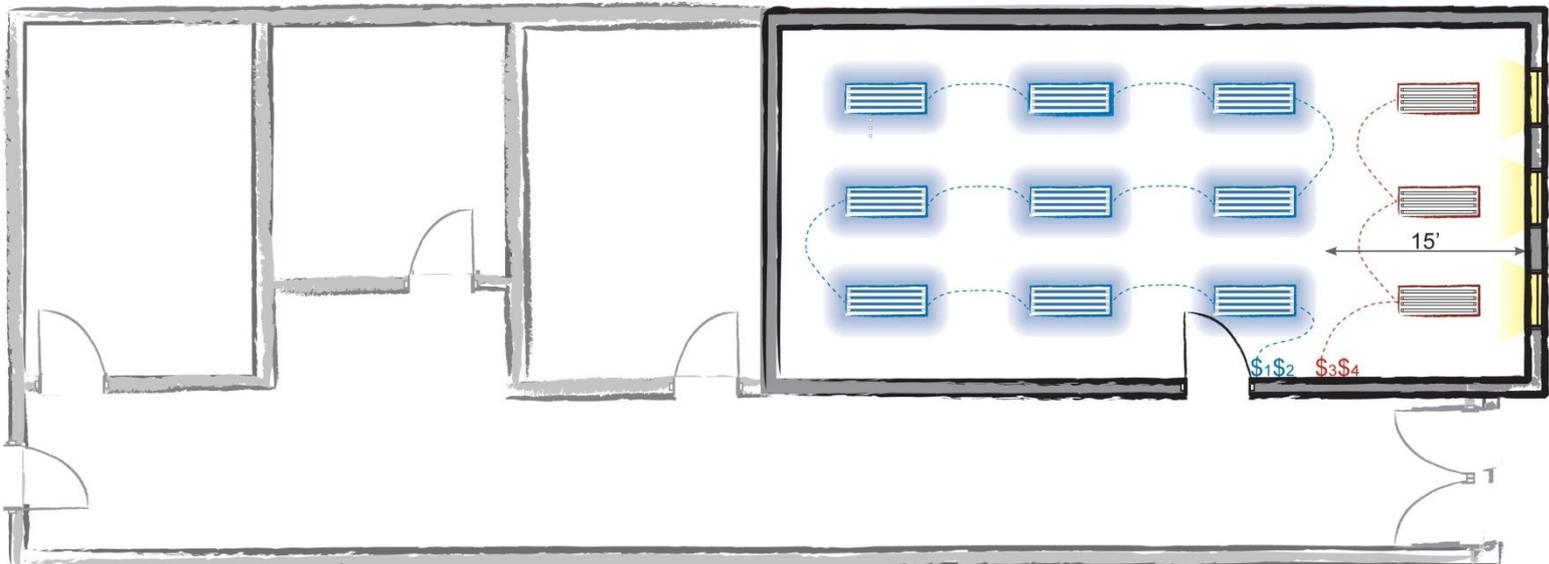


Section 505 Lighting Requirements

Daylight Zone Control

505.2.2.3

- 1 window wall
- 1 daylight zone switch
- 1 daylight zone 50% reduction switch
- **1 general area switch**
- 1 general area 50% reduction switch
- 4 switches total

