

## Suggested energy code solutions for commercial buildings

The code-compliant solutions listed below are suggested based on total installed cost, simplicity of design, and basic functional needs of the space. These solutions represent one of multiple code-compliant options to meet lighting and receptacle control requirements.<sup>1</sup>

Diagram key:

● = New construction

⚙ = New construction and retrofit<sup>2</sup>

|                          |                             | Atrium     | Classroom, Lecture Hall, Training Room | Conference, Break Room | Corridor <sup>3</sup> | Guestroom <sup>4</sup> | Lobby <sup>5</sup> | Open Office (>250 sq. ft.) | Parking Garage <sup>5,6</sup> | Private Office (<250 sq. ft.) | Restaurant/Cafeteria, Retail | Restroom | Stairwell <sup>9</sup> | Storage Room | Warehouse and Library Stacks <sup>5</sup> | Facade/Landscape | Other Exterior <sup>7</sup> |   |
|--------------------------|-----------------------------|------------|--|------------------------|-----------------------|------------------------|--------------------|----------------------------|-------------------------------|-------------------------------|------------------------------|----------|------------------------|--------------|---|------------------|-----------------------------|---|
| Manual Control           | Switch                      |            |  |                        |                       | ⚙                      |                    |                            |                               |                               |                              |          |                        | ⚙            |   |                  |                             |   |
|                          | Dimmer or scene control     | ⚙          | ⚙                                      | ⚙                      | ⚙                     |                        | ⚙                  | ⚙                          | ⚙                             | ⚙                             | ⚙                            |          |                        |              | ⚙   |                  |                             |   |
| Automatic ON/OFF Control | Timeclock                   | ⚙          |  |                        |                       |                        | ⚙                  | ⚙                          | ⚙                             | ⚙                             | ⚙                            |          |                        |              | ⚙   | ⚙                | ⚙                           |   |
|                          | Occupancy sensor            |            | ⚙                                      | ⚙                      | ⚙                     | ⚙                      | ●                  | ⚙                          | ⚙                             | ⚙                             |                              | ⚙        | ⚙                      | ⚙            | ●   |                  | ⚙                           |   |
|                          | Settings                    | Full ON    |  |                        |                       | ⚙                      |                    |                            | ⚙                             | ⚙                             |                              |          | ⚙                      | ⚙            |   |                  | ⚙                           | ⚙ |
|                          |                             | Partial ON | ⚙                                      |                        |                       |                        |                    |                            | ⚙                             |                               |                              | ⚙        |                        |              |   | ⚙                |                             |   |
|                          |                             | Manual ON  |  | ⚙                      | ⚙                     |                        | ⚙                  |                            |                               |                               | ⚙                            |          |                        |              | ⚙   |                  |                             |   |
|                          |                             | Full OFF   | ⚙                                      | ⚙                      | ⚙                     |                        | ⚙                  | ⚙                          | ⚙                             | ⚙                             | ⚙                            | ⚙        | ⚙                      |              | ⚙   | ⚙                | ⚙                           | ⚙ |
| Partial OFF              |                             |            |  |                        | ⚙                     |                        | ⚙                  |                            | ⚙                             |                               |                              |          | ⚙                      |              | ⚙   |                  | ⚙                           |   |
| Other                    | Daylight responsive control | ●          | ●                                      | ●                      | ●                     |                        | ●                  | ●                          | ●                             | ●                             | ● <sup>8</sup>               | ●        | ●                      | ●            | ●   |                  |                             |   |
|                          | Receptacle control          |            | ⚙                                      | ⚙                      |                       |                        |                    | ⚙                          |                               | ⚙                             |                              |          |                        |              |   |                  |                             |   |
|                          | Demand response             |            |  |                        |                       |                        |                    |                            |                               |                               |                              |          |                        |              |   |                  |                             |   |

1 The suggested code-complaint solutions are for buildings or tenant improvements greater than 25,000 ft<sup>2</sup>.

2 Retrofit requirements indicated are for lighting alterations greater than 20% of the connected load in a space.

3 To comply with some life safety code requirements for egress illumination, automatic full OFF is not suggested. For non-egress areas, the occupancy sensor should turn the lights to full OFF and a switching control may be used.

4 Automatic OFF is required for all luminaires and switched receptacles. Bathrooms must have a separate, automatic OFF control for lighting.

