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Nonresidential Indoor Lighting

This chapter covers the Energy Code requirements for indoor lighting design, installation, and controls for nonresidential buildings (conditioned and unconditioned). The chapter includes guidance for meeting the Energy Code and also includes installation scenarios with appropriate compliance approaches to meet the Code.

Refer to Chapter 6 for and about nonresidential outdoor lighting requirements. Refer to Chapter 7 for and about sign lighting requirements.

Overview

The Energy Code requires total lighting power is within a specified budget, and lighting controls are installed for efficient lighting operation.

What's New for 2025

The nonresidential lighting section has been revised based on public members' inputs during the 2025 Energy Code development. Other significant changes and improvements to the code requirements are as follows:

- Removal of the table which specifies the multilevel lighting control requirements for light sources which include LED light source and the soon to-be-banned light sources in California.
- Editorial changes as well as clarifications changes to the manual controls (previously "manual area controls") requirements, the shut-off controls requirements, the control interactions requirements, and the PAF requirements.
- A suite of updates to the daylight responsive controls (previously "automatic daylighting controls" in the 2022 Energy Code) requirements including a new lighting wattage threshold for requiring daylight responsive controls and clarifications about controllability of linear luminaires longer than 8 feet (must be controlled in segments of 8 feet or less).
- Removal of Tailored Method as one of the three approaches (others are Complete Building Method and Area Category Method) for meeting the prescriptive requirements of indoor lighting power. New additional lighting power allowances for wall display lighting, floor display lighting, and task lighting are added for a number of lighting applications.

Scope

The nonresidential indoor lighting requirements are contained in §100.0, §110.9, §110.12, §120.8, §130.0, §130.1, §130.4, §140.0, §140.1, §140.3, §140.6, and §141.0 of the Energy Code. Supporting definitions are in §100.1.

- The nonresidential indoor lighting requirements apply to nonresidential buildings and hotel/motel occupancies (including guest rooms). Hotel/motel guest rooms are covered by portions of both the nonresidential indoor lighting requirements and the residential indoor lighting requirements. (See Chapter 6 of the Residential Compliance Manual.)
- The nonresidential indoor lighting requirements are similar for conditioned and unconditioned spaces. Lighting power trade-offs are not allowed between conditioned and unconditioned spaces.

- Qualified historical buildings are regulated by the California Historical Building Code and not by the Energy Code. However, nonhistorical components of such buildings may need to comply with the Energy Code. For more information, see Chapter 1 of the Residential Compliance Manual.

All sections and table references in this chapter refer to sections and tables contained in the Energy Code.

Refer to Chapter 6 of the Residential Compliance Manual for information on lighting requirements for single-family residential buildings. Refer to the Multifamily Compliance Manual for information about requirements of multifamily buildings.

Functional Areas in Nonresidential Buildings That Must Comply with Applicable Residential Requirements

The following functional areas in nonresidential and hotel/motel occupancies are required to comply with the applicable residential lighting requirements in §150.0(k):

- Fire station dwelling accommodations
- Hotel and motel guest rooms

  Note that hotel and motel guest rooms are required to comply with §130.1(c)8, which requires captive card key controls, occupant sensing controls, or automatic controls. In addition, hotel and motel guest rooms are required to meet the controlled receptacle requirements of §130.5(d)4.

  EXCEPTION: One luminaire in a hotel or motel guest room that meets the following criteria is exempt from the control requirement:
    - The luminaire meets the requirement of §150.0(k)1A.
    - The luminaire is switched on separately from the other lighting in the room.
    - The switch for the luminaire is located within 6 feet of the entry door.
- Outdoor lighting attached to a hotel/motel building and separately controlled from inside a guest room.

Note that the above requirements also apply to additions and alterations to functional areas of existing buildings specified above.

Indoor Lighting Power Allotments Overview

Lighting power allotments are the established maximum lighting power that can be installed based on the compliance approach used, the building type, and building area. Lighting power allotments are determined prescriptively - by either the Complete Building Method or the Area Category Method - or determined by the performance approach (method).

Complete Building Method

Applicable when the lighting system of an entire building is designed and permitted at one time and either the entire building is of one occupancy type or where one occupancy type makes up at least 90 percent of the entire building. Also, this method may be used for a tenant space in a multitenant building if at least 90 percent of the tenant space is one building

occupancy type. A single lighting power density value governs the entire building or tenant space.

Area Category Method

Applicable for any permit situation including tenant improvements. Lighting power density values are assigned to each of the primary function areas of a building (offices, lobbies, corridors, etc.) as defined in Nonresidential Function Areas of §100.1. This approach allows some flexibility to accommodate special task lighting needs by providing an additional power allowance under some circumstances.

Performance Approach

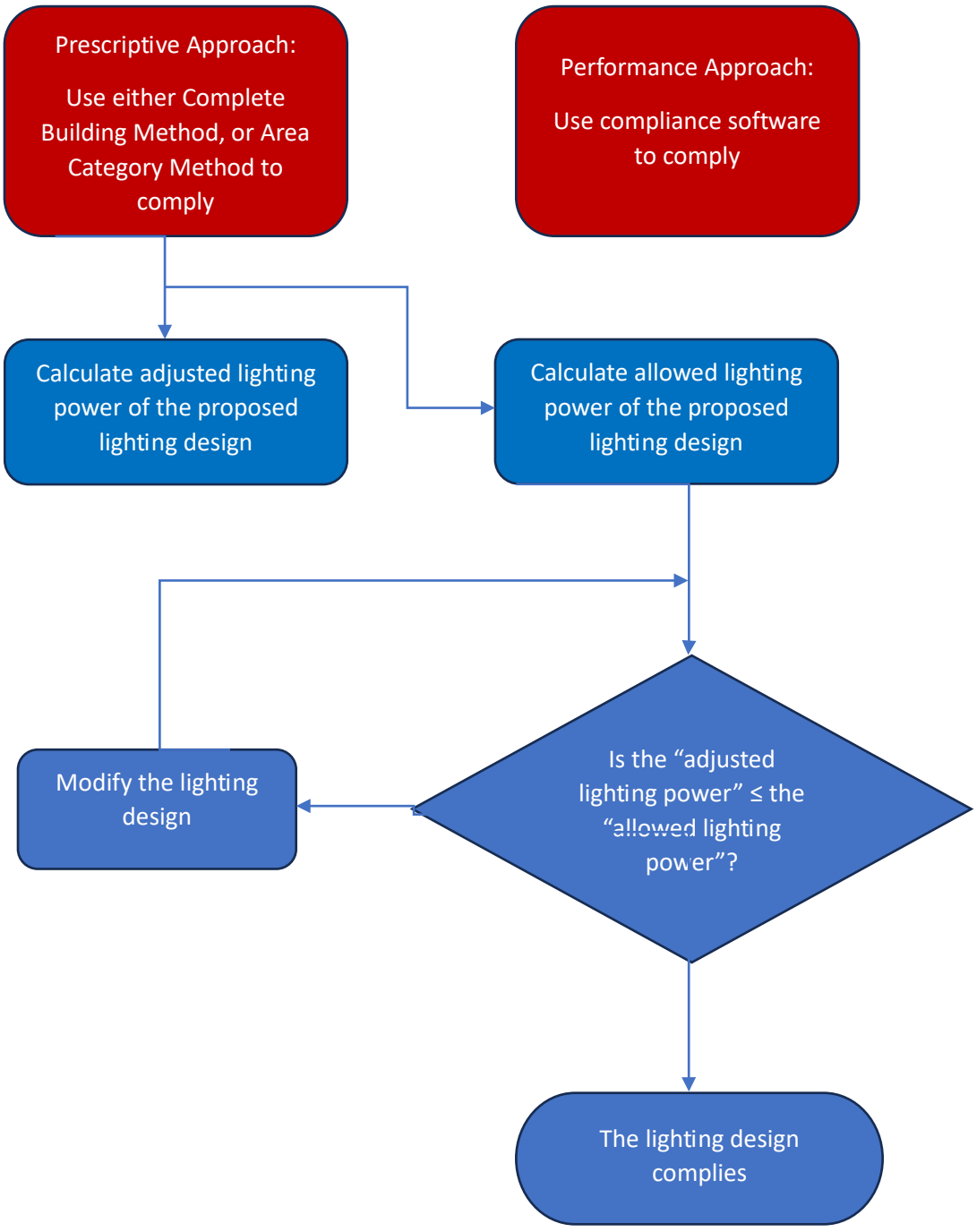
Applicable when the designer uses a California Energy Commission-certified compliance software program to demonstrate the energy consumption of the proposed building (including indoor lighting power) meets the energy budget. The performance approach incorporates one or more of the three previous methods, which establishes the custom energy budget of the building.

The performance approach allows energy allotments to be traded among space conditioning, mechanical ventilation, indoor lighting, service water heating, envelope, and covered process loads. Such trade-offs can be made only when permit applications are sought for those systems involved. For example, under the performance approach, a building with an envelope or mechanical ventilation system that is more efficient than the prescriptive efficiency requirements, may be able to meet the energy budget with more lighting power than allowed under the three prescriptive lighting approaches.

No additional lighting power allotment is gained by using the performance method unless it is traded from the space conditioning, mechanical ventilation, service water heating, envelope, or covered process systems. Therefore, the performance approach is not applicable to lighting compliance alone. The performance approach may be used only to model the performance of indoor lighting systems that are covered under the building permit application.

Figure 5-1: Indoor Lighting Power Compliance Overview Flowchart shows the process for complying with the nonresidential indoor lighting requirements.

Figure 5-1: Indoor Lighting Power Compliance Overview Flowchart



Source: California Energy Commission

- Choose an Indoor Lighting Power Compliance Approach (Refer to the Top Part of Figure 5-1: Indoor Lighting Power Compliance Overview Flowchart):

First, select either the prescriptive or performance approach for complying with the nonresidential indoor lighting power requirements of the Energy Code.

For the performance approach, lighting power calculations can be performed using an approved software program. Refer to the compliance software documentation for details.

For the prescriptive approach, choose from among the Complete Building Method or the Area Category Method.

Calculate the "allowed" lighting power using the chosen method. Allowed lighting power is the maximum lighting wattage that may be installed for the project (using lighting power values from Table 140.6-B and C).

Next, calculate the "adjusted" lighting power. Adjusted lighting power is designed lighting power *minus* lighting control credits *minus* lighting power reduction.

- Evaluate the Calculations — Allowed Lighting Power vs. Adjusted Lighting Power:

If the adjusted lighting power is less than or equal to the allowed lighting power, the proposed lighting complies with the Energy Code.

If the adjusted lighting power is greater than the allowed lighting power, the proposed lighting does not comply with the Energy Code. To comply, the proposed lighting power must be reduced by redesigning the lighting system, or, if using the performance approach, additional lighting credits may be acquired through improved efficiency in other systems.

Compliance Process – Forms, Plan Check, Inspection, Installation, and Acceptance Tests

Please refer to Chapter 5.1.5 of the *2022 Nonresidential and Multifamily Compliance Manual*.

General Requirements

Some requirements in the Energy Code are classified as "mandatory requirements" because they are required regardless of the compliance approach used. All projects must comply with all mandatory requirements.

It is the responsibility of the designer to design a lighting system and specify products that meet these requirements. It is the responsibility of the installer to install the lighting and controls specified on the plans. It is the responsibility of code enforcement officials to verify that the mandatory requirements are included on the plans and installed in the field.

The mandatory requirements for nonresidential indoor lighting include the following:

- Certain functional areas in nonresidential buildings must comply with the residential lighting requirements in §130.0(b).
- Manufactured lighting equipment, products, and devices must be appropriately certified or meet functionality requirements in §110.0(b), §110.1, and §110.9(a).
- Requirements for how luminaires shall be classified (according to technology) and how luminaire power shall be determined in §130.0(c).
- Required indoor lighting controls in §130.1.
- Lighting control acceptance testing in §130.4(a).
- Lighting control certificates of installation in §130.4(b).

The Energy Code also includes mandatory requirements for electrical power distribution systems. See Chapter 8 for more information.

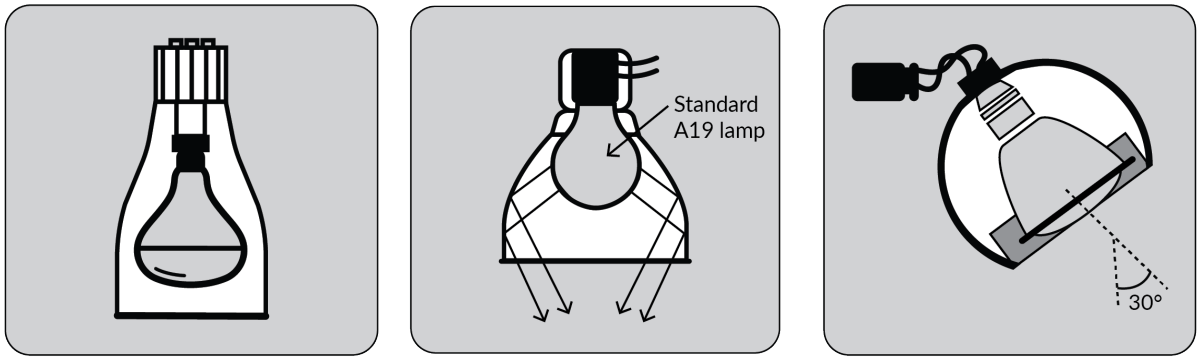
Luminaire Classification and Lighting Terms

Please refer to Chapter 5.3 of the *2022 Nonresidential and Multifamily Compliance Manual*.

Luminaires with Line-Voltage Lamp Holders

The wattage of luminaires with line-voltage lamp holders not served by drivers, ballasts, or transformers shall be the maximum-rated wattage of the luminaire as labeled in accordance with Section 130.0(c)1.

Figure 5- 2: Examples of Luminaires With Line-Voltage Lamp Holders



Source: Energy Solutions

Luminaires with Ballasts

Please refer to Chapter 5.3.2 of the *2022 Nonresidential and Multifamily Compliance Manual*.

Inseparable SSL Luminaires and SSL Luminaires with Remotely Mounted Drivers

The wattage of inseparable SSL luminaires and SSL luminaires with remote ballasts shall be the maximum-rated input wattage of the SSL luminaire.

Inseparable SSL luminaires are luminaires manufactured with solid-state lighting components that are not readily removed or replaced from the luminaires by the end users.

SSL luminaires shall be tested as specified in Section 130.0(c)4 in accordance with UL 1598, 2108, or 8750, or IES LM-79.

Figure 5-3: Examples of SSL Luminaires: Recessed Downlight Luminaires

Source: Lutron Electronics Co., Inc.

LED Tape Lighting and LED Linear Lighting

Please refer to Chapter 5.3.4 of the *2022 Nonresidential and Multifamily Compliance Manual*.

Modular Lighting Systems

Please refer to Chapter 5.3.5 of the *2022 Nonresidential and Multifamily Compliance Manual*.

Other Lighting Equipment

Please refer to Chapter 5.3.6 of the *2022 Nonresidential and Multifamily Compliance Manual*.

Lighting Terms

The following is a selection of lighting terms defined in §100.1 and included here to help readers understand the requirements.

General Lighting

General lighting (also known as ambient lighting) is electric lighting that provides a uniform level of illumination throughout an area exclusive of any provision for special visual tasks or decorative effect, or exclusive of daylighting.

Typical luminaires used for general lighting are troffers (prismatic, parabolic, or indirect diffusers), pendants (direct, indirect, or direct/indirect), high bay, low bay, and "aisle-lighter" fixtures. General lighting does not include display lighting (typically using directional MR, PAR, flood, spot, or wall washers) or decorative lighting (such as drum fixtures, chandeliers, or projection lighting.)

Decorative, Display, Task, and Special Effects Lighting

Section 100.1 also defines decorative, display, task, and special effects lighting as follows:

- *Decorative lighting* or luminaires are installed only for aesthetic purposes that do not serve as display lighting or general lighting. Decorative luminaires are chandeliers, sconces, lanterns, cove lighting, neon or cold cathode, theatrical projectors, moving lights, and light color panels, not providing general lighting or task lighting.
- *Display lighting* is supplementary lighting that provides a higher level of illuminance to a specific area than the level of surrounding ambient illuminance required to highlight features, such as merchandise, sculpture, or artwork.
- *Task lighting* is lighting directed to a specific surface or area providing illumination for visual tasks. Task lighting is not general lighting.
- *Special effects lighting* is different from decorative lighting. Special effects lighting is lighting installed to give off luminance instead of providing illuminance, which does not serve as general, task, or display lighting.

The Area Category Method (Table 140.6-C) provides additional lighting power allowances for lighting that is not considered general lighting; however, to claim these allowances, the non-general lighting systems must be separately switched.

For layered lighting designs with multiple luminaire types, compliance documentation will require allocating some or all non-general lighting power to the additional lighting power allowances and the rest of the lighting wattage to the general lighting power allowance. Only the general lighting power allowance is able to be shared across different spaces.

When there is only one lighting system type in a space, such as is the case when a monolithic design approach is taken, that system type will be treated as general lighting. Thus, light fixtures that might ordinarily be considered decorative or display luminaires are considered general lighting luminaires if they are the only system type in a given enclosed space.