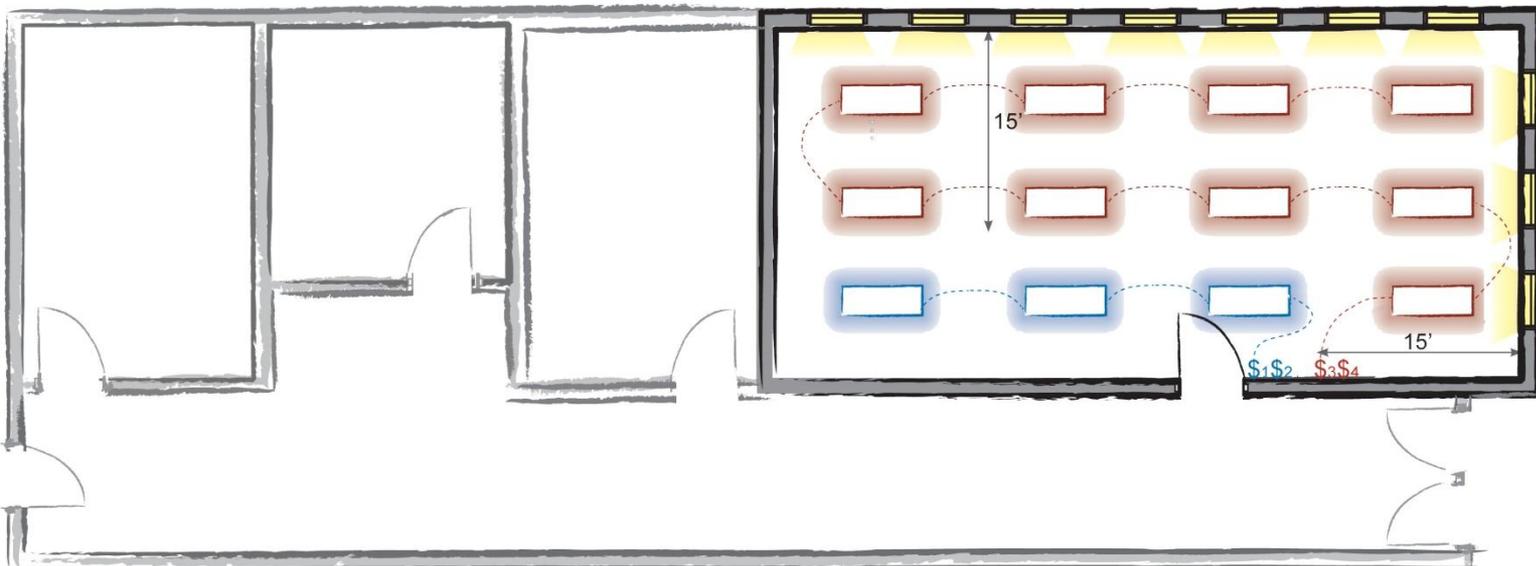


Section 505

Lighting Requirements

Daylight Zone Control

- 505.2.2.3**
- 2 window walls
 - 1 daylight zone switch
 - 1 daylight zone 50% reduction switch
 - 1 general area switch
 - 1 general area 50% reduction switch
 - 4 switches total