5 The occupancy sensor provides partial OFF functionality during business hours. The timeclock provides full OFF functionality after hours.

6 For entrances and exits, daylight responsive control is not required nor recommended, and the maximum light level is set to 50% at night.

7 Astronomical timeclock shall ensure all lights are off during daylight hours. For lights mounted below 24 ft. provide occupancy sensing to Partial OFF. All other lighting shall be scheduled to Partial OFF. See section 9.4.1.4 for scheduling times.

8 Not required for sidelight daylight zones in retail spaces.

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## Code requirement summary

|                          | Minimum control type        | Description  | Code provision   |             |
|--------------------------|-----------------------------|--|--|-------------|
| Manual Control           | Switch                      | Lighting shall be capable of turning ON and OFF. There shall be at least one manual device for control of the lighting within a space. See code for spaces that allow remote location of control.  | 9.4.1.1 (a)  |             |
|                          | Dimmer or scene control     | Lighting shall be capable of providing at least one level between 30% and 70% of full power, in addition to ON and OFF. There shall be at least one manual device for control of the lighting within a space. See code for spaces that allow remote location of control.   | 9.4.1.1 (a)<br>9.4.1.1 (d)   |             |
| Automatic ON/OFF Control | Timeclock                   | <b>Interior:</b> Scheduled control, based on time-of-day, turns lighting ON or OFF based on typical occupancy. Occupancy sensors also comply as an alternate to using a timeclock.<br><b>Exterior:</b> Scheduled control, based on time-of-day and sunrise/sunset, turns lighting ON or OFF based on typical occupancy and daylight (requires astronomical timeclock).   | 9.4.1.1 (i)<br>9.4.1.2 (a) & (c)<br>9.4.1.4 (a), (b), & (c)  |             |
|                          | Occupancy sensor            | Automatic control turns lighting ON upon occupancy or OFF after a vacancy of 20 minutes or less (15 minutes for exterior).   | 9.4.1.1<br>9.4.1.2 (b)<br>9.4.1.4 (d)  |             |
|                          | Settings                    | Full ON  | When initiated by a timeclock or occupancy sensor, lighting is automatically turned ON to maximum lighting power.                | 9.4.1.1 (c) |
|                          |                             | Partial ON   | When initiated by a timeclock or occupancy sensor, lighting is automatically turned ON to 50% or less of maximum lighting power. | 9.4.1.1 (c) |
|                          |                             | Manual ON  | Lighting is turned ON manually by an occupant.   | 9.4.1.1 (b) |
|                          |                             | Full OFF   | When initiated by a timeclock or occupancy sensor, lighting is automatically turned OFF.   | 9.4.1.1 (h) |
| Partial OFF              |                             | When initiated by a timeclock or occupancy sensor, lighting is automatically reduced by at least 50% of maximum lighting power (30% for parking garages). Automatic full OFF also complies.  | 9.4.1.1 (g)<br>9.4.1.2 (b) & (c)<br>9.4.1.4 (c) & (d)  |             |
| Other                    | Daylight responsive control | <b>Interior:</b> A sensor which adjusts lighting in response to available daylight is required for sidelight and skylight zones. The lighting must adjust using continuous daylight dimming to 20% or less and OFF. See the "Daylight Zone Requirements" diagrams for more information. The perimeter 20 ft. of parking garages with access to daylight must automatically reduce lighting power by at least 50% in response to daylight.<br><b>Exterior:</b> A photosensor can be used as an alternate to the dawn/dusk operation of an astronomical timeclock. | 9.4.1.1 (e)<br>9.4.1.1 (f)<br>9.4.1.2 (d)<br>9.4.1.4 (a)   |             |
|                          | Receptacle control          | At least 50% of the receptacles shall automatically turn OFF based on typical occupancy or after a vacancy of 20 minutes or less. Plug-in devices do not comply.   | 8.4.2  |             |
|                          | Demand response             | Demand response is not required by this energy code.   | N/A  |             |

Acceptance (functional) testing is required for all new construction applications to ensure that control hardware and software are calibrated, programmed and functioning properly (section 9.9). Office, retail, and school projects that are less than 25,000 ft<sup>2</sup> may pursue the simplified compliance path where the lighting power density is more stringent but the control requirements are less stringent than the traditional compliance path.