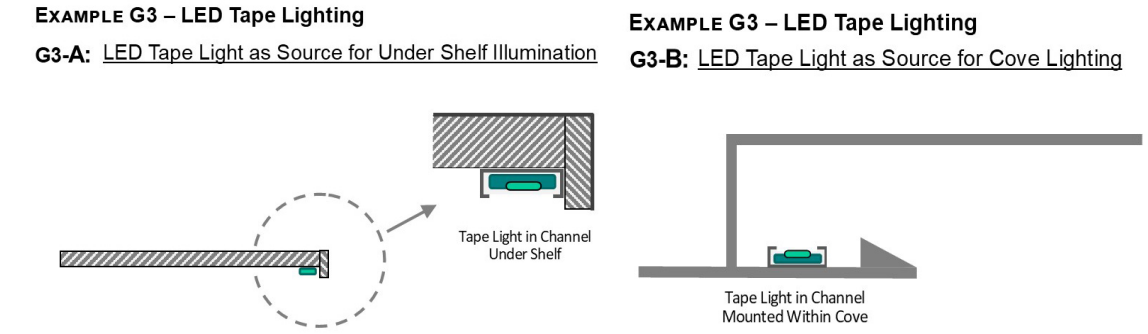
Example 5-1: LED Tape Lighting

LED tape lighting may be classified as Decorative Lighting, Task Lighting, or General Lighting, based on how it is used. Figure 5-4: Examples of LED Tape Lighting: In Use as Undershelf Lighting (left image); In Use as Cove Lighting (right image) shows two applications of LED tape lighting.

The image G3-A on the left shows LED tape lighting that is installed in a channel mounted to the underside of a shelf or cabinet or installed directly with adhesive material. This use would be classified as display or task lighting. Such applications are not considered General Lighting.

The image G3-B on the right shows an architectural cove with tape lighting installed in a channel mounted within the cove or installed directly with adhesive material. This use may be classified as Decorative or Display Lighting or considered General Lighting, based on whether the illumination emanating from the cove is the only source of uniform lighting in the space.

Figure 5-4: Examples of LED Tape Lighting: In Use as Undershelf Lighting (left image); In Use as Cove Lighting (right image)



Source: Bernie Bauer

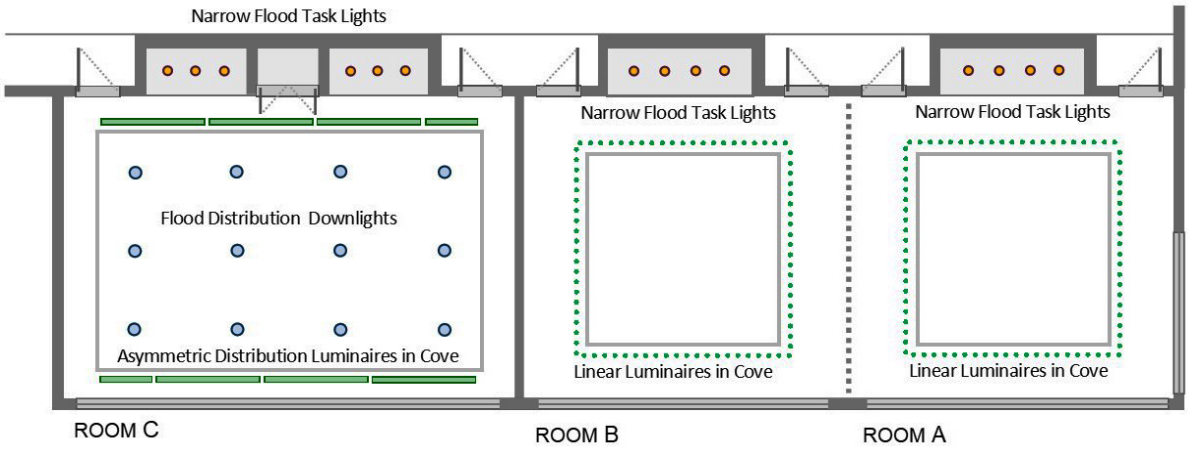
Example 5-2: Cove Lighting

Room A & Room B have two lighting systems: The first system consists of linear luminaires mounted in a cove to provide up-lighting bouncing off the ceiling and providing general illumination. The other system is a series of downlights providing task illumination over an alcove in the room. Cove lighting may be classified as decorative or display lighting when there are other luminaires providing general illumination. However, the cove lighting in Room A and Room B of this example also provides general illumination. Therefore, the cove lighting luminaire power is applied to the allowed general lighting LPD shown in Table 140.6-C Area Category Method instead of as a decorative or display allowance from Table 140.6-C. The lighting power of the downlights providing task illumination are assigned to Additional Lighting Power in Table 140.6-C, provided they are on a separate circuit. If they are on the same circuit as the cove lights, they must also be included in the base lighting allowance.

Room C has three lighting systems:

- Asymmetric distribution luminaires mounted on two sides of the cove to provide up-lighting bouncing off the ceiling for visual enhancement.
- A grid of flood downlights designed to provide general illumination.
- A series of downlights providing task illumination over two alcoves in the room. Cove lighting in this scenario may be classified as decorative or display lighting and can use the decorative/display allowances shown in Table 140.6-C, provided one is available for the space type in which the cove is located, and the cove is separately circuited from the downlights. The flood downlights are designed to provide general/ambient illumination; therefore, the general lighting LPD allowances in Table 140.6-C or 140.6-D apply. As with the cove lights, the downlights providing task illumination can use the appropriate additional allowances in Table 140.6-C or 140.6-D, provided one is available and they are separately circuited.

Figure 5-5: Examples of Cove Lighting: Asymmetric Distribution Luminaires in Cove (Room C); Linear Luminaires in Cove (Rooms A and B)



Source: Bernie Bauer

Mandatory Lighting Controls

Reference: Section 130.1

This section contains information about lighting controls that must be installed regardless of the method used to comply with the lighting power requirements**.**

All lighting controls and equipment must comply with the applicable requirements in §110.9, 130.1, and 130.2 and must be installed in accordance with the manufacturer's instructions (§130.0(d)).

Mandatory nonresidential indoor lighting controls include the following:

- Manual controls, allowing on and off control manually for each area separately.
- Multilevel controls, allowing the ability to use all, some, or none of the light in an area.
- Shut-off controls, which, automatically shut off or reduce light output when a space is vacant.
- Daylight responsive controls, which separately control general lighting in the daylit area based on the amount of daylight in the space.

- Demand-responsive lighting controls, which are capable of receiving and automatically responding to a demand response signal.

Manual Controls

Reference: Section 130.1(a); Section 10-103(a)2

Each building space shall be provided with lighting controls that allow lighting in that space to be manually turned on and off. Manual controls allow building occupants to control the light while they are in the space.

Manual Controls: The manual controls shall be readily accessible and located in the same space or be located so that the controlled lighting or the status of the controlled lighting can be seen when operating the controls.

EXCEPTION to the readily accessible requirement: Restrooms having two or more stalls, parking areas, stairwells, corridors, and spaces of the building intended for access or use by the public may use a manual control not accessible to unauthorized personnel.

EXCEPTION to the same-space requirement: Healthcare facility restrooms and bathing rooms intended for a single occupant can have lighting controls located outside the enclosed area but directly adjacent to the door.

Separate Controls for Lighting Types: In addition, provide separate control for each type of lighting (including general lighting, floor display lighting, wall display lighting, window display lighting, case display lighting, decorative lighting, and special effects lighting) such that each can be turned on and off without turning on or off other types of lighting or other equipment.

Note: Scene controllers may comply with this requirement provided that at least one scene turns on general lighting only, and the control provides a means to manually turn off all lighting.

Egress Lighting: For egress lighting required by the California Building Code, up to 0.1 W/sq. ft. of indoor lighting may be continuously illuminated during occupancy. Egress lighting that complies with this wattage limitation is not required to comply with the manual control requirements if:

- The space designated for means of egress is shown on the building plans and specifications submitted to the local enforcement agency under Section 10-103(a)2 of Part 1 (California Code of Regulations, Title 24); and
- The egress lighting controls are not controllable by unauthorized personnel during a normal power failure.

The following are some examples of spaces that are deemed to be appropriate to locate the manual controls outside of the controlled areas. Still, the manual control is preferred to be located so that a person using the control can see the lights or area controlled by that control or have a visual signal or display showing the current state of the controlled lighting.

- Malls and atria, main entry lobbies, auditorium areas, dining areas, retail merchandise sales areas, wholesale showroom areas, commercial and industrial storage areas, general

commercial and industrial work areas, convention centers, arenas, psychiatric and secure areas in healthcare facilities, and other areas where placement of a manual control poses no health and safety hazard.

Multilevel Lighting Controls

Reference: Section 130.1(b)

Multilevel lighting controls allow the lighting intensity to be adjusted in order to accommodate to the activities in the space.

This requirement applies to general lighting in enclosed spaces 100 sq. ft. or larger with a connected general lighting load greater than 0.5 W/sq. ft. General lighting does not include task, display, or decorative lighting.

The multilevel control must enable continuous dimming from 100 percent to 10 percent or lower of lighting power.

EXCEPTION: The following applications are not required to comply with the multilevel lighting control requirements:

- An indoor space that has only one luminaire.
- Restrooms.
- Healthcare facilities.
- General lighting with light source of HID and induction that have a minimum of one control step between 30 and 70 percent of full rated power.

Shut-Off Controls

Reference: Section 130.1(c)

All installed indoor lighting shall be equipped with controls that are able to automatically reduce lighting power when the space is typically unoccupied.

Shut off controls can be used to automatically turn off or reduce lighting when the spaces are not occupied. For example, an office building is typically unoccupied at night and on weekends; automatic shutoff controls ensure that lighting is off during these periods.

In addition to lighting controls installed to comply with §130.1(a) (manual on and off controls located in each area) and §130.1(b) (multilevel lighting controls), all installed indoor lighting shall be equipped with shut off controls that meet the following requirements (§130.1(c)1):

- One or more of the following automatic shut off controls:
    - Occupant sensing control set to no more than a 20-minute time delay; or
    - Automatic time-switch control; or
    - Other control capable of automatically shutting off all lighting when the space is typically unoccupied.
- Separate controls for lighting on each floor, other than lighting in stairwells; and
- Separate control zones for a space enclosed by ceiling-height partitions not exceeding 5,000 square feet. Note that spaces larger than 5,000 square feet will have more than one separately controlled zone (where each zone does not exceed 5,000 square feet).

EXCEPTION: The area controlled may not exceed 20,000 square feet in the following function areas: malls, auditoriums, single-tenant retail, industrial, convention centers, and arenas

The following applications are exempt from the shut off control requirements of §130.1(c)1:

- An area that is in 24-hour use every day of the year.
- Lighting complying with the occupant sensing control requirements of §130.1(c)5.
    - This exception applies to those areas where occupant sensing controls are required to shut off all lighting. These areas include offices 250 sq. ft. or smaller, multipurpose rooms of less than 1,000 sq. ft., classrooms, conference rooms, or restrooms.
- Lighting complying with the occupant sensing control requirements of §130.1(c)6E.
- Lighting complying with the occupant sensing control requirements of §130.1(c)6C:
    - This exception applies to lighting in stairwells and common area corridors that provide access to guestrooms of hotel/motels and complying with Section 130.1(c)6C.
- Electrical equipment rooms covered by Article 110.26(D) of the California Electrical Code.
- Lighting designated as emergency lighting, connected to emergency power source or batter supply, and functions in emergency mode only when normal power is absent.

The following applications are exempt from shut-off controls identified in Section 130.1(c):

- Healthcare facilities are not required to meet the shut off control requirements of §130.1(c).
- Egress Lighting: Lighting up to 0.1 watts per sq. ft. may be continuously illuminated for egress illumination and is not required to meet the shut off control requirements of §130.1(c). Lighting providing "egress illumination," as used in the California Building Code, shall provide no less light than required by California Building Code Section 1008 while in the partial-off mode.

Use of Countdown Timer Switches

Countdown timer switches may be used to comply with the automatic shut off control requirements in §130.1(c)1 only in enclosures or rooms smaller than 70 sq. ft. and server aisles in server rooms.

The maximum timer setting shall be 10 minutes for enclosures or rooms and 30 minutes for server aisles.

Automatic Time-Switch Controls with Manual Override

Automatic time-switch controls shall include a manual override control that allows the lighting to remain on for no more than two hours when an override is initiated.

EXCEPTION: In the following functional areas, the override time may exceed two hours if a captive-key override is used:

- Malls, Auditoriums, Single-tenant retail, Industrial, Laboratories, and Arenas.

EXCEPTION: Areas where occupant sensing controls are installed.

Automatic Time-Switch Control Holiday Shut Off Feature

An automatic holiday shut off feature shall be incorporated with the automatic time-switch control that turns off all loads for at least 24 hours and then resumes the normally scheduled operation.

EXCEPTION: The following are not required to incorporate the automatic holiday shut-off features:

- Retail stores, associated malls, restaurants, grocery stores, churches, and theaters.

EXCEPTION: Areas where occupant sensing controls are installed.

Areas Where Occupant Sensing Controls are Required to Shut Off All Lighting After Occupancy

Reference: Section 130.1(c)5

Lighting in the following areas shall be controlled with occupant sensing controls to automatically shut off all of the lighting in 20 minutes or less after the control zone is unoccupied. In addition, controls shall be provided that allow the lights to be manually shut off in accordance with §130.1(a) regardless of the sensor status:

- Offices 250 sq. ft. or smaller
- Multipurpose rooms smaller than 1,000 sq. ft.
- Classrooms
- Conference rooms
- Restrooms

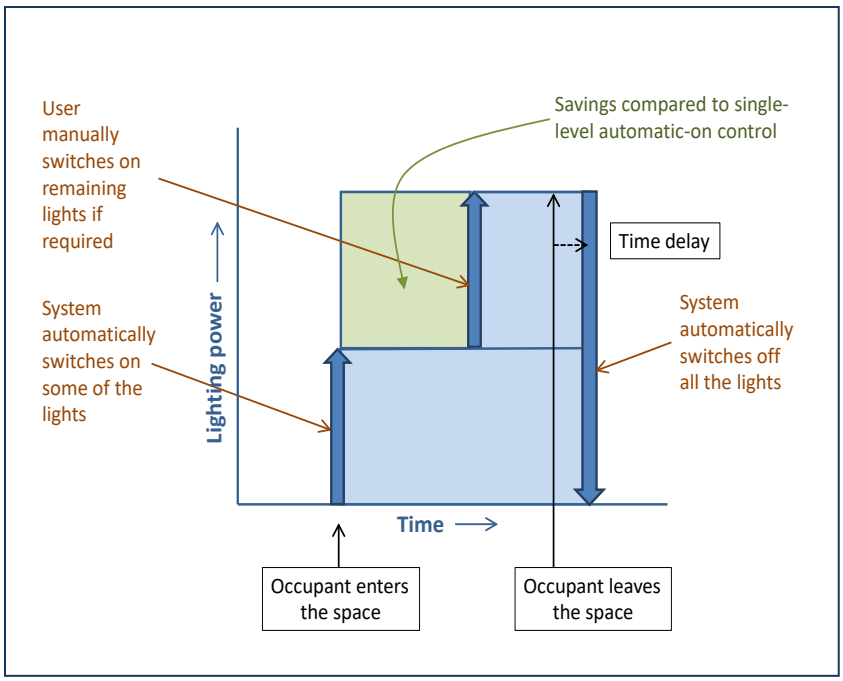
In areas required by §130.1(b) to have multilevel lighting controls, the occupant sensing controls shall function as one of the following:

- A partial-on occupant-sensing control capable of automatically activating between 50 and 70 percent of controlled lighting power (requires lights to be turned ON manually to 100 percent) and automatically turns lights off when the space is unoccupied
- A vacancy-sensing control that automatically turns lights off after an area is vacated and requires lights to be turned on manually

For areas not required by §130.1(b) to have multilevel lighting controls, occupant sensing controls may function as one of the following:

- An automatic full-on occupant-sensing control , or
- A partial-on occupant-sensing control, or
- A vacancy-sensing control, where all lighting responds to a manual on input only.

Figure 5-6: Functional Diagram for Partial-ON Occupant Sensor



Source: California Energy Commission

Areas Where Full or Partial-Off Occupant Sensing Controls are Required in Addition to Complying With §130.1(c)1

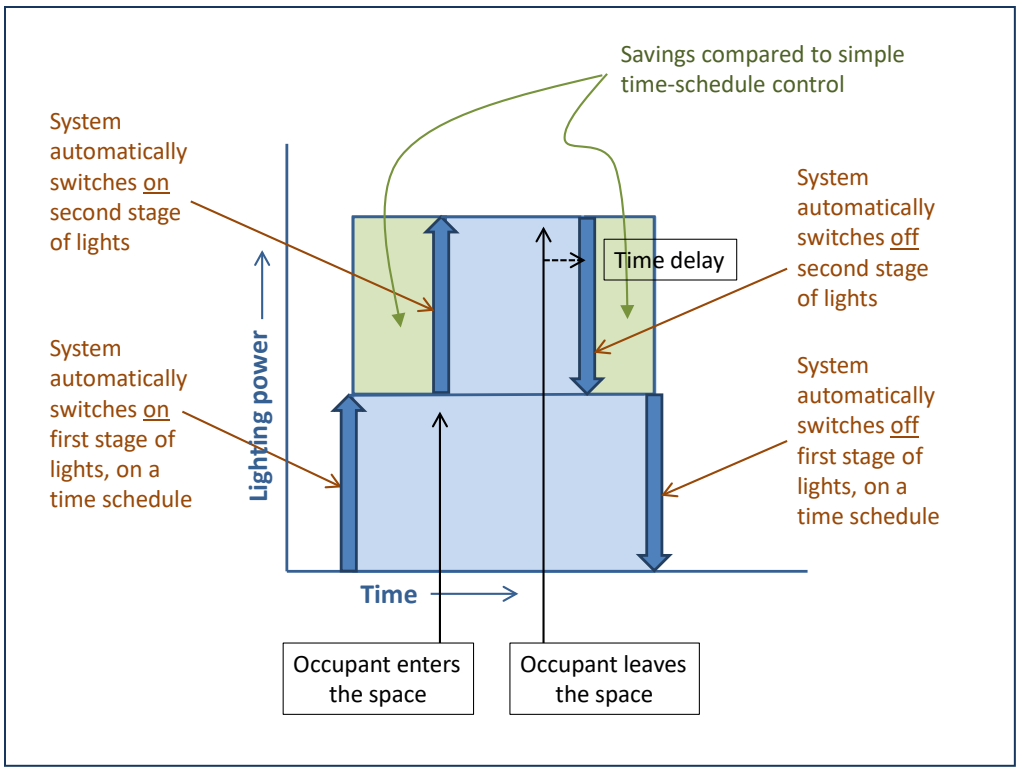
Reference: Section 130.1(c)6

In addition to the basic shut off requirements in §130.1(c)1, §130.1(c)6 requires full or partial off occupant sensing controls to turn off or reduce lighting when an area is unoccupied.