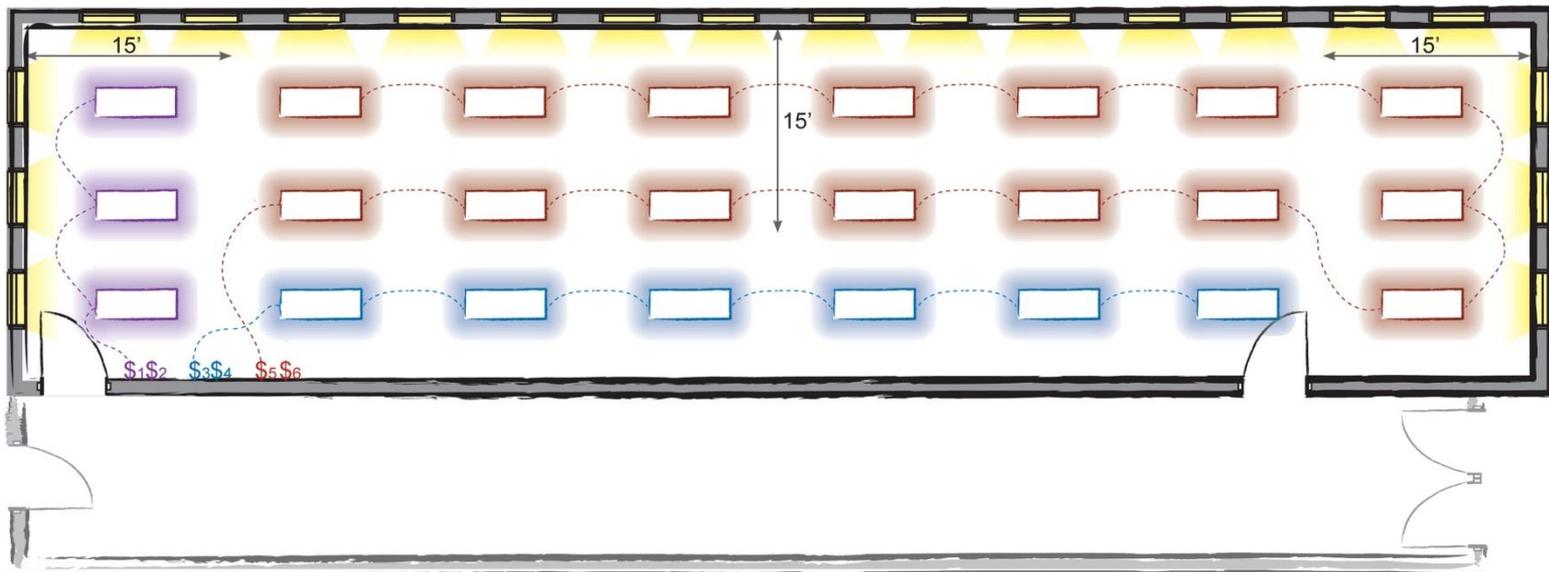


Section 505 Lighting Requirements

Daylight Zone Control

505.2.2.3

- 3 window walls
- 2 daylight zone switches
- 2 daylight zone 50% reduction switches
- 1 general area switch
- 1 general area 50% reduction switch
- 6 switches total

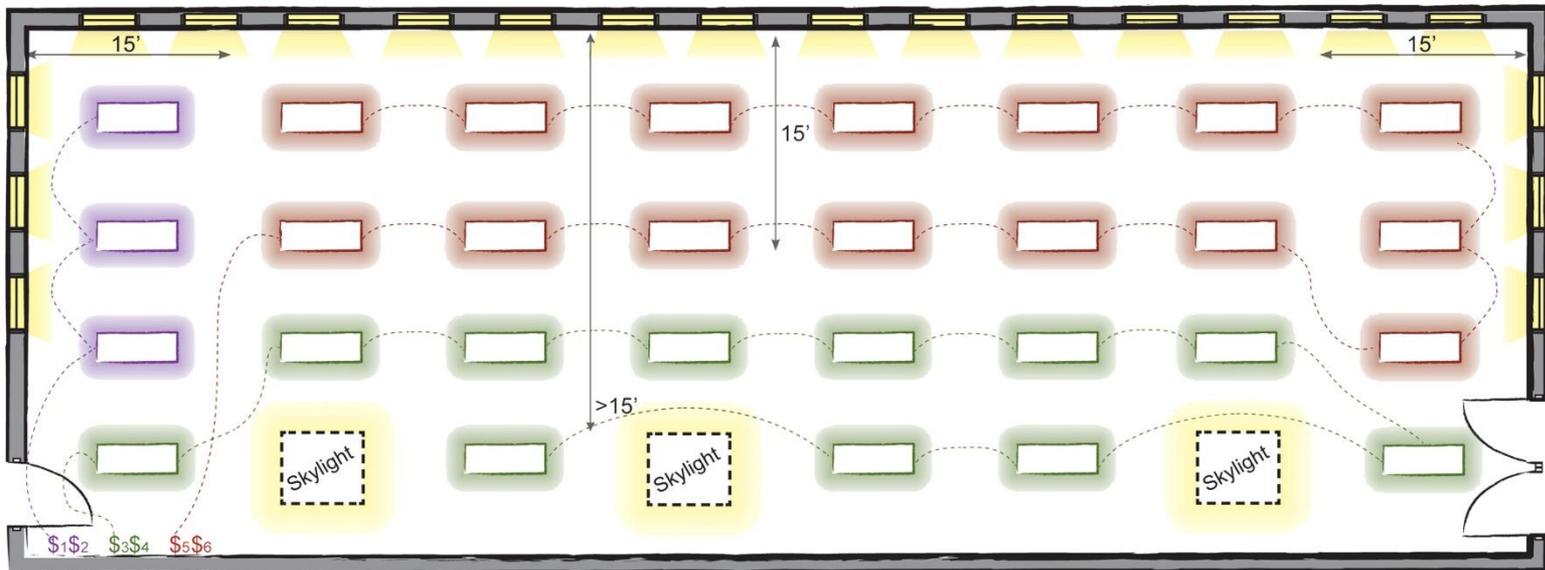


Section 505 Lighting Requirements

Daylight Zone Control

505.2.2.3

- 3 window wall
- 3 daylight zone switches
- 3 daylight zone 50% reduction switches
- No general area switches
- No general area reduction switches
- 6 switches total



