Proposal Summary

Indoor Lighting Controls

Updated Tuesday, September 23, 2025

Prepared by: Yao-Jung Wen (Energy Solutions)

Measure Description

This measure proposes the following revisions to the mandatory control requirement section in the code (Section 130.1) and the associated acceptance test (NA 7.6 in the Reference Appendices). The proposed changes include both updates in the requirements and code language clean-up. Many of the proposed measures also bring the requirements in Title 24, Part 6 into better alignment with the national standards (ASHRAE 90.1) and other model codes (IECC). The first five proposed changes would generate savings and may incur additional costs in implementing the updated requirements; therefore, a full CASE Report will be developed to demonstrate cost-effectiveness. The last proposed changes are code language cleanup and are not likely to result in additional savings or costs. Energy savings estimates and cost and cost-effectiveness analysis will not be performed for these three proposed changes as part of the CASE Report development.

1) **Require nighttime dimming in parking garage daylight adaptation zones.** This measure ensures proper visual adaptation for drivers entering parking garages at night by requiring lighting in the daylight adaptation zones to reduce the light level to that of the general parking zone from sunset to sunrise.
2) **Require partial or full OFF occupant sensing controls in more spaces.** The space types currently being considered include lounges, breakrooms, waiting areas, auditorium areas, hotel function areas, financial transaction areas, lobbies in certain building types, museum exhibition/display areas, and rooms that house server racks in data centers. Additionally, the requirement would trigger occupied standby controls in spaces where ventilation is allowed to be shut off and temperature set back when no occupant is detected. This would result in energy savings from HVAC systems.
3) **Reduce occupant sensing control time delay to 15 minutes.** This measure would reduce the time delay for occupant sensing controls from the current 20 minutes to 15 minutes.

4) **Clarify the definition and reduce the threshold for requiring multilevel lighting controls.** The 0.5 W/ft^2 exception to the multilevel lighting controls requirement is an artifact of when expensive fluorescent ballasts were required for each controlled fixture. The added cost for dimming of LED fixtures is negligible, and this update would reflect the new market conditions. This section was developed in 2013 to clarify when light sources were required to have dimming capability, and other mandatory control sections were to define when dimming was applied to various controls. This is no longer clear. Thus, in addition to clarifying when light sources must be capable of dimming, this proposal would also add a manual dimming control section to Section 130.1(a), "Manual Controls," to provide greater clarity on when manual dimming controls are required.
5) **Require continuous dimming for all required daylight responsive controls and not be subject to Section 130.1(b) LPD exception.** Daylight responsive controls are cost-effective when the controlled wattage exceeds 75 Watts and is not dependent on the lighting power density (LPD) of the space. This 0.5 W/ft^2 exception to the multilevel lighting controls requirement is an artifact of when expensive fluorescent ballasts were required for each controlled fixture. The added cost for dimming of LED fixtures is negligible, and this update would reflect the new market conditions.
6) **Require manual overrides of daylight responsive controls to be timed or reset at the next ON cycle.** When the design of the lighting control system allows the daylight responsive control to be manually over ridden and increase lighting power above the control setpoint, the proposed measure would require this type of override to reset after a defined duration or be reset the next time the lights are turned on again after being turned off by manual switching, time-based controls, or occupant sensing controls.
7) **Make the Alternate Partial Daylight Test the only test method for the Daylight Responsive Control Acceptance Test**. This proposed measure would remove the Partial Daylight Test method and make the Alternate Partial Daylight Test the only test method. This simplifies the acceptance test procedure and promotes better compliance with the daylight responsive controls requirements.
8) **Improve the lighting controls acceptance test methods for luminaire-level lighting controls (LLLC).** The proposed measure would improve the acceptance test methods by providing instructions for testing LLLCs when they are used as the control solution to meet the mandatory lighting controls requirements. The improved test method would reduce test burden and increase effectiveness for the Acceptance Test Technicians.

Table 1 summarizes the scope of the proposed code change.

Table 1: Scope of Proposed Code Change

An "X" indicates the proposed code change is relevant.

Building Type(s)		single family	**Construction Type(s)**	X	new construction
	X	multifamily		X	additions
	X	nonresidential		X	alterations
Type of Change	X	mandatory	**Updates to Compliance Software**		no updates
		prescriptive		X	update existing feature
		performance		X	add new feature
Third Party Verification		no changes to third party verification			
	X	update existing verification requirements			
	X	add new verification requirements			

Justification for Proposed Change

Several of the proposed revisions to the mandatory control requirements would bring Title 24 into alignment with ASHRAE 90.1 lighting requirements and increase energy savings. The nighttime adaptation compensation controls for the parking garage daylight adaptation zone are an existing requirement in ASHRAE 90.1, and such controls are considered a best practice to increase safety from an illuminating engineering standpoint. ASHRAE 90.1 also requires more spaces to implement partial or full OFF occupant sensing controls, and some of those spaces are currently either not required to have occupant sensing controls or not included as an area category in Title 24. Reducing the maximum time delay of occupant sensing controls to 15 minutes saves energy and aligns with the publication of Addendum BD to ASHRAE 90.1-2022, as well as the default settings for many brands of occupant sensors.[1]