In warehouse aisle ways and warehouse open areas, library book stack aisles, stairwells, and corridors, lighting power must reduce by at least 50 percent when the areas are unoccupied. The decision to reduce or turn lighting off may be made by the designer.

Lighting in these spaces must also comply with §130.1(c)1, which requires lighting to be capable of shutting off when the building is unoccupied. If a partial off occupancy sensor is used to reduce lighting when a space is unoccupied, it can be paired with an automatic time switch to shut lighting off when the building is typically unoccupied.

Figure 5-7: Functional Diagram for Partial Off Occupant Sensor



Source: California Energy Commission

- In warehouse aisle and warehouse open areas, lighting shall be controlled with occupant sensing controls that automatically reduce lighting power by at least 50 percent when the areas are unoccupied. The occupant sensing controls must have independent zoning for each aisle, and the aisle zones must not extend beyond the aisle into the open area of the warehouse.

  EXCEPTION: The following conditions exempt the lighting system from this requirement, but it must meet the additional listed requirements:

  - When metal halide lighting or high-pressure sodium lighting is installed in warehouses, occupant sensing controls shall reduce lighting power by at least 40 percent (instead of the 50 percent required above). This exception is due to limitations of dimming or bilevel ballast technology for high-intensity discharge (HID) light sources.

- In the following library book stack aisles, lighting shall be controlled with occupant sensing controls that automatically reduce lighting power by at least 50 percent when the areas are unoccupied:

  - Library book stack aisles 10 feet or longer that are accessible from only one end
  - Library book stack aisles 20 feet or longer that are accessible from both ends

  The occupant sensing controls shall independently control lighting in each aisle way and shall not control lighting beyond the aisle way being controlled by the sensor.

- In corridors and stairwells, lighting shall be controlled by occupant sensing controls that separately reduce the lighting power in each space by at least 50 percent when the space is unoccupied. The occupant sensing controls shall be capable of turning the lighting fully on

automatically only in the separately controlled space and shall be automatically activated from all designed paths of egress.

- In office spaces greater than 250 sq. ft., general lighting shall be controlled by occupant sensing controls that meet all of the following requirements.

  These requirements apply exclusively to luminaires providing general lighting. Luminaires not meant to provide general lighting can either be controlled following the same occupant sensing controls requirements as general lighting as specified in §130.1(c)1 using time-switch controls or separate occupant sensing controls.

  - The occupant sensing controls shall be configured so that lighting is controlled separately in control zones not greater than 600 sq. ft.
  - In 20 minutes or less after the control zone is unoccupied, the occupant sensing controls shall uniformly reduce lighting power in the control zone to no more than 20 percent of full power (control functions that switch control zone lights completely off when the zone is vacant meet this requirement).
  - In 20 minutes or less after the entire office space is unoccupied, the occupant sensing controls shall automatically turn off lighting in all control zones in the space.
  - In each control zone, lighting shall be allowed to automatically turn on to any level up to full power upon occupancy within the control zone. When occupancy is detected in any control zone in the space, the lighting in other control zones that are unoccupied shall operate at no more than 20 percent of full power.

  EXCEPTION to the mandatory occupant sensing controls for offices greater than 250 sq. ft.: Under-shelf or furniture-mounted task lighting that is already controlled by a local switch and either a time clock or an occupancy sensor does not need to be included in the control zones of the occupant sensing controls.

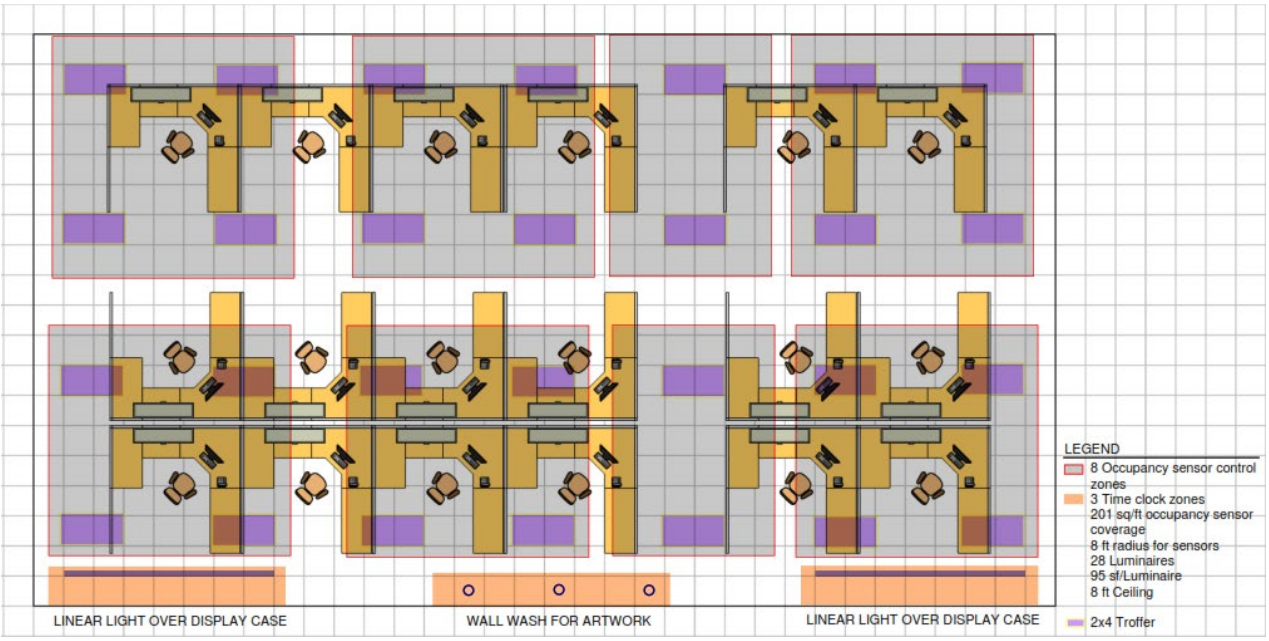
Example 5-3: An Office with Luminaires Serving Different Lighting Purposes

An office of 2,584 square feet has three types of luminaires, as shown in the figure below:

- Overhead luminaires providing general lighting to the cubicles (the 28 purple rectangles).
- Linear lights over display cases near the wall highlighting the objects in the cases (bottom left and right).
- Wall wash lighting along the wall highlighting artwork (bottom center).

Only the overhead luminaires providing general lighting are subject to the occupant sensing control requirements in §130.1(c)6D. Different approaches and options to meet the requirements are discussed in the next example. The linear display lighting and wall wash are grouped together and controlled by a time clock to comply with the shut off requirements in §130.1(c)1.

Figure 5-8: (for Example 5-3) An Office Plan With Occupant Sensing Control Zone Layout



Source: Energy Solutions

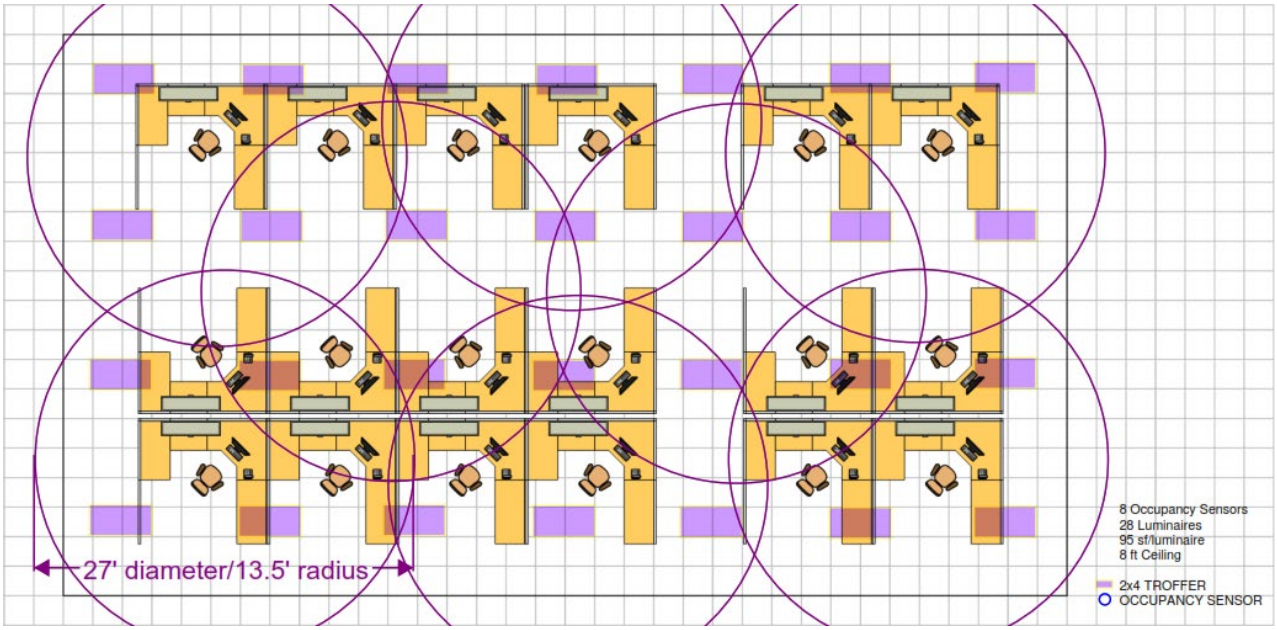
Example 5-4: Occupant Sensing Control Zones for Office Spaces Greater Than 250 Square Feet

In office spaces greater than 250 sq. ft., the occupant sensing controls must be configured such that general lighting in the space is divided into separate control zones, and the size of each control zone must be 600 sq. ft. or less.

The figure below provides an example of the same 2,584 square foot office as in the previous example that meets this requirement. Display lighting and wall wash are omitted as they do not need to comply with this requirement. In this case, the office is divided into eight occupant sensing control zones, each controlled by an occupant sensor. The occupant sensors in this example have a circular coverage pattern with a radius of 13.5 feet, resulting in a coverage area of 573 square feet, which meets the 600 square feet or less per control zone requirement. Each circle in the image represents the coverage area of the occupant sensor located at the center of the circle. The evenly spaced purple rectangles represent 2'x4' luminaires that provide general lighting in the office, and the luminaires within each circle are controlled by the occupant sensor at the center of the circle. If a luminaire is in two or more circles, it is controlled by the closest occupant sensor.

The size of each control zone is at the discretion of the practitioner, as long as it is not larger than 600 square feet. The control zones within the office space do not need to be equal in size. If each occupant sensing control zone in an office is 250 square feet or less and the prescriptive compliance path is used, consider taking advantage of the power adjustment factor (PAF) provided in §140.6(a)2I for occupant sensing controls in offices larger than 250 square feet. Refer to Calculation of Adjusted Indoor Lighting Power for more information on the PAF.

Figure 5-9: (for Example 5-4) An Office Plan With Occupant Sensing Control Zone Layout



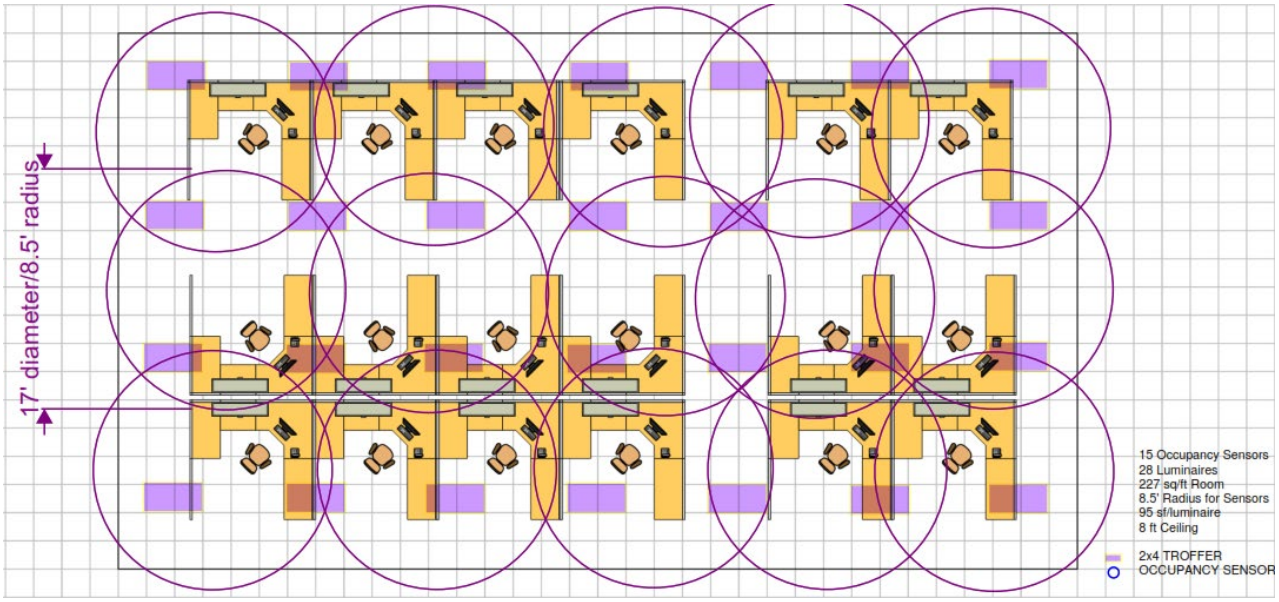
Source: Energy Solutions

Example 5-5: Occupant Sensing Control Zone in a Large Office Using Power Adjustment Factor

The figure below shows another occupant sensing control zone design for the same 2,584 sq. ft. office. In this design, 15 occupant sensors are used to meet the requirement, and each sensor has a circular coverage pattern with a radius of 8.5 feet, resulting in a coverage area of 227 sq. ft. Because each sensor controls 227 sq. ft., which is less than 250 sq. ft. but more than 126 sq. ft., a PAF of 0.20 can be used per Table 140.6-A. Refer to §140.6(a)2I and Section 5.6.2 of this compliance manual for detailed requirements on using the PAF for occupant sensing controls in offices larger than 250 square feet.

Note: Using PAFs for occupant sensing controls is dependent on the square footage that each occupant sensor covers and not the number of occupant sensors used. For example, if each of the 15 occupant sensors in the figure below had a coverage area greater than 250 sq. ft., the design would not qualify to use the PAF.

Figure 5-10: (for Example 5-5) An Office Plan With Occupant Sensing Control Zone Layout



Source: Energy Solutions

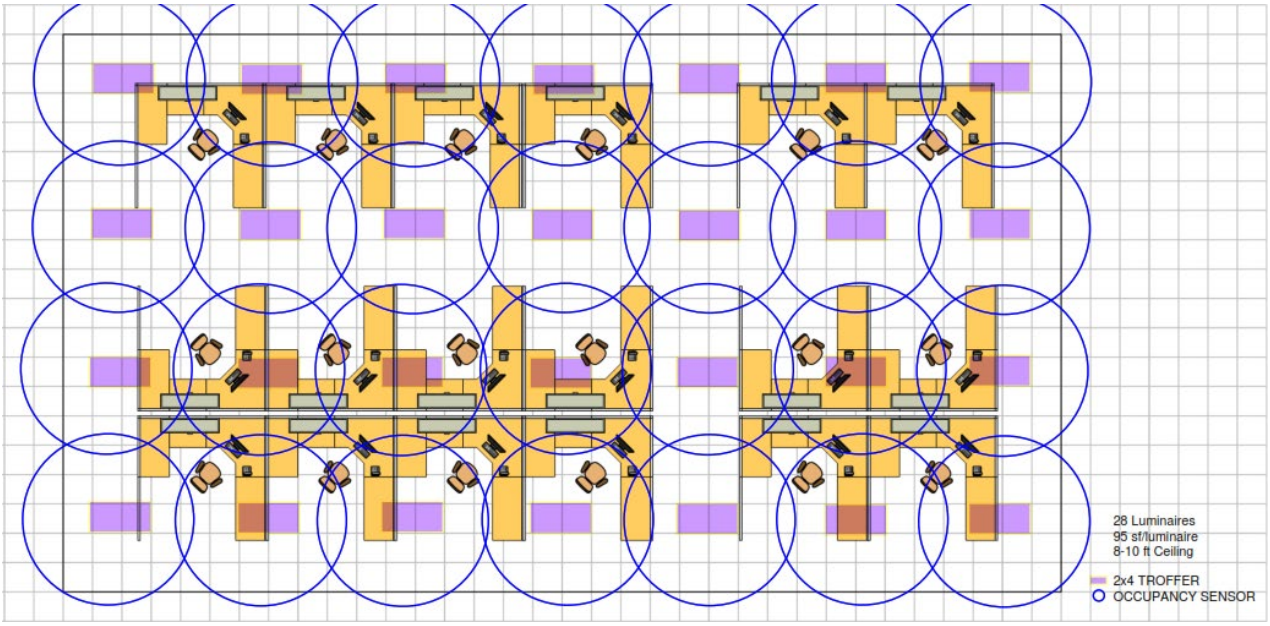
Example 5-6: Occupant Sensing Control Zones for Luminaires with Integral Occupant Sensors

For luminaires with an integral occupant sensor that are capable of reducing power independently from other luminaires, each luminaire can be considered as its own control zone, and the size of the control zone equals the coverage area of the luminaire-integrated occupant sensor. This configuration is likely to result in occupant sensing control zones 250 sq. ft. or smaller. So, if using the prescriptive compliance path, consider taking advantage of the PAF provided in §140.6(a)2I for occupant sensing controls in offices larger than 250 square feet. Refer to Calculation of Adjusted Indoor Lighting Power for more about using the PAF.