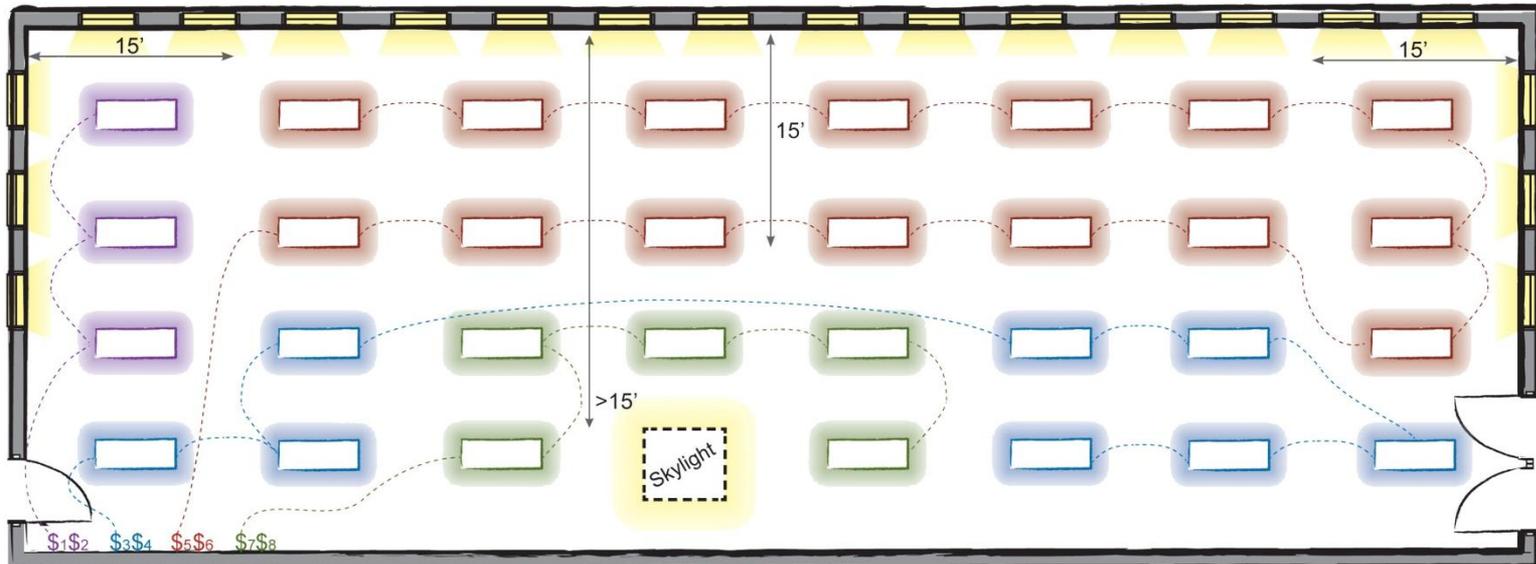
Section 505

Lighting Requirements

Daylight Zone Control

505.2.2.3

- 3 window wall
- 3 daylight zone switches
- 3 daylight zone 50% reduction switches
- 1 general area switch
- 1 general area 50% reduction switch
- 8 switches total

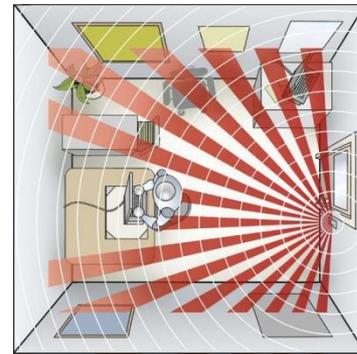


505.2.2.2 Automatic Lighting Shutoff

Automatic lighting shutoff control device required in all buildings larger than 5,000 ft²

Exempted spaces

- ✓ Sleeping units (see 505.2.3)
- ✓ Lighting for patient care
- ✓ When an automatic shutoff would endanger occupant safety or security