## Daylight zone requirements

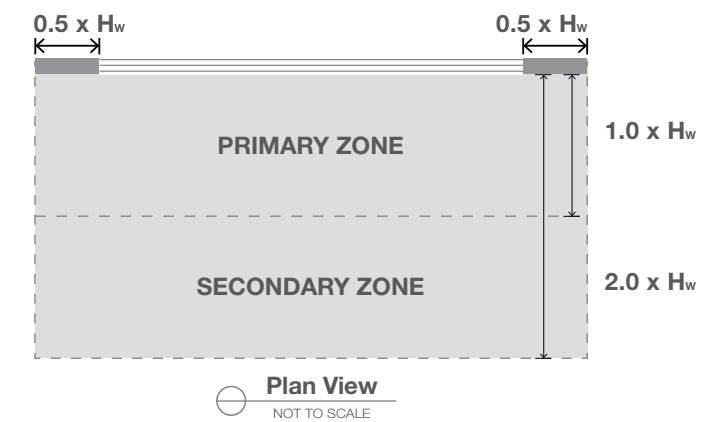
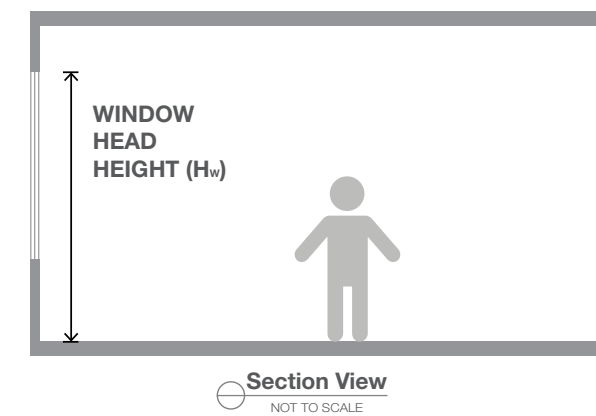
### Daylight Zone Requirements:

Fixtures in the primary and secondary daylight zones must be independently controlled by zone. Sidelighted zones must be controlled separately from toplighted zones.

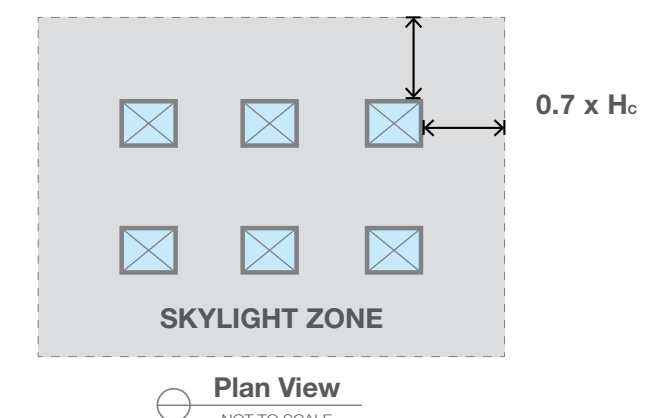
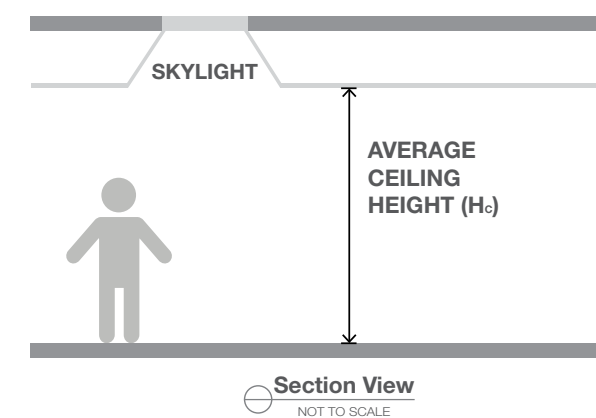
### Daylight Exceptions:

Daylight control is not required when the total lighting power in all daylight zones in a space is less than 150W or when the total glazing area is less than 20 ft<sup>2</sup>.

### Sidelighting (Window)



### Toplighting (Skylight)



This document summarizes the lighting and receptacle control requirements for commercial buildings. It is for information purposes only. It is not meant to replace your state's or local jurisdiction's official energy code. The recommendations presented in this guide are based on the originally published code prior to addenda. Please refer to your local building energy code or authority having jurisdiction for your precise requirements. Only the authority having jurisdiction can guarantee code compliance.