Note: Each luminaire with an integral occupant sensor can be considered as its own control zone only if they are commissioned to reduce power independently from other luminaires. Several lighting systems allow "grouping" luminaires with an integral occupant sensor. In such a grouping configuration, all luminaires within the group will operate to provide the designed task light level as long as one luminaire-integrated sensor detects occupancy. Similarly, all luminaires will reduce power to 20 percent or less only after no occupant is detected by any of the luminaire-integrated sensors within the group for 20 minutes. In this case, the total area covered by a group of luminaire-integrated occupant sensors is considered as a single occupant sensing control zone and shall be 600 square feet or less.

The figure below provides an example of the same 2,584 sq. ft. office using luminaires with an integral occupant sensor, with each luminaire commissioned to reduce power independently from the other luminaires. In this case, there are 28 luminaires; therefore, there are 28 occupant sensing control zones. The coverage area of each sensor (and therefore the size of each control zone) is 100 sq. ft. This occupant sensing control zone design not only meets the control requirements but is eligible for a PAF of 0.30 since each occupant sensing control zone is less than 125 sq. ft. (see Table 140.6-A).

Figure 5-11: (for Example 5-6) An Office Plan With Occupant Sensing Control Zone Layout

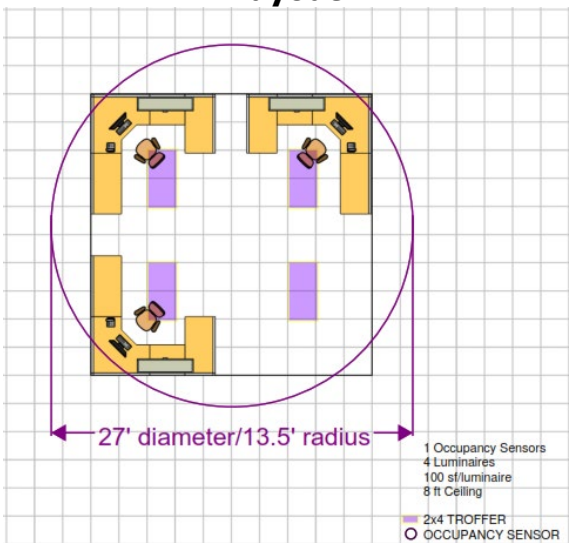


Source: Energy Solutions

Example 5-7: Occupant Sensing Controls for an Office Greater Than 250 Square Feet With a Single Control Zone

An office space larger than 250 sq. ft. but smaller than or equal to 600 sq. ft. may have a single control zone for the entire office as long as the field of view of the occupant sensor is able to cover the entire office. The figure below shows a shared office space of 400 square feet as an example. In this case, a single occupant sensor is able to cover the entire office and, therefore, meets the requirement.

Figure 5-12: (for Example 5-7) An Office Plan With Occupant Sensing Control Zone Layout



Source: Energy Solutions

Notes About Occupant Sensing Ventilation Controls And Occupant Sensing Lighting Controls

Note 1: Occupant sensing ventilation controls for offices greater than 250 sq. ft. are required because this space type meets both criteria. Because of this, occupant sensing zone controls

for the space-conditioning system are also required. Refer to §120.1(d)5 and §120.2(e)3 in the Energy Code as well as Chapter 4 of this manual to ensure occupant sensor ventilation controls and occupant sensing zone controls are properly implemented on the mechanical systems. Corridors are another space type covered by §130.1(c)6, where ventilation air is allowed to go to zero during occupied standby mode, and thus are required to meet occupant sensing ventilation control requirements.

Note 2: This occupant sensing controls requirement in §130.1(c)6D does not negate other lighting controls provisions in §130.1. For example, for office spaces greater than 250 sq. ft. where daylight Responsive controls are also required per §130.1(d), lighting in the occupied occupant sensing control zones shall be dimmed in response to the available daylight. Refer to Lighting Control Interactions — Considerations for Spaces With Daylight Responsive Controls and Multilevel Lighting Controls of this manual to ensure the proper interactions among the required lighting controls.

Areas Where Partial-Off Occupant Sensing Controls Are Required Instead of Complying With §130.1(c)1

Reference: Section 130.1(c)6E

In parking garages and parking areas, and in loading and unloading areas, lighting is required to have partial off occupant sensing controls instead of meeting the shut off requirements of §130.1(c)1. Lighting in these spaces may operate full time at the minimum setback level and is not required to be shut off after hours. The decision to turn the lights off fully may be made by the designer.

The general lighting shall meet the following requirements:

- Be controlled by occupant sensing controls having at least one control step between 20 percent and 50 percent of design lighting power.
- No more than 500 watts of rated lighting power shall be controlled together as a single zone.
- Occupant sensing controls shall be capable of automatically turning the lighting fully on only in each separately controlled space.
- The occupant sensing controls shall be automatically activated from all designed paths of egress.

For these spaces, lighting power must be reduced by at least 50 percent of the design lighting power, and the lighting must be reduced while maintaining similar levels of uniformity to the full power conditions. The zoning of the controls requires careful consideration of paths of egress to ensure that the sensor coverage in the zone is adequate. The wattage limits per zone will typically not permit entire floors of a garage to be on a single zone.

Reference: Section 130.1(c)6C

Similarly, lighting in stairwells and common area corridors that provide access to guestrooms of hotel/motels is required to have partial off occupant sensing controls instead of meeting of Section 130.1(c)1.

Daylight Responsive Controls

Reference: Section 130.1(d)

Daylighting (aka daylight harvesting) can be used as an effective strategy to reduce electric lighting energy use by reducing electric lighting power in response to available daylight. Section 130.1(d) addresses mandatory requirements of daylight responsive controls for adjustments of the electric lighting in response to available daylight.

Daylight Responsive controls are required in all daylit zones (primary and secondary sidelit daylit zones; skylit daylit zones) to automatically reduce general lighting when sufficient daylight is available. Read further on applicability and exceptions.

Daylit Zones and Controlling Lighting in Daylit Zones

The terms of the three types of daylit zones:

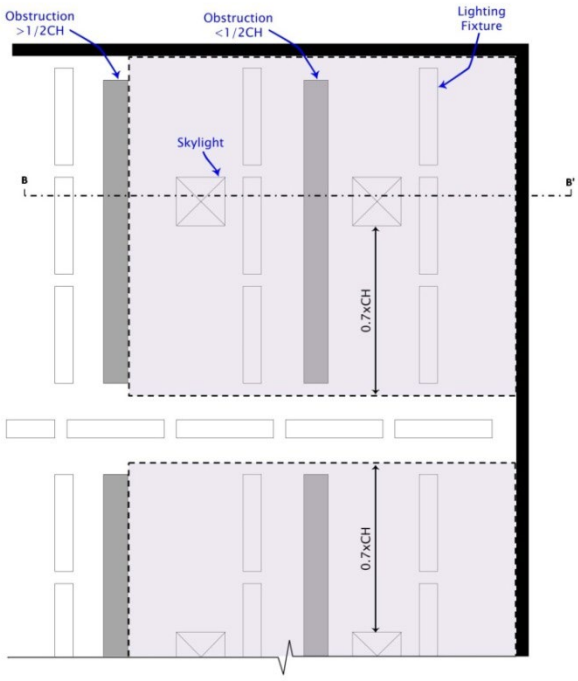
Skylit Daylit Zone is the rough area in plan view under each skylight, plus 0.7 times the average ceiling height in each direction from the edge of the rough opening of the skylight, minus any area on a plan beyond a permanent obstruction that is taller than one-half the distance from the floor to the bottom of the skylight.

Note: Modular furniture walls should not be considered a permanent obstruction.

The bottom of the skylight is measured from the bottom of the skylight well (for skylights having wells), or the bottom of the skylight if no skylight well exists.

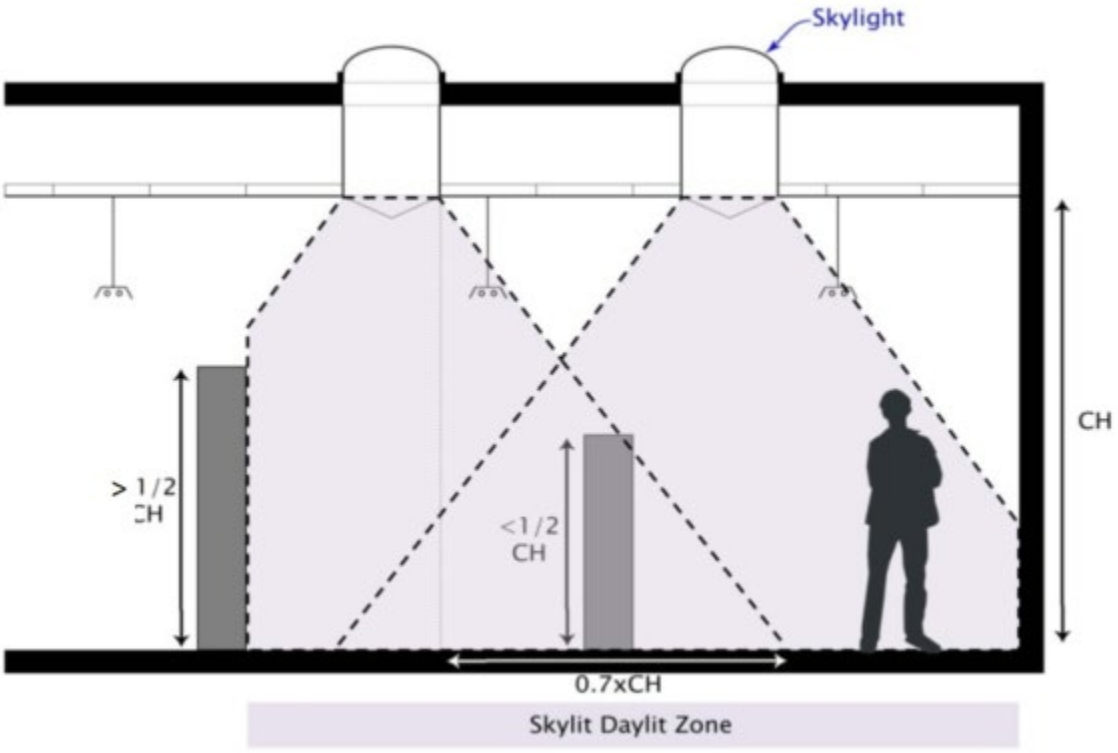
For determining the skylit daylit zone, the geometric shape of the skylit daylit zone shall be identical to the plan view geometric shape of the rough opening of the skylight. For example, the skylit daylit zone for a rectangular skylight must be rectangular; for a circular skylight, the skylit daylit zone must be circular.

Figure 5-13: Example of Skylit Daylit Zone Layout in Overhead View



Source: California Energy Commission

Figure 5-14: Example of Skylit Daylit Zone Layout in Side View

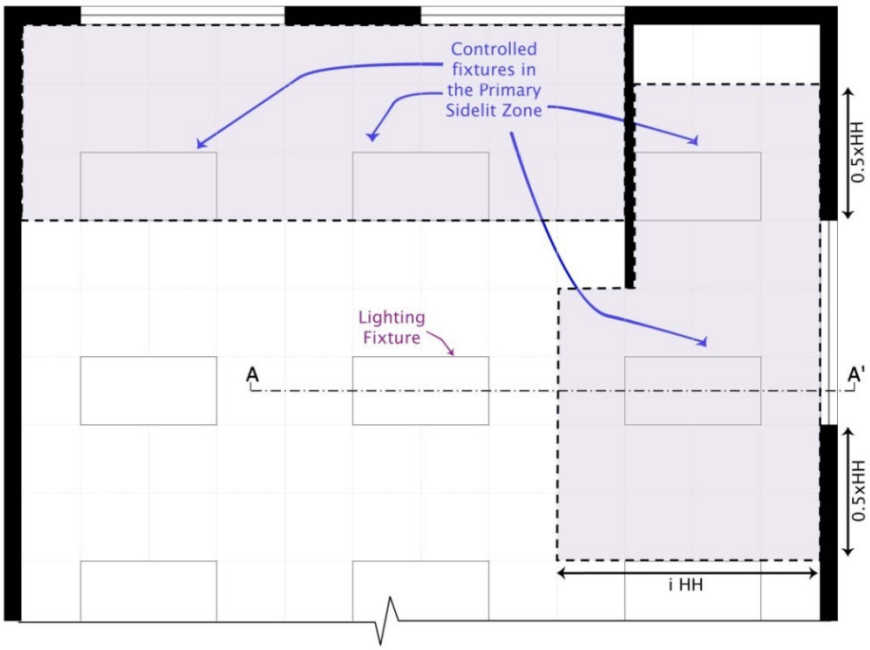


Source: California Energy Commission

Primary Sidelit Daylit Zone is the area in plan view directly adjacent to each vertical glazing, one window head height deep into the area, and window width plus 0.5 times window head height wide on each side of the rough opening of the window, minus any area on a plan beyond a permanent obstruction that is 6 feet or taller as measured from the floor.

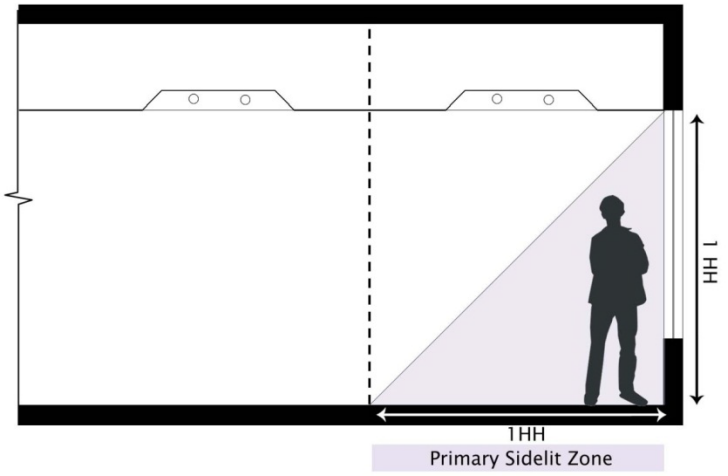
Note: Modular furniture walls should not be considered a permanent obstruction.

Figure 5-15: Example of Primary Sidelit Daylit Zone Layout in Overhead View



Source: California Energy Commission

Figure 5-16: Example of Primary Sidelit Daylit Zone Layout in Side View



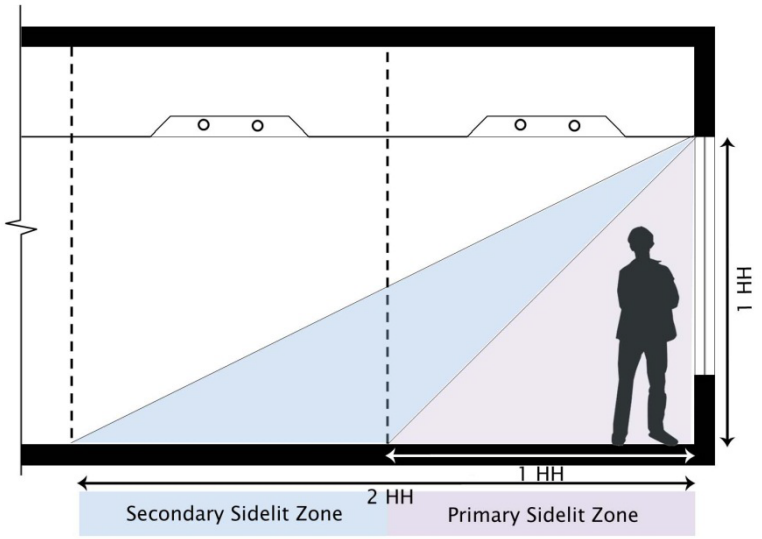
Source: California Energy Commission

Secondary Sidelit Daylit Zone is the area in plan view directly adjacent to each vertical glazing, two window head heights deep into the area, and window width plus 0.5 times window head height wide on each side of the rough opening of the window, minus any area on a plan beyond a permanent obstruction that is 6 feet or taller as measured from the floor.

Note: "Window Head Height" is the vertical distance from the finished floor level to the top of a window or vertical fenestration. This is important to know in order to figure out the sidelit daylit zone where there is a window or there are windows.

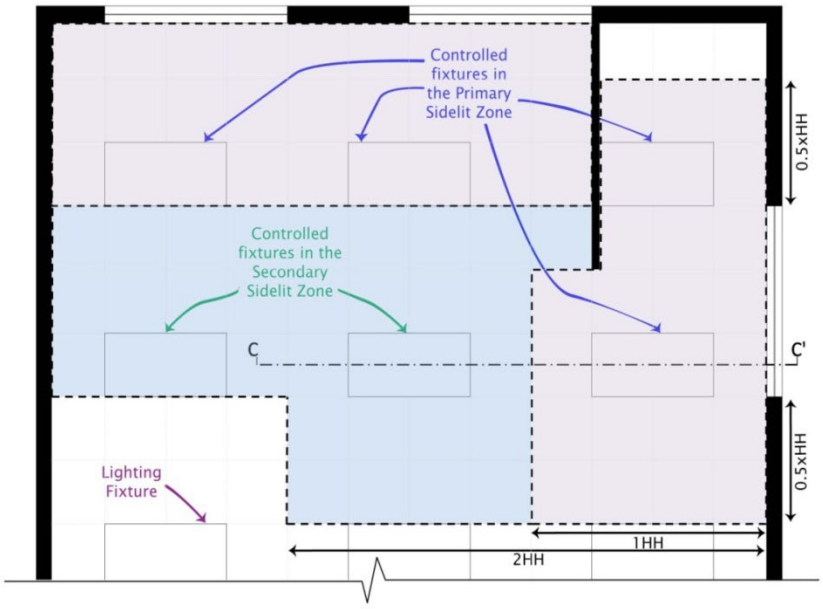
Note: Modular furniture walls should not be considered a permanent obstruction.