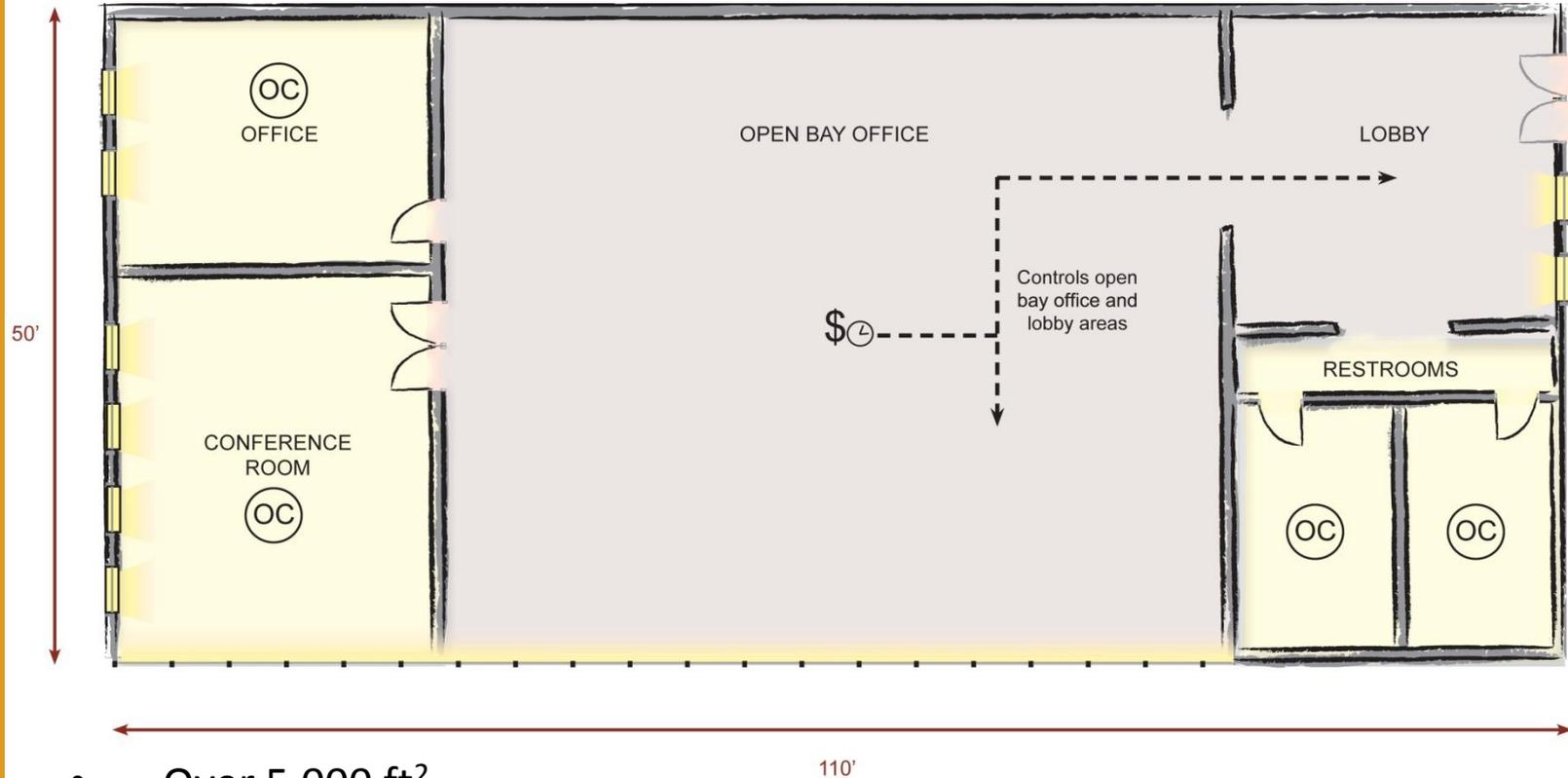
Intent: Eliminate after hours lighting waste!