Figure 5-17: Example of Secondary Sidelit Daylit Zone in Side View



Source: California Energy Commission

Figure 5-18: Example of Secondary Sidelit Daylit Zone in Overhead View



Source: California Energy Commission

Daylight Responsive Controls in Indoor Spaces (Not Including Parking Garages)

Daylight responsive controls are required for general lighting in skylit daylit zones and primary sidelit daylit zones where the total installed general lighting wattage is 75 watts or greater.

Daylight responsive controls are also required for general lighting in secondary sidelit daylit zones when one of the following two conditions is met:

- Secondary sidelit daylit zones have a total installed general lighting wattage of 75 watts or greater and also daylight responsive controls for primary sidelit daylit zones are required in the same enclosed space.
- Secondary sidelit daylit zones have a total installed general lighting wattage of 75 watts or greater and also daylight responsive controls for primary sidelit daylit zones are not required in the same enclosed space.

Luminaires providing general lighting in the skylit daylit zone, primary sidelit daylit zone, or secondary sidelit daylit zone shall be controlled by daylight responsive controls specific to the conditions in the different type of zone that meet the applicable requirements:

- Building Plans: All skylit daylit zones, primary sidelit daylit zones, and secondary sidelit daylit zones must be shown on the building plans.
- Separate Control Zones: The daylight responsive controls shall provide separate control for general lighting in each type of daylit zone. General lighting luminaires in the skylit daylit zone must be controlled separately from those in the primary sidelit daylit zone and secondary sidelit daylit zone.

  In spaces where skylights are near exterior walls with windows, the skylit daylit zone may overlap with either the primary or secondary sidelit daylit zone. The skylit daylit zone takes precedence, and the general lighting luminaires in the overlapping area must be controlled as part of the skylit daylit zone.

- Overlapping Daylight Zones: Where the primary sidelit daylit zone and the secondary sidelit daylit zone overlap, such as in corner spaces, the primary sidelit daylit zone takes precedence and the general lighting luminaires in the overlapping area must be controlled as part of the primary sidelit daylit zone.
- Luminaires in Overlapping Daylit Zones (part 1): A general lighting luminaire that crosses both primary sidelit daylit zone and secondary sidelit daylit zone must be controlled as part of the primary sidelit daylit zone regardless of how much of the luminaire is in each zone. A general lighting luminaire that crosses both the secondary sidelit daylit zone and a non-daylit zone must be controlled as part of the secondary sidelit daylit zone regardless of how much of the luminaire is in each zone. Example 5-10 illustrates how to control an 8-foot luminaire for daylight dimming when it crosses both the primary and secondary sidelit daylit zones.
- Luminaires in Overlapping Daylit Zones (part 2): The code does not prevent segmenting luminaires into shorter segments, and as long as the segments are 8 feet and less, these segments are controlled according to the type of daylit zone where the segment is primarily located (a hierarchy of first skylit then primary sidelit and last secondary sidelit).
- Secondary Daylit Zones: General lighting in the secondary sidelit daylit zones must be controlled independently of general lighting in the primary sidelit daylit zones. However, a single sensor can be used to control both the primary and secondary sidelit daylit zones provided that the control system can make separate and appropriate light level adjustments in each zone.

Example 5-8: Controlling Luminaires Across Daylit Zones

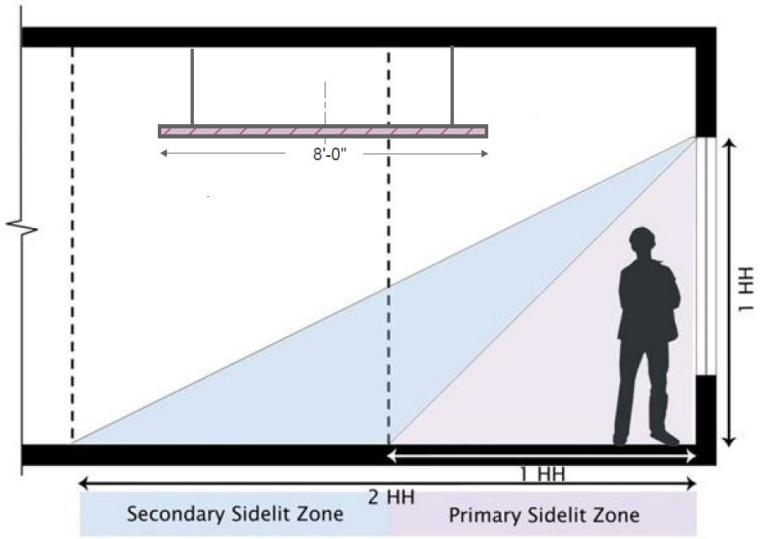
The general lighting in the space depicted in Figure 5-19: (Example 5-8) Controlling Luminaires Across Daylit Zones is provided by a few rows of 8-foot linear pendant luminaires perpendicular to the window. Each luminaire crosses two daylit zones with about 2 feet in the primary sidelit daylit zone and 6 feet in the secondary sidelit daylit zone.

Because the luminaires are only 8-foot long, it does not need to be segmented into smaller sections for daylight responsive controls. And because the luminaires are in both the primary and secondary sidelit daylit zones, they must be controlled as part of the primary sidelit daylit zone when the entire luminaire is controlled as a single section.

Alternatively, each luminaire is allowed to be controlled in two 4-foot long segments, the first segment being the 4-foot section in the primary sidelit daylit zone and the other 4-foot segment in the secondary sidelit daylit zone. In this case, only the segment that is partially in the primary sidelit zone must be controlled as part of the primary sidelit daylit zone, and the other half that is entirely in the secondary sidelit zone can be controlled as part of the secondary sidelit daylit zone.

It is also allowed and good practice to segment the control of the luminaire with a 2 foot section in the primary sidelit zone and controlled as part of the primary sidelit zone. In this case the remaining 6 feet of the luminaire would be in the secondary sidelit zone and controlled as part of the secondary sidelit zone.

Figure 5-19: (Example 5-8) Controlling Luminaires Across Daylit Zones



Source: California Energy Commission

- Controlled Segmentation of luminaires (part 1): General lighting luminaires that are long such as linear pendants, strip lights, tape lights, and cover lights shall be segmented into control sections so that lighting is evaluated and controlled separately in each type of daylit zone (skylit daylit zones: primary sidelit daylit zones, secondary sidelit daylit zones, and non-daylit zones). Each controlled segment must be 8 feet or shorter.
    - Evaluation of installed wattage in each daylit zone: The lighting power of each luminaire segment shall be allocated to the daylit zone in which the segment would be controlled. In most cases where the luminaire or luminaire segment is 8 feet long or less, this allocation to daylit zone is based on which of the various daylit zones the luminaire is in or partially in according to the hierarchy of first skylit, then primary sidelit and lastly secondary sidelit. For luminaires with premanufactured housings longer than 8 feet, the rules about controlling these luminaires are different as are the allocation of watts to the daylit zone. This is described in the exception in item 8 below.
    - Separate control for each daylit zone: In daylit zones where daylight responsive controls are required, each luminaire segment must be separately controlled according to the type of daylit zone in which the segment is primarily located.

Example 5-9 shows how long luminaires should be segmented in evaluating lighting power to each daylit zone and controlling them for daylight dimming.

Example 5-9: Evaluating and Controlling Luminaires Longer than 8 Feet but with Segments 8 feet and Shorter

Luminaires that are longer than 8 feet and with segments of 8 feet and less are controlled based on a hierarchy of where the segment are primarily located - first, controlled as part of the skylit daylit zone if the segment is primarily located; next, controlled as the primary sidelit daylit zone if primarily located; lastly controlled as the secondary sidelit if located in there. General lighting in Figure 5-20: (Example 5-9) Evaluating and Controlling Long Luminaires with

Segments Less than 8 Feet is provided by three rows of 12-foot linear pendant luminaires, and each row of luminaire is made up of three factory assembled 4-foot sections shipped to the site and joined together on-site.

The first row from the right-hand side of the image is entirely in the primary sidelit daylit zone, therefore, even though it is longer than 8 feet, it does not need to be segmented for daylight responsive controls. The entire row must be controlled as part of the primary sidelit daylit zone.

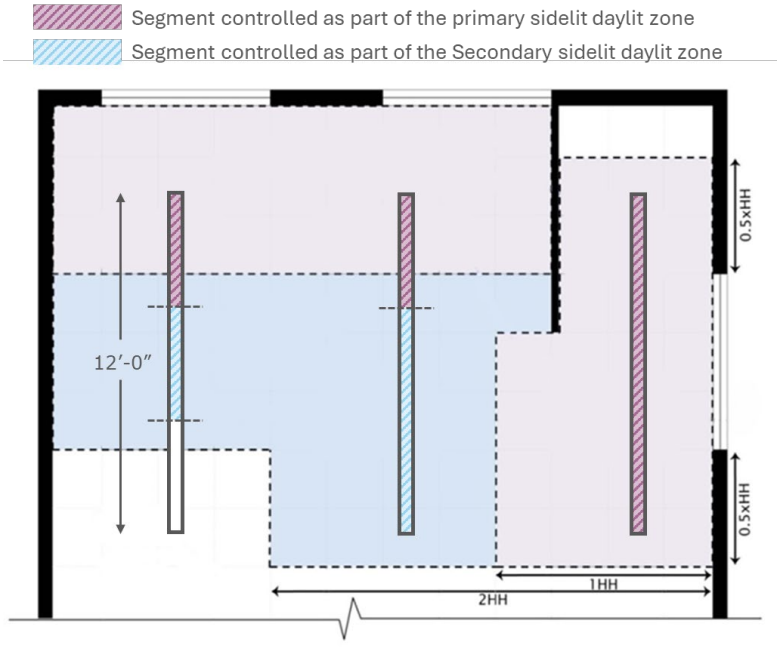
The middle row crosses both the primary and secondary sidelit daylit zones. Since it is longer than 8 feet, it must be controlled in segments of 8 feet or less. The sensible segmentation choice would be to segment it into one 4-foot and one 8-foot sections as depicted in the figure. Since the 4-foot segment is partially in the primary sidelit daylit zone and according to the hierarchy of allocating to daylit zones, its lighting power must be allocated to the primary sidelit daylit zone, and it must be controlled as part of the primary sidelit daylit zone. The 8-foot segment is entirely in the secondary sidelit daylit zone, and therefore, its lighting power is allocated to the secondary sidelit daylit zone, and the segment must be controlled as part of the secondary sidelit daylit zone.

The third row, the left-most row, crosses the primary and secondary sidelit daylit zones as well as the non-daylit zone. There are multiple ways to segment the luminaire to meet the daylight responsive controls requirements:

Option 1 (not shown in the figure): Segment it the same way as the luminaire in the middle row. Since the 4-foot segment is primarily in the primary sidelit daylit zone, its lighting power must be allocated to the primary sidelit daylit zone, and it must be controlled as part of the primary sidelit daylit zone. The 8-foot segment is primarily in the secondary sidelit daylit zone, and therefore, its lighting power is allocated to the secondary sidelit daylit zone, and the segment must be controlled as part of the secondary sidelit daylit zone.

Option 2: Segment the two luminaires (the middle and the third row) into three 4-foot segments as shown in the figure. Note that the code only requires the luminaire to be segmented in segments of 8 feet or less and does not stipulate the number and length of the segments as long as each segment is no longer than 8 feet. In this case, the first 4-foot segment of the middle-row luminaire is primarily in the primary sidelit daylit zone, its lighting power must be allocated to the primary sidelit daylit zone, and it must be controlled as part of the primary sidelit daylit zone. The other 4-foot segments of the middle-row luminaire are entirely in the secondary sidelit daylit zone, so its lighting power is allocated to the secondary sidelit daylit zone, and the segments must be controlled as part of the secondary sidelit daylit zone. The luminaire (the third-row luminaire) on the left side of the figure where the bottom 4-foot segment is primarily in the non-daylit zone, also is partially in the secondary sidelit zone and therefore, its lighting power is allocated to the secondary sidelit zone.

Figure 5-20: (Example 5-9) Evaluating and Controlling Long Luminaires with Segments Less than 8 Feet



Source: California Energy Commission

- Controlled Segmentation of luminaires (part 2): In the scenario in which the installed luminaires are manufactured with factory assembled housing longer than 8 feet, the luminaire is allowed to be controlled as a single segment according to the type of daylit zone in which it is primarily located. A lighting configuration that looks continuous and uninterrupted but is made up by joining multiple segments during field installation does not qualify for this exception and must be controlled in segments of 8 feet or shorter. An example is the usage of a luminaire with an extruded aluminum body over 8 feet and it is not assembled from shorter segments in the field during installation. Examples 5-10 to 5-12 provide examples of what types of luminaires qualify for this exception. When calculating the general lighting wattage in various daylit zones, the wattage of these long luminaires is fully allocated to the daylit zone the luminaire is "primarily" in. Calculation of primarily is based on the amount of luminaire area in each daylit zone and the zone with highest fraction of luminaire areas is considered the zone which the luminaire is primarily in. When considering daylit areas – this could also include "non-daylit" areas.
- Luminaires without housings. Some lighting systems do not have housings. The most common configuration is tape lighting which can be used as cove lighting. Cove lighting is often installed to serve as "decorative lighting" and is not subject to the requirements for general lighting. When cove lighting is the only light source for a space or portion of a space, then it is providing general lighting and shall be controlled by daylight responsive controls if there is sufficient wattage in the daylit zones. As general lighting when the tape lighting crosses from daylit to non-daylight zones or across daylit zone types, the tape light shall be controlled in segments of 8 feet or less according to the daylit zone the segment is partially in and controlled according to the daylit area type according to the hierarchy - first skylit then primary sidelit and finally secondary sidelit daylight zone.
- EXCEPTIONS: Daylight responsive controls are not required for any of the following conditions:

- Areas under skylights where it is documented that existing adjacent structures or natural objects block direct sunlight for more than 1,500 daytime hours per year between 8 a.m. and 4 p.m.
- Areas adjacent to vertical glazing below an overhang, where the overhang covers the entire width of the vertical glazing, no vertical glazing is above the overhang, and the ratio of the overhang projection to the overhang rise is greater than 1.5 for south, east, and west orientations or greater than 1 for north orientations.
- Rooms that have a total glazing area of less than 24 square feet.
- Luminaires in sidelit daylit zones in retail merchandise sales and wholesale showroom areas.

Daylight Responsive Control Installations and Configurations

Daylight responsive controls must be installed and configured according to the following requirements:

- In spaces where multilevel lighting is available for the general lighting, regardless of whether the availability is triggered by the requirements under §130.1(b):
  - If general lighting is continuously dimmable, daylight responsive controls must have more than 10 light output levels and at least one of the levels must reduce the lighting power by 90 percent of full power or more.

    Note: Per Reference Appendices NA7.6.1.4, continuous dimming is defined as having the capability to provide more than 10 levels of controlled light output.
  - The daylight responsive controls must be dimmable if the general lighting meets the criteria of Section 130.1(b). See Lighting Control Interactions — Considerations for Spaces With Daylight Responsive Controls and Multilevel Lighting Controls for more details on these criteria (more than 0.5 W/sf, more than one light fixture in the room and not HID or induction lighting).
  - If general lighting is not dimmable, namely, multilevel lighting controls are not required and not available, the light can remain at full output before daylight reaches 150 percent of the design illuminance on the task surface. Daylight responsive controls must turn the lights OFF when daylight is at 150 percent of the design illuminance. However, with the broad use of LED sources which often are dimmable, there are a number of reasons why the designer specifies dimmable daylight responsive lighting controls.
    - Section 130.1(c)6 requires partial off occupancy sensing in warehouses, open plan offices, corridors etc.; this is frequently achieved by dimming the light source to its partial off setting when occupancy sensor does not sense any occupancy. Thus the dimming daylight responsive control is compatible with the continuous dimming capability of the LED driver that is being served by both the daylighting controls and the partial off occupancy sensor.

- Dimmable daylight responsive controls are specified for occupant comfort reasons, a control that dims lighting in response to daylight is less intrusive than a control that turns the lights completely on and off.
- The dimmable daylight responsive controls are selected to yield more savings for the occupants.

When dimmable daylight responsive lighting controls are specified, regardless of they were required, then the correct operation of the controls shall be verified by the acceptance test NA7.6.1.4 *Continuous Dimming Control Systems Functional Testing*.

- For those general lighting systems that do not have dimmable daylight responsive controls because they do not meet the criteria of Section 130.1(b) and the designer has specified the minimally compliant on/off controls, the correct operation of the controls shall be verified by the acceptance test NA7.6.1.5 *Stepped Switching or Stepped Dimming Control Systems Functional Testing*. Item (d) of this test, *partial daylight test*, only applies if the control has an intermediate control step. Though not required for the daylight responsive control, the designer might specify the intermediate step for HID or induction lighting systems which make use of Exception 4 to Section 130.1(b).

When the requirements of §130.1(d) are triggered by the addition of skylights to an existing building and the lighting system is not recircuited, the daylighting control is not required to meet the multilevel requirements in §130.1(d)2Ci. The daylighting control may provide on/off control in accordance with §141.0(b)2G for alterations.

- In all portions of the daylight zone, the combined illuminance from the controlled lighting and daylight shall not be less than the illuminance from controlled lighting when no daylight is available.

  In the darkest portion of the daylit zone (the "reference location" in the Reference Appendix NA7.6 *Indoor Lighting Controls Acceptance Tests*), the control should not overdim the lights.
- When the daylight illuminance, in the darkest portion of the daylit zone, is greater than 150 percent of the illuminance provided by the controlled lighting when no daylight is available, the controlled lighting power in that daylight zone shall be reduced by a minimum of 90 percent.

  The best control would fully dim the system when daylight levels in the darkest portion of the daylit zone are at 100 percent of the illuminance from controlled lighting when no daylight is available. The 150 percent/90 percent requirement allows some tolerance for error while obtaining most of the energy savings.
- Photosensors, the device that senses light levels and transmits this to the photocontrol, shall be located so they are not readily accessible to unauthorized personnel. This location helps prevent unauthorized modification or disabling of the light sensor. The location where calibration adjustments are made to automatic daylight responsive controls shall be readily accessible to authorized personnel and may be inside a locked case or under a cover that requires a tool for access. These adjustments allow the authorized personnel (such as the

lighting technician) to modify the response of the photocontrol (daylight responsive control) so the combination of daylit and electric light provides sufficient interior illuminance under all daylight conditions while reducing electric lighting in response to daylight availability and saving energy. Access to controls can be limited by placing locks or screws on enclosures or under a cover plate so a tool or key is needed to gain access. Initial commissioning and retrocommissioning of the controls are simplified if the calibration adjustments are readily accessible to authorized personnel so that a lift or a ladder is not required to access the location where calibration adjustment are made.

Some controls have wireless remotes for adjusting settings. This allows one person with a light meter and the wireless calibration tool to be located at the edge of the daylit zone and make the calibration adjustments without having to run back and forth between taking the measurement and making the adjustment.

- Manual controls, as required by §130.1(a), shall interact with daylight responsive controls in the following ways:
    - Manual controls must be able to turn off the lights at any time.
    - Manual controls must be able to reduce the light output below the light level set by the daylight responsive controls.

Example 5-13: Complying With the 150 Percent of the Design Illuminance Daylighting Requirement and "Reference Location" (from NA7.6.1)

When the illuminance received from daylight is greater than 150 percent of the design illuminance (or nighttime electric lighting illuminance), the general lighting power in the daylit zone must reduce by a minimum of 90 percent.

For example, a space has 500 watts of general lighting power in the daylit zones. The design illuminance for the space is 50 foot-candles (fc). When the available daylight in the space reaches 75 fc (that is, 150 percent of 50 fc), then the power consumed by the general lighting in the daylit zones should be 50 watts or lower.

Without checking all points in the daylit zone served by controlled lighting, verifying that the requirements are met at a worst-case location far away from windows or skylights is sufficient. This location is referred as the "Reference Location" in Reference Appendix NA7.6.1.4(a) and NA7.6.1.5(a).

Daylight Responsive Controls in Parking Garages

For parking garage areas, daylight responsive controls are required in both primary and secondary sidelit daylit zones when all the following criteria are met:

- The total installed wattage of general lighting in the primary and secondary sidelit daylit zones is 60 watts or greater.
- The areas have a combined total of 36 square feet or more of glazing or opening.

When daylight responsive controls are required, luminaires providing general lighting that are in the combined primary and secondary sidelit daylit zones shall be controlled independently from other lighting in the parking garage.

Parking areas on the roof of a parking structure are outdoor hardscape and daylight responsive control requirements do not apply to these spaces.

The primary differences between the automatic daylight control requirements in parking garages and the rest of interior lighting spaces are the following:

- The primary and secondary sidelit daylit zones are controlled together in parking garages, whereas they must be separately controlled in other spaces. However, it is permissible that in either space type, a single sensor can be used if the control system can make the appropriate light level adjustments in each zone.
- In parking garages, when the daylight illuminance is greater than 150 percent of the illuminance provided by the controlled lighting when no daylight is available, the controlled lighting power in the combined primary and secondary sidelit daylight zone shall be reduced by 100 percent. In other words, the light must be turned off. (In other interior spaces, the lighting power must be reduced by 90 percent.)
- Egress lighting for the parking garage may be controlled by daylight responsive controls, but a fail-safe mechanism must be in place to ensure that the egress lighting is functioning and stays on if the photosensor fails.

EXCEPTION: Daylight responsive controls are not required for luminaires in the daylight adaptation zone within the parking garage areas. Daylight adaptation zone in a parking garage is the interior path of travel for vehicles adjacent to the entrance or exit of a parking garage, from the portal or physical building line to about 66 feet inside the structure, as needed for visual adaption to transition from exterior daylight levels to interior light levels.

Demand-Responsive Lighting Controls

Reference: Section 130.1(e), Section 110.12

Buildings with nonresidential lighting systems having a total installed lighting power of 4,000 watts or greater that are subject to the multilevel requirements in §130.1(b) must meet demand-responsive lighting control requirements.

The demand-responsive control must be capable of reducing the total lighting power by 15 percent or greater.

EXCEPTION: Spaces where a health or life safety statute, ordinance, or regulation does not permit the general lighting to be reduced are exempted from the requirement and do not count toward the 4,000 watt threshold.

See Appendix D for guidance on compliance with the demand-responsive control requirements.

Example 5-14: Demand-Responsive Lighting Controls 15 Percent Reduction in Lighting Power

Question:

What lighting counts toward the 4,000 watt demand-responsive lighting threshold? If this threshold is exceeded, what lighting must have demand-responsive lighting controls? What lighting counts toward the 15 percent minimum reduction?

Answer:

Only general lighting that is subject to multilevel requirements in §130.1(b) counts toward the 4,000 watt threshold. When this threshold is exceeded, demand-responsive controls are required for general lighting.

The demand-responsive controls must be capable of reducing the total lighting power by a minimum of 15 percent. This includes general lighting and any additional lighting such as task, display, or other lighting. For example, consider an office that has 5,000 total installed watts of general lighting subject to §130.1(b) and 2,000 watts of additional lighting power. While only the 5,000 watts of general lighting are required to have demand response controls per §110.12(c), the 15 percent reduction is based on the 7,000 total installed watts in the office.

Lighting Control Interactions — Considerations for Spaces With Daylight Responsive Controls and Multilevel Lighting Controls

Reference: Section 130.1(d)2F

Indoor lighting systems subject to §130.1 require multiple types of lighting controls. Section 130.1(d)2F includes the requirements for control interactions between multilevel controls and daylight responsive controls (daylighting controls).

Example 5-15: Interaction Between Manual Controls and Daylight Responsive Controls

Question:

For a space with manual dimming control and daylight responsive controls, can the manual dimming control override the daylight responsive control?

Answer:

Yes. Section 130.1(d)2F includes requirements for control interactions between lighting control types.

The daylight responsive control must allow the manual control to turn off or to dim the level of lighting. This means an occupant can use the dimming control to decrease the lighting level as necessary and override the daylight responsive control.

Practical Considerations

Please refer to Chapter 5.4.6.1 of the *2022 Nonresidential and Multifamily Compliance Manual*.

Lighting Control Functionality

Reference: Section 110.9(b)

All installed lighting control devices and systems must meet the functionality requirements in §110.9(b). In addition, all components of a lighting control system installed together must meet the applicable requirements in §130.0 through §130.5, §140.6 through §140.8, §141.0, and §150.0(k).

To ensure compliance with the requirements of §110.9(b), designers and installers should review features of their specified lighting control products as part of code compliance.

- Time-Switch Lighting Controls

Time-switch lighting control products shall provide the functionality listed in §110.9(b)1.

- Daylight Responsive Controls

Daylight responsive control products shall provide the functionality listed in §110.9(b)2.

- Dimmers

Dimmer products shall provide the functionality listed in §110.9(b)3.

- Occupant Sensing Controls

Occupant sensing control products (including occupant sensors, partial-on occupant sensors, partial-off occupant sensors, motion sensors, and vacancy sensor controls) shall provide the functionality listed in §110.9(b)4 and §110.9(b)6.

Occupant sensing controls must be capable of automatically reducing the lighting or turning the lighting off within 20 minutes after the area has been vacated.

Track Lighting Integral Current Limiters and Track Lighting Supplementary Overcurrent Protection Panels

Please refer to Chapter 5.4.8 of the *2022 Nonresidential and Multifamily Compliance Manual*.

Prescriptive Requirements for Daylighting Devices and for Large Enclosed Spaces

Please refer to Chapter 5.5 of the *2022 Nonresidential and Multifamily Compliance Manual*.

Daylighting Device (Clerestories, Horizontal Slate, and Light Shelves) Power Adjustment Factors

Reference: Section 140.6(a)2L

Certain design features and technologies can increase the daylighting potential of spaces. Some of these design features and technologies may be used in conjunction with daylight responsive controls to receive PAFs from Table 140.6-A or as a performance compliance option in the performance method.

A careful analysis should be performed to avoid glare when including daylighting devices in a design. For example, specularly reflective (e.g., polished or mirror-finished) slats may redirect sunlight and cause uncomfortable glare. Since that is not the only consideration to make when considering daylighting design features, a careful daylighting analysis should be performed on a space-by-space, project-by-project basis.

The daylight dimming plus off PAF and institutional tuning in daylit areas may be added to any of the daylighting design PAFs to create a combined total PAF.

In addition, the horizontal slat PAF can be added to the clerestory fenestration PAF if the requirements for both are met.

In the performance method, a variety of control strategies is available in the compliance software to take advantage of further savings.

At permit application, use form NRCC-LTI-E to document daylighting device PAFs.

Daylighting Requirements for Large, Enclosed Spaces

Reference: Section 140.3(c)

Section 140.3 has prescriptive requirements for building envelopes, including daylighting for large, enclosed spaces directly under roofs. Lighting installed in these spaces is required to comply with all lighting control requirements, including the daylight responsive control requirements. Mandatory daylighting control requirements are covered in Daylight Responsive Controlsof this chapter.

For projects that comply with the prescriptive daylighting requirements by installing daylight openings in large, enclosed spaces directly under roofs, the daylit areas may require daylight responsive controls. However, for projects using the performance approach, it is possible to displace the daylighting openings and daylight responsive controls with other building efficiency options

Large, Enclosed Spaces Requiring Daylighting – Qualifying Criteria

Please refer to Chapter 5.5.2.1 of the *2022 Nonresidential and Multifamily Compliance Manual*.

Prescriptive Daylighting Requirements

Please refer to Chapter 5.5.2.2 of the *2022 Nonresidential and Multifamily Compliance Manual*.

Prescriptive Compliance Approach for Indoor Lighting – Introduction

Requirements for a Compliant Building

Please refer to Chapter 5.6.1 of the *2022 Nonresidential and Multifamily Compliance Manual*.

Calculation of Adjusted Indoor Lighting Power

The adjusted indoor lighting power of all building areas is the total watts of all planned permanent and portable lighting systems in the proposed building.

Some adjustments are available to reduce the reported indoor lighting power. These adjustments are discussed below.

Power Adjustment Factors or Reduction of Wattage Through Controls

The Energy Code provides an option for a lighting power reduction credit when specific lighting controls are installed, provided those lighting controls are not required.

A power adjustment factor (PAF) is an adjustment to the installed lighting power in an area that allows some of the installed lighting power to not be counted toward the building's total installed lighting load.

In calculating adjusted indoor lighting power, the installed watts of a luminaire providing general lighting in a functional area listed in Table 140.6-C may be reduced by multiplying the watts controlled by the applicable power adjustment PAF, per Table 140.6-A.

To qualify for a PAF, the following conditions must be met:

- The person who is eligible under Division 3 of the Business and Professions Code to accept responsibility for the construction or installation of features, materials, components, or manufactured devices must sign and submit the certificate of installation before a PAF will

be allowed for compliance with §140.6. If any of the requirements in this Certificate of Installation are not met, the installation shall not be eligible to use the PAF.

- Luminaires and controls meet the applicable requirements of §110.9, and §130.0 through §130.5.
- The controlled lighting is permanently installed general lighting systems and the controls are permanently installed nonresidential-rated lighting controls (portable lighting, portable lighting controls, and residential rated lighting controls do not qualify for PAFs).

  When used for determining PAFs for general lighting in offices, furniture-mounted luminaires shall qualify as permanently installed general lighting systems if:

  - They are installed no later than the time of building permit inspection.
  - They are permanently hardwired.
  - They are designed to provide indirect general lighting. (They may also have elements that provide direct task lighting.)
  - The lighting control for the furniture mounted luminaire complies with all other applicable requirements in §140.6(a)2.

    Before multiplying the installed watts of the furniture-mounted luminaire by the applicable PAF, 2 watts per square foot of the area illuminated by the furniture mounted luminaires shall be subtracted from installed watts of the furniture mounted luminaires to account for portable lighting.
- At least 50 percent of the light output of the controlled luminaire is within the applicable area listed in Table 140.6-A. Luminaires on lighting tracks must be within the applicable area to qualify for a PAF.
- Only one PAF from Table 140.6-A may be used for each qualifying luminaire. PAFs shall not be added together unless specifically allowed in Table 140.6-A.
- Only lighting wattage directly controlled in accordance with §140.6(a)2 shall be used to reduce the calculated adjusted indoor lighting power as allowed by §140.6(a)2. If only a portion of the wattage in a luminaire is controlled in accordance with §140.6(a)2, then only that portion of controlled wattage may be reduced in calculating adjusted indoor lighting power.
- Lighting controls used to qualify for a PAF shall be designed and installed in addition to manual, multilevel, and automatic lighting controls required in §130.1, and in addition to any other lighting controls required by the Energy Code.
- To qualify for the PAF for daylight continuous dimming plus off control, the following requirements must be met:
  - The daylight control and controlled luminaires must meet the requirements of §130.1(d), 130.4(a)3, and 130.4(a)7.
  - The daylight control shall be continuous dimming and shall additionally turn lights completely off when the daylight available in the daylit zone is greater than 150 percent of the illuminance received from the general lighting system at full power.
  - The PAF shall apply to the luminaires in the primary sidelit daylit zone, secondary sidelit daylit zone, and skylit daylit zone.

- To qualify for the PAF for an occupant sensing control controlling the general lighting in large office areas above workstations, in accordance with Table 140.6-A, each occupant sensing control zone must be 250 square feet or smaller and the following requirements must be met (note that occupant sensing controls are already required in offices greater than 250 square feet per §130.1(c)6D, and each occupant sensing control zone may not be greater than 600 square feet (refer to Shut-Off Controls for more information); This PAF is provided when the occupant sensing control zones are 250 square feet or smaller):
    - The office area must be greater than 250 square feet.
    - This PAF is available only in office areas with workstations.
    - Controlled luminaires may only be those that provide general lighting directly above the controlled area or furniture-mounted luminaires that comply with §140.6(a)2 and provide general lighting directly above the controlled area.
    - Qualifying luminaires must be controlled by occupant sensing controls that meet the following requirements, as applicable:
        - Infrared sensors shall be equipped (either by the manufacturer or in the field by the installer) with lenses or shrouds to prevent them from being triggered by movement outside the controlled area.
        - Ultrasonic sensors shall be tuned to reduce their sensitivity, to prevent them from being triggered by movements outside the controlled area.
        - All other sensors shall be installed and adjusted as necessary to prevent them from being triggered by movements outside the controlled area.
    - The PAF shall be applied only to the portion of the installed lighting power that is controlled by the occupant sensors, not to the total installed lighting power.
    - The value of the PAF (0.2 or 0.3) depends on the square footage controlled by each occupant sensor.
    - Show the occupant sensing control zones of the offices (offices greater than 250 square feet) on the plans.
- The following requirements must be met to qualify for the institutional tuning PAF:
    - The lighting controls must limit the maximum output or maximum power draw of the controlled lighting to 85 percent or less of full light output or full power draw.
    - The means of setting the limit must be accessible only to authorized personnel.
    - The setting of the limit must be verified by the acceptance test required by §130.4(a)7.
    - The construction documents must specify which lighting systems will have their maximum light output or maximum power draw set to no greater than 85 percent of full light output or full power draw.

- To qualify for the Demand Responsive Control PAF, the general lighting wattage receiving the PAF must not be within the scope of §110.12(c) and all of the following requirements must be met:
    - The controlled lighting must be capable of being automatically reduced in response to a demand response signal.
    - General lighting must be reduced in a manner consistent with the requirements of Section 130.1(b) - the general lighting shall be capable of being dimmed continuously from 100 percent to 10 percent or lower of lighting power.

  Requirements of §110.12(c): Buildings with nonresidential lighting systems having a total installed lighting power of 4,000 watts or greater that is subject to the requirements of §130.1(b) shall install controls capable of automatically reducing lighting power in response to a Demand Response Signal. See Demand-Responsive Lighting Controls of this manual for more information.
- To qualify for the PAF for daylighting devices (including clerestories, light shelves, and horizontal slats) in Table 140.6-A, the daylighting devices must meet the requirements in §140.3(d). The PAFs shall only apply to lighting in a primary or secondary sidelit daylit zone where continuous dimming daylighting controls meeting the requirements of §130.1(d) are installed.

  Refer to Chapter 3 for more information on the requirements for daylighting devices that qualify for a PAF.

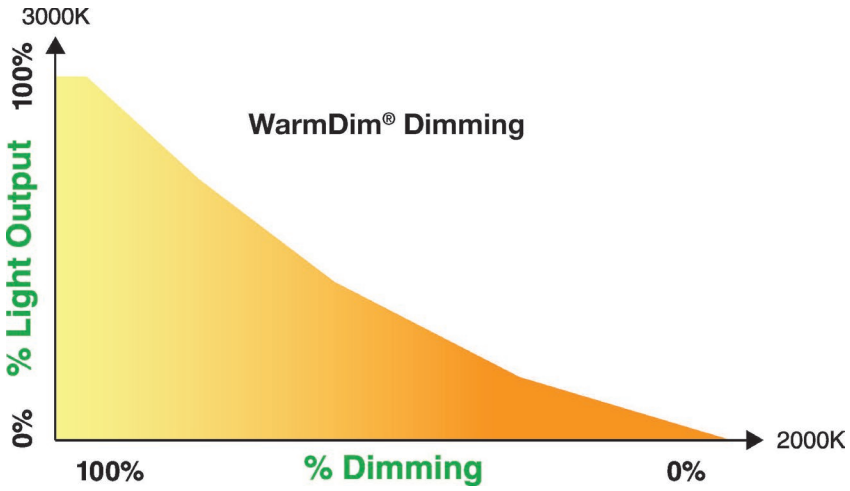
Luminaire Power Adjustment

Color-tunable LED lighting technologies are available for lighting applications including hospitality, healthcare, and other uses. This technology produces correlated color temperatures (CCT) that match the current use of a space.