Automatic Lighting Shutoff Options

Automatic Lighting Shutoff Compliance Options

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

Automatic Lighting Shutoff



- Over 5,000 ft²
- Enclosed areas are controlled by occupancy sensor
- Open public spaces are controlled by an automatic control device

505.2.2.2.1 Occupant Override

Controls an area \leq 5,000 ft²

Readily accessible

Within view of the lights or area controlled

Manually operated

\leq 2 hour override

Exceptions

- ✓ In malls and arcades, auditoriums, single-tenant retail space, industrial facilities and arenas
 - Over 2 hours *when using captive key override*
 - Can cover up to 20,000 ft²

505.2.2.2.2 Holiday Scheduling

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

505.2.3

Sleeping Unit Lighting Control

Applies to hotels, motels, boarding houses, or similar

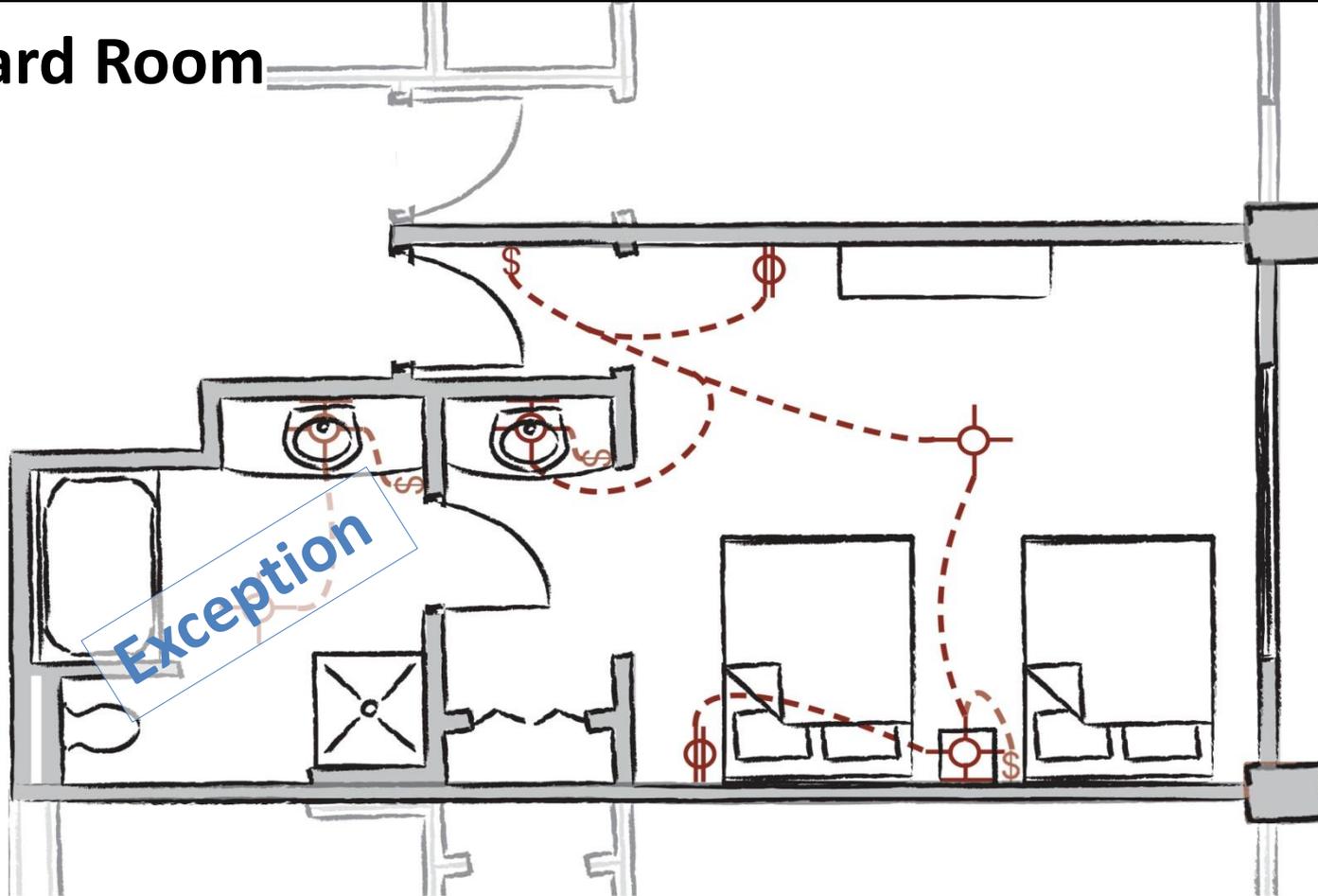
- ✓ Master switch required at each room or main room entry
- ✓ Must control all permanently wired luminaires or switched receptacles

Exceptions: bathrooms

Intent: Allow occupant to turn off lights at exit point!