Two categories of color tunable luminaires – tunable-white LED and dim-to-warm LED luminaires – can qualify for a luminaire lighting power adjustment multiplier of 0.80 if the luminaire meet all of the requirements of §140.6(a)4B, paragraphed below:

- Small Aperture: Luminaire aperture width no wider than 4 inches for an aperture length longer than 18 inches; aperture width no wider than 8 inches otherwise.
- Color Changing Capability: Capable of color change greater than or equal to 2000K CCT for tunable-white LED luminaires; capable of color change greater than or equal to 500K CCT for dim-to-warm LED luminaires.
- Controls: Connected to controls that allow color changing of the illumination.

Figure 5-21: Relationship of Dimming to Change in Correlated Color Temperature of Dim-to-Warm (aka "WarmDim") Lighting Technology



Source: Juno WarmDimming® Dimming courtesy of Acuity Brands Lighting, Inc.

Portable Lighting in Office Areas

Section 140.6(a) of the Energy Code requires that all planned lighting, including portable and permanent lighting systems, be counted toward the lighting energy use of the building, regardless of when it is planned to be installed.

Because office cubicles (including their portable lighting) are typically not installed until after the building inspection is complete, the portable lighting power is counted together with the permanent lighting as the adjusted lighting power for compliance. When using the area category method for offices with portable lighting, the additional lighting power provision is available for portable lighting and decorative/display lighting. Refer to Area Category Method (One of Two Prescriptive Compliance Approaches) for more information about the area category method.

The Energy Code defines portable lighting as lighting with plug-in connections for electric power. That includes table and floor lamps, those attached to modular furniture, workstation task luminaires, luminaires attached to workstation panels, those attached to movable displays, or those attached to personal property.

Two Interlocked Lighting Systems

Within the following five functional areas, as defined in §100.1, two lighting systems may be installed provided they are interlocked so that both lighting systems cannot operate simultaneously. All other functional areas are permitted to install only one lighting system.

- Auditorium
- Convention center
- Conference room
- Multipurpose room
- Theater

No more than two lighting systems may be used for these five specifically defined functional areas, and if there are two lighting systems, they must be interlocked.

Where there are two interlocked lighting systems, the lower-wattage system may be excluded from determining the adjusted indoor lighting power if:

- The person who is eligible under Division 3 of the Business and Professions Code to accept responsibility for the construction or installation of features, materials, components, or manufactured devices must sign and submit the certificate of installation before two interlocked lighting systems will be recognized for compliance.
- If any of the requirements in the certificate of installation are not met, the two interlocked lighting systems will not be recognized for compliance.
- The two lighting systems shall be interlocked with a nonprogrammable double-throw switch to prevent simultaneous operation of both systems.

For compliance with the Energy Code, a nonprogrammable double-throw switch is an electrical switch commonly called a "single pole double throw" or "three-way" switch that is wired as a selector switch allowing one of two loads to be enabled. It can be a line voltage switch or a low-voltage switch selecting between two relays. It cannot be overridden or changed in any manner that would permit both loads to operate simultaneously.

Lighting Wattage Not Counted Toward Building Load

The Energy Code does not require the lighting power of certain types of luminaires in specific functional areas, or for specific purposes, to be counted toward the installed lighting power of a building. For example, lighting in the guest rooms of hotels is not required to be counted for compliance with §140.6. However, lighting in all other function areas within a hotel are required to comply with all applicable requirements in §140.6. Lighting in guest rooms is, however, regulated by the low-rise residential lighting standards.

The wattage of the following indoor lighting applications may be excluded from the adjusted (installed) indoor lighting power:

- Lighting for themes and special effects in theme parks.
- Studio lighting for film or photography provided that these lighting systems are in addition to and separately switched from a general lighting system.
- Lighting for dance floors, theatrical and other live performances, and religious worship provided that these lighting systems are in addition to a general lighting system and are separately controlled by a multiscene or theatrical cross-fade control station accessible only to authorized operators.
- Lighting intended for makeup, hair, and costume preparation in performance arts facility dressing rooms if the lighting is switched separately from the general lighting system, switched independently at each dressing station, and controlled with a vacancy sensor.
- Lighting for temporary exhibits in civic facilities, transportation facilities, convention centers, and hotel function areas if the lighting is an addition to a general lighting system and is separately controlled from a panel accessible only to authorized operators.
- Lighting installed by the manufacturer in walk-in freezers, vending machines, food preparation equipment, and scientific and industrial equipment.

- Examination and surgical lights, low-ambient night-lights, and lighting integral to medical equipment, if this lighting is in addition to and switched separately from a general lighting system.
- Lighting for plant growth or maintenance in non-controlled environment horticulture spaces, if it is controlled by a multilevel astronomical time-switch control that complies with the applicable provisions of §110.9.
- Lighting equipment that is for sale.
- Lighting demonstration equipment in lighting education facilities.
- Lighting that is required for exit signs subject to the CBC. Exit signs shall meet the requirements of the Appliance Efficiency Regulations.
- Exit way or egress illumination that is normally off and that is subject to the CBC.
- In hotel/motel buildings: Lighting in guest rooms (lighting in hotel/motel guest rooms must comply with §130.0(b). (Indoor lighting not in guest rooms must be in compliance with all applicable nonresidential lighting requirements in the Energy Code.)
- Temporary lighting systems. Temporary lighting is defined as a lighting installation with plug-in connections that does not persist beyond the time constraints specified in California Electrical Code – not exceeding 90 days for holiday decorative lighting and similar purposes.
- Lighting in Occupancy Group U buildings smaller than 1,000 sq. ft.
- Lighting in unconditioned agricultural buildings smaller than 2,500 sq. ft.
- Lighting systems in qualified historic buildings, as defined in the State Historic Building Code (Title 24, Part 8), are exempt from the lighting power allowances if they consist solely of historic lighting components or replicas of historic lighting components. If lighting systems in qualified buildings contain some historic lighting components or replicas of historic components, combined with other lighting components, only those historic or replica components are exempt. All other lighting systems in qualified historic buildings shall comply with the lighting power allowances.
- Lighting in nonresidential parking garages for seven or fewer vehicles must comply with the applicable residential parking garage provisions of §150.0(k).
- Lighting for signs must comply with §140.8.
- Lighting in refrigerated cases smaller than 3,000 sq ft. must comply with the Appliance Efficiency Regulations.
- Lighting in elevators meeting the requirements in §120.6(f).
- Lighting connected to a life safety branch or critical branch, as specified in Section 517 of the California Electrical Code.
- Horticultural lighting in Controlled Environment Horticulture (CEH) spaces (indoor growing and greenhouses) complying with Section 120.6(h).

Nonresidential indoor lighting applications not listed above must comply with all applicable nonresidential indoor lighting requirements.

Example 5-16: Lighting Power Exceptions and Control Requirements

Question:

For indoor lighting, if lighting is excluded from the indoor power limitations per §140.6(a)3, is that lighting also excluded from the indoor lighting control requirements of §130.1?

Answer:

No. Indoor lighting excluded from the power limitations of §140.6 is not necessarily exempt from the mandatory control requirements of §130.1. These sections are independent of each other.

Prescriptive Compliance Approach for Indoor Lighting – Allowed Indoor Lighting Power

General Rules for Calculation of Allowed Indoor Lighting Power

Reference: Section 140.6(b)

The Energy Code limits the amount of lighting power that may be installed in a building. The following are the general rules for calculating allowed indoor lighting power.

- There shall be no lighting power allotment trade-offs between the separate conditioned and unconditioned indoor function areas. Indoor conditioned and indoor unconditioned lighting power allotments must each be separately determined on compliance documentation.
- There shall be no lighting power allotment trade-offs between the separate indoor and outdoor function areas. Indoor and outdoor lighting power allotments must each be separately determined on compliance documentation.

Complete Building Method (One of the Three Prescriptive Compliance Approaches)

Please refer to Chapter 5.7.2 of the *2022 Nonresidential and Multifamily Compliance Manual*.

Requirements for Using the Complete Building Method

Please refer to Chapter 5.7.2.1 of the *2022 Nonresidential and Multifamily Compliance Manual*.

Definitions of Complete Building Types

When using the Complete Building Method, qualifying building types are those in which a minimum of 90 percent of the building floor area functions as one of the building types listed in Table 140.6-B, (as defined below), and which do not qualify as any other building occupancy type more specifically defined in §100.1 (the occupancy type information are provided below), and which do not have a combined total of more than 10 percent of the area functioning as any nonresidential function areas specifically defined in §100.1.

Definitions of Nonresidential Building Occupancy Types (Below are partial list from §100.1):

Assembly Building is a building with meeting halls in which people gather for civic, social, or recreational activities. These include civic centers, convention centers and auditoriums.

Financial Institution Building is a building with floor areas used by an institution which collects funds from the public and places them in financial assets, such as deposits, loans, and bonds.

Grocery Store Building is a building with building floor areas used for the display and sale of food.

Gymnasium Building is a building with building floor areas used for physical exercises and recreational sport events and activities.

Healthcare Facility is any building or portion thereof licensed pursuant to California Health and Safety Code Division 2, Chapter 1, section 1204 or Chapter 2, section 1250.

Industrial/Manufacturing Facility Building is a building with building floor areas used for performing a craft, assembly, or manufacturing operation.

Library Building is a building with building floor area used for repository of literary materials, and for reading reference such as books, periodicals, newspapers, pamphlets and prints.

Motion Picture Theater Building is a building with building floor areas used for showing motion pictures to audiences.

Museum Building is a building with building floor areas in which objects of historical, scientific, artistic or cultural interests are curated, treated, preserved, exhibited and stored.

Office Building is a building of CBC Group B Occupancy with building floor areas in which business, clerical or professional activities are conducted.

Parking Garage Building is a building with building floor areas used for parking vehicles and consists of at least a roof over the parking area enclosed with walls on all sides. The building includes areas for vehicle maneuvering to reach designated parking spaces. If the roof of a parking structure is also used for parking, the section without an overhead roof is considered an outdoor parking lot instead of a parking garage.

Performance Arts Theater Building is a building with building floor areas used for showing performing arts that include plays, music, or dance to audiences.

Restaurant Building is a building with building floor areas in which food and drink are prepared and served to customers in return for money.

Retail Store Building is a building with building floor areas used for the display and sale of merchandise except food.

School Building is a building used by an educational institution. The building floor area can include classrooms or educational laboratories, and may include an auditorium, gymnasium, kitchen, library, multipurpose room, cafeteria, student union, or workroom. A maintenance or storage building is not a school building.

Sports Arena Building is a building with building floor areas used for public viewing of sporting events and activities.

Area Category Method (One of Two Prescriptive Compliance Approaches)

Reference: Section 140.6(c)2

Area Category Method General Lighting Power Allotment

Please refer to Chapter 5.7.3.1 of the *2022 Nonresidential and Multifamily Compliance Manual*.

Additional Lighting Power – Area Category Method

In addition to the allowed indoor lighting power calculated according to §140.6-B through F, the building may add additional lighting power allowances for qualifying lighting systems as

specified in the Qualifying Lighting Systems column in Table 140.6-C under the following conditions:

- Only primary function areas having a lighting system as specified in the Qualifying Lighting Systems column in Table 140.6-C and in accordance with the corresponding footnote of the table shall qualify for the additional lighting power allowances.
- The additional lighting power allowances shall be used only if the plans clearly identify all applicable task areas and the lighting equipment designed to illuminate these tasks.
- Tasks that are performed less than two hours per day or poor-quality tasks that can be improved are not eligible for the additional lighting power allowances.
- The additional lighting power allowances shall not utilize any type of luminaires that are used for general lighting in the building.
- The additional lighting power allowances are used only for areas complying with the Area Category Method. The allowances shall not be used when using the Complete Building Method.
- The additional lighting power allowed is the smaller of:
    - The lighting power density listed in the "Allowed Additional Lighting LPD" column in Table 140.6-C, times the sq. ft. of the primary function, or
    - The adjusted indoor lighting power of the applicable lighting.
- In addition to meeting §140.6(c)2Gi through vi, additional lighting power for videoconferencing as specified in Table 140.6-C shall be allowed in a videoconferencing studio, as defined in §100.1, provided the following conditions are met:
    - Before the Additional Videoconference Studio Lighting power allotment will be allowed for compliance with §140.6 of the Energy Code, the person who is eligible under Division 3 of the Business and Professions Code to accept responsibility for the construction or installation of features, materials, components, or manufactured devices shall sign and submit the certificate of installation.

      If any of the requirements in this certificate of installation are not met, the Additional Videoconference Studio Lighting installation shall not be eligible for the additional lighting power allotment.
    - The Videoconferencing Studio is a room with permanently installed videoconferencing cameras, audio equipment, and playback equipment for both audio-based and video-based two-way communication between local and remote sites.
    - General lighting is controlled in accordance with Table 130.1-A.
    - Wall wash lighting is separately switched from the general lighting system.
    - All of the lighting in the studio, including general lighting and additional lighting power allowed by §140.6(c)2Gvii is controlled by a multi-scene programmable control system (also known as a scene preset control system).
- Qualified wall display lighting for the additional lighting power allowances:

- Must be a lighting system type appropriate for wall lighting. Lighting systems appropriate for wall lighting are lighting track adjacent to the wall, wall-washer luminaires, luminaires behind a wall valance or wall cove, or accent light.
- Must be mounted within 10 feet of the wall having the wall display.
- Additional allowed power for wall display lighting is available only for lighting that illuminates walls having wall display. The length of display walls must include the length of the perimeter walls, including but not limited to closable openings and permanent full height interior partitions.
- Must not be used for floor display lighting.

Lighting Terms:

(related to Area Category Method)

General Lighting is installed electric lighting that provides a uniform level of illumination throughout an area, exclusive of any provision for special visual tasks or decorative effect, exclusive of daylighting, and also known as ambient lighting.

Decorative Lighting/Luminaires is lighting or luminaires installed only for aesthetic purposes and that does not serve as display lighting or general lighting. Decorative luminaires are chandeliers, sconces, lanterns, neon or cold cathode, light emitting diodes, theatrical projectors, moving lights, and light color panels, not providing general lighting or task lighting.

Floor Display Lighting is supplementary lighting that provides a higher level of illuminance to a specific area than the level of surrounding ambient illuminance required to highlight features, such as merchandise on a clothing rack or sculpture or free standing of artwork, which is not displayed against a wall.

Wall Display Lighting is supplementary lighting that provides a higher level of illuminance to a specific area than the level of surrounding ambient illuminance required to highlight features, such as merchandise on a shelf or wall-mounted artwork, which is displayed on perimeter walls.

Window Display Lighting is lighting that provides a higher level of illuminance to a specific area than the level of surrounding ambient illuminance of objects such as merchandise, goods, and artifacts, in a show window, to be viewed from the outside of a space through a window.

Example 5-17: Lighting Power Allowance for Non-General Lighting (Such as Decorative Lighting)

The area category method (Table 140.6-C) provides additional lighting power allowances for lighting that is not considered general lighting; however, to claim these allowances, the other lighting systems must be separately switched.

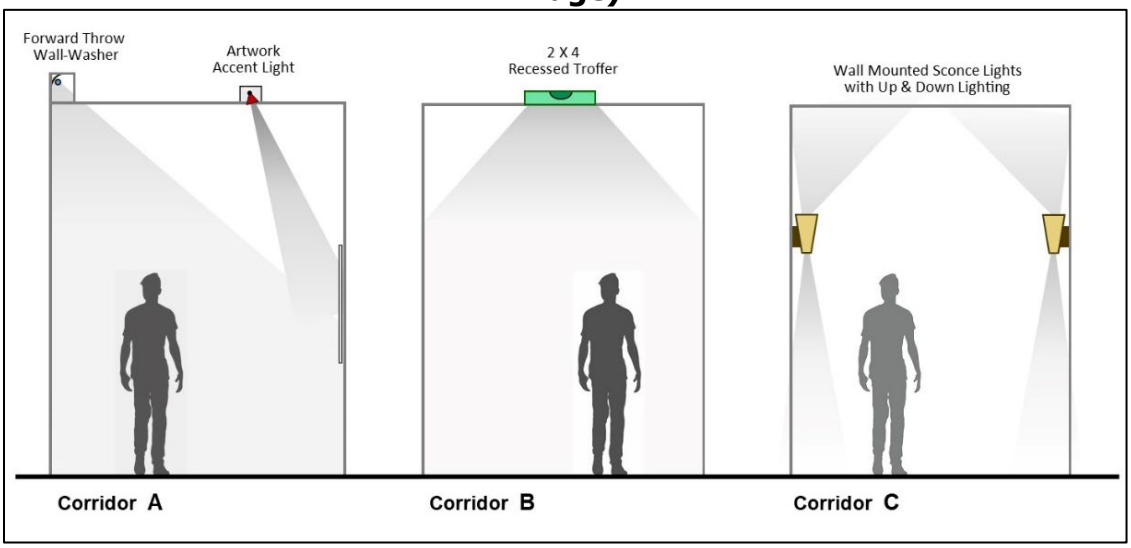
Under layered lighting design scenarios with multiple luminaire types, compliance documentation will require allocating some or all of non-general lighting power to the additional lighting power allowances and the rest of the lighting wattage to the general lighting power allowance. Only the general lighting power allowance is able to be shared across different spaces.

When there is only one lighting system type in a space, such as is the case when a monolithic design approach is taken, that system type will be treated as general lighting. Thus, light fixtures that might ordinarily be considered ornamental or display luminaires are considered general lighting luminaires if they are the only system type in a given enclosed space.

Example 5-18: Corridor With Accent Lighting and General Lighting

A corridor may have a lighting system to provide both decorative lighting and general lighting as illustrated in the following images about three different corridor scenarios.

Figure 5-22: Corridors with General Lighting and Non-General Lighting: A Corridor With Wall Washer and Accent Luminaires (left image), a Corridor With Recessed Troffer Luminaires (center image), and a Corridor With Scone Luminaires (right image)



Source: Bernie Bauer

Corridor A has two lighting systems: forward wall-washers which provides the primary illumination and recessed accent lights for highlighting artwork. Wall-washers (asymmetric optics) are generally used as accent or feature lighting. However, in this scenario since they provide the general or ambient illumination the lighting power for these luminaires per Table 140.6-C Area Category Method are allowed up to the 0.40 W per sq. ft general lighting allowance for corridor spaces. The artwork recessed accent lights are providing focal illumination to highlight the art. Therefore, the lighting power for these luminaires may be assigned to the 0.25 W per sq. ft. decorative/display lighting allowance listed under the "Additional Lighting Power" column of Table 140.6-C.

One option: provided the total lighting power of the wall-washers and accent lights is equal to or less than the allowed 0.4 W per sq. ft. general lighting power allowance for corridor spaces under Table 140.6-C, both luminaires may use the general lighting power allowance.

Another option: if the total lighting power of the wall-washers and accent lights exceeds the 0.4 W per sq. ft. general lighting power allowance for corridor spaces under Table 140.6-C, an additional 0.25 W per sq. ft. decorative/display lighting allowance may be used for the accent lights provided that the accent lights are separately switched from the wall washers. The additional lighting power allowed will be the lower of the calculated additional allowance for decorative/display lighting or the proposed wattage of the accent lighting.

Corridor B has one lighting system (2 by 4 recessed LED basket troffers) which provides all the illumination for the space. Basket troffers (symmetric wide distribution optics) are primarily to provide general or ambient illumination. Therefore, the lighting power for these luminaires must be assigned to the 0.4 W per sq. ft. general lighting power allowance for corridor spaces listed in Table 140.6-C. The 0.25 W per sq. ft. decorative/display lighting allowance does not apply in this scenario as there are no luminaires providing directional illumination.

Corridor C has one lighting system: wall sconces that provide up-lighting on the ceiling for general /ambient illumination, but the sconces also include a downlight element. However, in this scenario since they provide the general or ambient illumination the lighting power for these luminaires are assigned the 0.40 W per sq. ft. general lighting power allowance for corridor spaces as listed in Table 140.6-C. If needed, the 0.25 W per sq. ft. decorative/display lighting allowance could also apply in this scenario. However, the up-light and downlight components of the luminaries must be placed on separate circuits.

Example 5-19: Calculating the Allowed Lighting Power Using Area Category Method

Question:

What is the allowed lighting power for a 10,000-ft² multi-use building with the following area types?

- Main entry lobby of 500 ft²,
- Corridors of 1,500 ft²,
- Grocery store (Grocery Sales) of 3,000 ft²,
- Retail store (Retail Merchandise Sales) of 2,500 ft²
- Restrooms of 500 ft²
- Future development of 2,000 ft²

Answer:

Most of the functional area types and corresponding lighting power density values can be found in Table 140.6-C. The future development area type is unknown with no built-out plan at the time of permitting, therefore the function area type is designated as "All other" with LPD of 0.4 W/ft².

- Main Entry: 0.7 W/ft^2 x 500 ft^2 = 350 W
- Corridors: 0.4 W/ft^2 x 1,500 ft^2 = 600 W
- Grocery Store (Grocery Sales): 1 W/ft^2 x 3,000 ft^2 = 3,000 W
- Retail Store (Merchandise Sales): 0.95 W/ft^2 x 2,500 ft^2 = 2,375 W
- Restrooms: 0.65 W/ft^2 x 500 ft^2 = 325 W
- Future Development (All other): 0.4 W/ft^2 x 2,000 ft^2 = 800 W
- Total = 7,450 watts for 10,000 ft^2

Example 5-20: Tunable-White and Dim-to-Warm Luminaires

Question:

Which tunable-white and dim-to-warm luminaires qualify for the additional lighting power allowance for applications in healthcare facilities?

Answer:

There is additional lighting power allowance for tunable-white and dim-to-warm luminaires for most of the healthcare/hospital function areas as specified in Table 140.6-C.

The qualified tunable-white luminaires shall be capable of color change ≥ 2000K CCT.

The qualified dim-to-warm luminaires shall be capable of color change ≥ 500K CCT.

A dim-to-warm luminaire product capable of color tune from 2700K to 1800K is acceptable and qualifies for the additional light power.

Performance Compliance Approaches

The performance approach is an alternative to the prescriptive approach. The allowed lighting power is calculated as part of the energy budget for the proposed design building. A building complies with the performance approach if the energy budget calculated for the proposed design building is no greater than the energy budget calculated for the standard design building.

Under the performance approach, the energy use of the building is modeled using a compliance software program approved by the CEC. In this energy analysis, the standard lighting power density for the building is determined by the compliance software program based on occupancy type, in accordance with either the complete building or area category method described above. This standard lighting power density is used to determine the energy budget for the building.

When a lighting permit is sought under the performance approach, the applicant uses a proposed lighting power density to determine whether or not the building meets the energy budget. If it does, this proposed lighting power density is automatically translated into the allowed lighting power for the building (by multiplying by the area of the building).

If the building envelope or mechanical systems are included in the performance analysis (because they are part of the current permit application), then the performance approach allows energy trade-offs between systems that can let the allowed lighting power go higher than any other method. Alternatively, it allows lighting power to be traded away to other systems, which would result in a lower allowed lighting power. This flexibility in establishing allowed lighting power is one of the more attractive benefits of the performance approach.

General lighting power is the power used by installed electric lighting that provides a uniform level of illumination throughout an area, exclusive of any provision for special visual tasks or decorative effect, exclusive of daylighting, and also known as ambient lighting.

Trade-offs in general lighting power are allowed between all spaces using the Area Category Method.

Also, with the Area Category Method, the Energy Code provides an additional lighting power allowance for special cases. Each of these lighting system cases is treated separately as "use-it-or-lose-it" lighting. The user receives no credit (standard design matches proposed), but there is a maximum power allowance for each item.

See the Nonresidential ACM Reference Manual for additional information.

Lighting Control Installation and Acceptance Requirements for Installers and Acceptance Test Technicians

Please refer to Chapter 5.9 of the *2022 Nonresidential and Multifamily Compliance Manual*.

Lighting Installation Certificate Requirements (Section 130.4(b))

Please refer to Chapter 5.9.1 of the *2022 Nonresidential and Multifamily Compliance Manual*.

Lighting Control Acceptance Requirements (Section 130.4(a))

Acceptance testing must be performed by a certified lighting controls acceptance test technician to certify the indoor and outdoor lighting controls serving the building, area, or site will meet the acceptance requirements.

A certificate of acceptance shall be submitted to the local enforcement agency under §10-103(a) of Part 1 and §130.4(a), that:

- Certifies that all of the lighting acceptance testing necessary to meet the requirements of Part 6 is completed.
- Certifies that the applicable procedures in Reference Nonresidential Appendix NA7.6 and NA7.8 have been followed.
- Certifies that daylight responsive controls comply with Reference Nonresidential Appendix NA7.6.1.
- Certifies that lighting shut-off controls comply with Reference Nonresidential Appendix NA7.6.2.
- Certifies that demand responsive lighting controls comply with Reference Nonresidential Appendix NA7.6.3.
- Certifies that outdoor lighting controls comply with Reference Nonresidential Appendix NA7.8.
- Certifies that lighting systems receiving the institutional tuning power adjustment factor comply with Reference Nonresidential Appendix NA7.6.4.
- Certified that demand responsive controlled receptacles comply with Reference Nonresidential Appendix NA7.6.5.

Additions and Alterations

Overview

Please refer to Chapter 5.10.1 of the *2022 Nonresidential and Multifamily Compliance Manual*.

Additions

Please refer to Chapter 5.10.2 of the *2022 Nonresidential and Multifamily Compliance Manual*.

Alterations – General Information

Scope

Please refer to Chapter 5.10.3.1 of the *2022 Nonresidential and Multifamily Compliance Manual*.

Indoor Lighting Alteration Exceptions

Please refer to Chapter 5.10.3.2 of the *2022 Nonresidential and Multifamily Compliance Manual*.

Skylight Exception

Please refer to Chapter 5.10.3.3 of the *2022 Nonresidential and Multifamily Compliance Manual*.

Alterations – Performance Approach

Please refer to Chapter 5.10.3.4 of the *2022 Nonresidential and Multifamily Compliance Manual*.

Alterations – Prescriptive Approach

Please refer to Chapter 5.10.3.5 of the *2022 Nonresidential and Multifamily Compliance Manual*.

Indoor Lighting Alterations

Please refer to Chapter 5.10.4 of the *2022 Nonresidential and Multifamily Compliance Manual*.

Indoor Lighting Alteration Control Requirements

The control requirements for each option are described in Table 141.0-F.

Option 1 requires indoor lighting alterations to meet all the mandatory control requirements that are applicable to the project. The control requirements include manual controls, multilevel controls, automatic shutoff controls, daylighting controls, and demand-responsive controls.

Options 2 and 3 are likely to result in a lower lighting power than Option 1; therefore, indoor lighting alterations must meet manual control and automatic shut off control requirements. In offices larger than 250 square feet, occupant sensing shutoff controls are not required for Options 2 and 3. Multilevel lighting controls (§130.1(b)), daylighting controls (§130.1(d)), and demand-responsive controls (§130.1(e)) are not required for Options 2 and 3.

Alterations to indoor lighting systems shall not prevent the operation of existing, unaltered controls and shall not alter controls to remove functions specified in §130.1. Alterations to indoor lighting systems are not required to separate existing general, floor, wall, display, or decorative lighting on shared circuits or controls. New or completely replaced lighting circuits shall comply with the control separation requirements of §130.1(a)4 and 130.1(c)1D.

The acceptance testing requirement of §130.4 is not required for alterations where lighting controls are added to control 20 or fewer luminaires for the entire alteration project.

Example 5-21: Warehouse Luminaire Alteration With 40 Percent Lighting Power Reduction

Question:

All existing luminaires in a warehouse facility of 5,000 sq. ft. are proposed to be replaced by LED luminaires (shown below). There are 100 existing metal halide luminaires, and each uses 250 watts, all of which will be replaced. The replacement LED luminaires use 150 watts each. How is compliance being determined, and what controls are required?

Answer:

The compliance option of §141.0(b)2Iiii requires a 40 percent reduction in installed lighting power for one-to-one luminaire alterations within a building or tenant space of 5,000 square feet or less. Thus, enter the number and wattage of the existing luminaires into NRCC-LTI, and use the form to calculate both the existing installed lighting power (100 x 250 W = 25,000 W) and the maximum allowance based on a 40 percent reduction (25,000 W x 0.6 = 15,000 W). Enter the number and wattage of the new luminaires into NRCC-LTI, just like any other project. This is a one-for-one replacement, so the total lighting power of the new luminaires meets the allowance (100 x 150 W = 15,000 W).

Since the alteration meets §141.0(b)2Iiii, only manual controls and automatic shut off controls are mandatory as specified in Table 141.0-F.

Example 5-22: Lighting Wiring Alterations

Question:

If the lighting system is being rewired as part of a lighting alteration project, which Energy Code requirements must be complied with?

Answer:

Alterations to lighting wiring are considered alterations to the lighting system, so the requirements are the same as for lighting system alterations. Only altered components of the alteration must meet applicable requirements. For example, rewiring or relocating existing controls will trigger applicable requirements for the existing controls. If existing luminaires are not altered, they would not be held to alteration requirements such as lighting power allowance requirements or additional control requirements in §141.0(b)2I.

Altered lighting circuits must comply with the control requirements as specified in §130.1(a)3.

The acceptance testing requirements are triggered if controls are added to control more than 20 luminaires.

Example 5-23: Alterations Projects Replacing Both Lamps and Ballasts of the Luminaires

Question:

There are 100 lighting fixtures in an existing office space. For 20 fixtures, the internal components (lamps and ballasts) are being replaced with retrofit kits.

Which Energy Code requirements apply?

Answer:

Because 20 out of 100 (or 20 percent) of the luminaires are altered, which is more than the 10 percent of existing luminaires in the space, the alteration must meet either §141.0(b)2Ii or §141.0(b)2Iii. Moreover, removing and replacing both lamps and ballasts with retrofit kits are considered one-for-one luminaire alteration. Therefore, the alteration could meet §141.0(b)2Iiii instead of §141.0(b)2Ii or §141.0(b)2Iii if the total wattage of the altered luminaires has been reduced by at least 40 percent and if the altered building or tenant space is 5,000 square feet or less.

Example 5-24: One-for-One Alterations in Enclosed Spaces With One Luminaire

Question:

A project includes more than 50 luminaires with one-for-one alterations on a floor, but a portion of those altered luminaires are in enclosed spaces containing one luminaire.

How are the luminaires in the enclosed spaces counted toward the trigger threshold of 50 luminaires under §141.0(b)2I in a one-for-one luminaire alteration?

Answer:

Although Exception 2 to §141.0(b)2I exempts enclosed spaces with one luminaire from the requirements of §141.0(b)2I, it does not reduce the total luminaire count on a floor or a tenant space. Therefore, the altered luminaires on the floor that are not in the spaces with one luminaire are required to meet the requirements of either §141.0(b)2Ii, §141.0(b)2Iii, or §141.0(b)2Iiii.

Example 5-25: A Project with an addition of a lighting control

Question:

There is a proposed project with a 4'6" tall partition wall between two named rooms. If the partition is removed from the space and all existing luminaires are staying and an occupancy sensor is added , does it trigger the requirements of §141.0(b)2I (Indoor Lighting Alterations)?

Answer:

No, since the alterations are limited to the addition of an occupancy sensing control, it does not trigger any of the requirements of §141.0(b)2I.

Example 5-26: Daylighting Requirements for Large Enclosed Spaces

Question:

A 30,000 ft² addition has a 16,000 ft² space with an 18-ft. high ceiling and a separate 14,000 ft² space with a 13 ft high ceiling. The lighting power density in this building is 1 W/ft². Do skylights have to be installed in the portion of the building with 18-foot ceiling?

Answer:

Yes. Section 140.3(c) requires daylighting in enclosed spaces that are greater than 5,000 ft² directly under a roof with a ceiling height over 15 feet. In this example the area with a ceiling height greater than 15 feet is 16,000 ft²; therefore, prescriptive daylighting requirements apply. (Note: Daylighting requirements do not apply in Climate Zones 1 and 16).

Example 5-27: Daylighting Requirements for Alterations

Question:

A preexisting air-conditioned 30,000 ft² warehouse with a 30 ft. ceiling and no skylights will have its general lighting system replaced as part of a conversion to a big box retail store. Are skylights prescriptively required?

Answer:

No. The general lighting system is being replaced and is not "installed for the first time." Thus, §141.0(b)2F does not apply and therefore does not trigger the requirements in §140.3(c) for daylighting.

Indoor Lighting Compliance Documents

Overview

Please refer to Chapter 5.11.1 of the *2022 Nonresidential and Multifamily Compliance Manual*.

Submitting Compliance Documentation

Please refer to Chapter 5.11.2 of the *2022 Nonresidential and Multifamily Compliance Manual*.

Separately Documenting Conditioned and Unconditioned Spaces

Please refer to Chapter 5.11.3 of the *2022 Nonresidential and Multifamily Compliance Manual*.

Compliance Documentation Numbering

Please refer to Chapter 5.11.4 of the *2022 Nonresidential and Multifamily Compliance Manual*.

Certificate of Compliance Documents

Please refer to Chapter 5.11.5 of the *2022 Nonresidential and Multifamily Compliance Manual*.

Certificates of Installation Documents

See Lighting Installation Certificate Requirements (Section 130.4(b)) of this chapter for additional information.

The certificate of installation is used primarily as a declaration that the installed lighting and controls matches what is claimed on the certificate of compliance. The certificate of installation is signed by the licensed person that completed the installation. The certificate of installation documents installed energy management control system (EMCS), two interlocked systems, lighting power adjustment factor (PAF), and additional wattage installed in a video conferencing studio.

If any of the requirements in any of these certificates of installation fail the respective installation requirements, then that application shall not be recognized for compliance with the lighting standards.

Certificate of Acceptance

Acceptance requirements ensure that equipment, controls, and systems operate as required by the Energy Code. Acceptance testing consists of:

- Visual inspection of the equipment and installation.
- Functional testing of the systems and controls.

Individual acceptance tests may be performed by one or more field technicians under the responsible charge of a licensed contractor or design professional, (responsible person) eligible under Division 3 of the Business and Professions Code, in the applicable classification, to accept responsibility for the scope of work specified by the certificate of acceptance document. The responsible person must review the information on the certificate of acceptance form and sign the form to certify compliance with the acceptance requirements.

Typically, the individuals who perform the field testing/verification work and provide the information required for completion of the acceptance form (field technicians) are contractors, engineers, or commissioning agents. Field technicians do not need to be a third-party and are

not required to be licensed contractors or licensed design professionals. Only the responsible person who signs the certificate of acceptance form certifying compliance must be licensed.

When certification is required by Title 24, Part 1, §10-103.1, acceptance testing must be performed by a certified lighting controls acceptance test technician. Acceptance test technicians receive hands-on and classroom training on the testing procedures and must pass an exam to become certified. Acceptance test technicians are trained and certified by an Energy Commission approved Acceptance Test Technician Certification Provider.

The acceptance tests required for nonresidential indoor lighting include:

- Shutoff controls.
- Daylight responsive controls.
- Demand-responsive lighting controls and demand-responsive controlled receptacles.
- Institutional tuning controls that qualify for a power adjustment factor.

Instructions for completing the certificates of acceptance are imbedded in the certificates. The lighting controls acceptance testing procedures are included in Nonresidential Reference Appendix NA7.6.

See Chapter 14 of this manual for additional information about acceptance requirements.

For Manufacturers and Installers

Please refer to Chapter 5.12 of the *2022 Nonresidential and Multifamily Compliance Manual*.

Luminaire Labeling

Please refer to Chapter 5.12.1 of the *2022 Nonresidential and Multifamily Compliance Manual*.