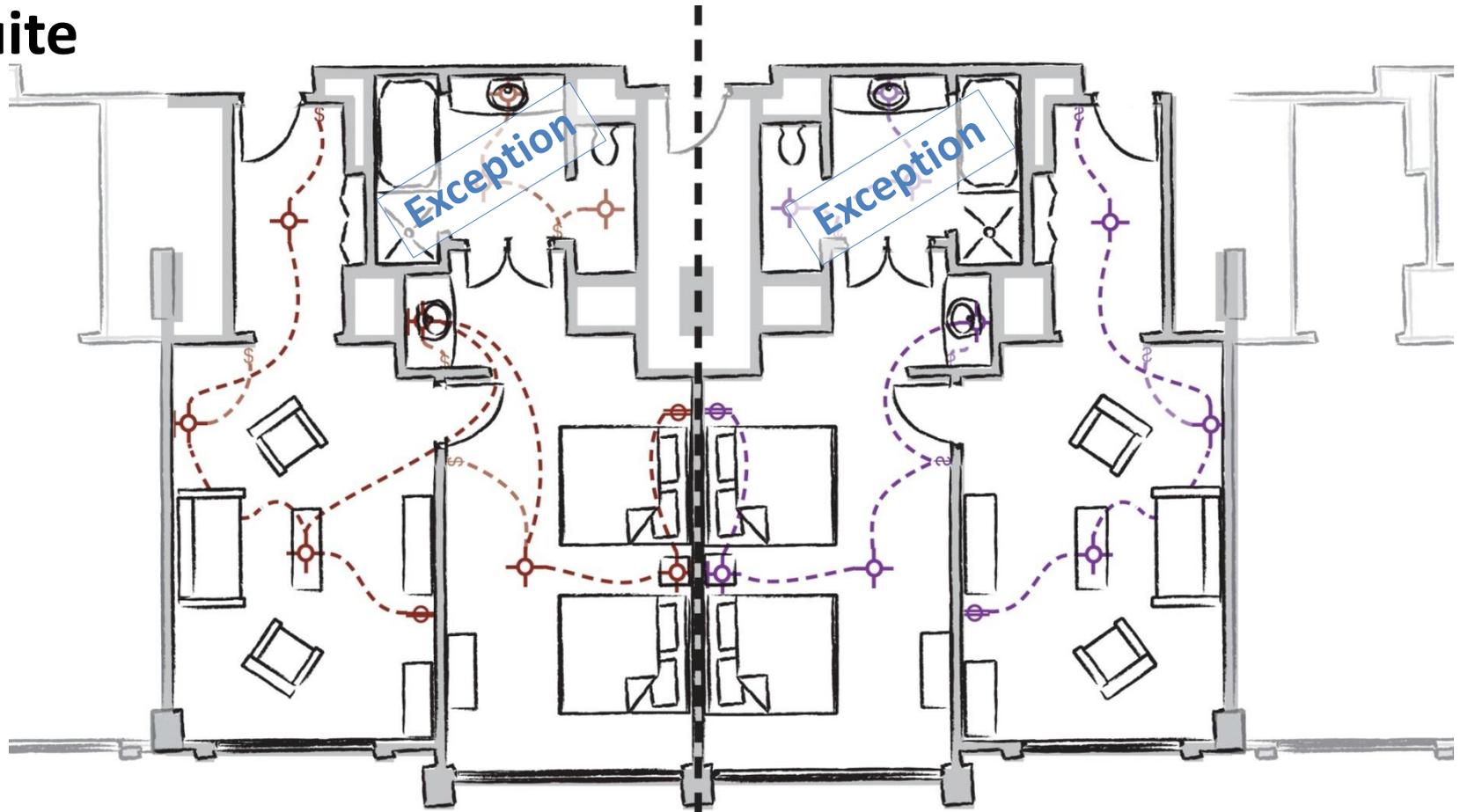
Sleeping Unit Lighting Control

Standard Room



Sleeping Unit Lighting Control

Suite



Control at primary entry

! Control at each room entry