The 0.5 watts per square foot threshold for requiring multilevel lighting controls has been in place since the pre-LED era and was based on traditional light sources. With LEDs' high efficacy and being continuously dimmable with no or minimal additional cost,

---

[1] https://www.ashrae.org/file%20library/technical%20resources/standards%20and%20guidelines/standards%20addenda/90_1_2022_bd_20250509.pdf

it would be prudent to recalibrate and revise the threshold based on current technologies. Furthermore, the code language for multilevel lighting controls has been ambiguous as to whether it pertains to continuous dimming that other controls can utilize or a physical dimmer for manual dimming. Since several other mandatory control sections reference multilevel lighting controls, it is essential to clean up the multilevel lighting controls code language to ensure those references are consistent and coherent. The current exception for multilevel lighting controls also creates a conflict with daylight responsive controls when a space is exempted from multilevel lighting controls but is required to implement daylight responsive controls. Without continuous dimming provided by multilevel lighting controls, daylight responsive controls would not be effective, and the resulting behavior could be perceived negatively by the occupant. The proposal of requiring continuous dimming for daylight responsive controls regardless of the multilevel lighting controls exception aims to address this conflict.

Requiring manual overrides of daylight responsive controls to be timed or reset at the next ON cycle is a code cleanup effort to address ambiguity in the current code language that does not clearly specify whether daylight responsive controls can be overridden by any user and how and when daylight responsive controls should resume when overridden.

The Alternate Partial Daylight Test was proposed and adopted in the 2022 T24 energy code as an alternative to the original Partial Daylight Test, as creating a proper test condition for performing the original Partial Daylight Test is often difficult. The intent was for the two test methods to coexist for a few code cycles, allowing Acceptance Test Technicians' (ATTs') to make a smooth transition to the Alternate Partial Daylight Test. It is time to formally remove the less effective Partial Daylight Test to improve acceptance test effectiveness and increase the compliance rate.

Current lighting controls acceptance test methods were designed for zone-based controls, where the lights in the entire zone, e.g., a daylit zone, are controlled by a single sensor. When luminaire-level lighting controls (LLLC) are used as the control solution to meet mandatory control requirements, the sampling rules in current test methods create a test burden, as too many controls would need to be tested. Additionally, the current test methods need to consider the independentedness of each LLLC luminaire in responding to changing daylight conditions and provide specific instructions for correctly and effectively performing the Full Daylight Test.

Data Needs / Information Requests

The Statewide CASE Team is seeking the following information to inform the code change proposal. Data may be provided anonymously. To participate or provide

information, please email Yao-Jung Wen at, ywen@energy-solution.com, directly and copy info@title24stakeholders.com.

- Require nighttime dimming in parking garage daylight adaptation zones
    - Data on the areas (square footage) of daylight adaption zones in relation to the overall parking structure area.
    - Information on the number of 24/7 and non-24/7 parking garages in California, and the typical operating hours for non-24/7 parking garages to help inform the energy savings estimate.
    - Cost of additional materials and labor to implement nighttime dimming in the daylight adaptation zones.
    - Examples of existing implementations of parking garage daylight adaptation zone nighttime dimming in California.
    - Determining the additional material required in equipment for nighttime dimming control.
- Require partial or full OFF occupant sensing controls in more spaces
    - Determining the space types that occupancy controls are frequently used (but not currently required by code), and the impact on occupants or call backs.
    - Updated, most recent, material and labor costs of adding occupant sensing controls vs. simple time-switch controls to spaces.
    - Cost of implementing occupied standby controls and cost of integrating lighting and HVAC controls for occupied standby.
    - Information on the practical challenges and issues in programming energy control and management systems (ECMS) for occupied standby.
    - Information on any integration issues between lighting and HVAC controls for implementing occupied standby controls.
    - Information around how occupied standby controls are implemented in practice to meet the current code requirements.
- Reduce occupant sensing control time delay to 15 minutes
    - Cost differential between occupancy sensors or control systems that do not provide a time delay setting for 15 minutes or less and those that do provide time delay settings for 15 minutes or less.
    - Cost of occupant sensing technologies that will not result in increased false offs if the time delay is reduced to 15 minutes.
    - Information on any possible prevalent false-offs in specific applications or space types.

    - Information on the fraction of practitioners' existing projects that already use a 15-minute or less time delay for occupant sensing controls.
- Clarify the definition and reduce the threshold for requiring multilevel lighting controls
    - Data on the fraction of the spaces that are currently exempted from the multilevel lighting controls requirement but will no longer meet the exception after the code change, i.e., spaces where the lighting power density is greater than 0.4 watts per square foot but less than or equal to 0.5 watts per square foot.
    - Cost of implementing multilevel lighting controls for different applications that would be affected, i.e. the cost of implementing multilevel lighting controls in spaces where the lighting power density is greater than 0.4 watts per square foot but less than or equal to 0.5 watts per square foot.
- Require continuous dimming for daylight responsive controls regardless of the lighting code Section 130.1(b) multilevel lighting controls exception
    - Practitioners' (lighting designers, electrical engineers, installers, commissioning agents, and ATTs) estimates, based on their projects, on the fraction of the spaces that meet the multilevel lighting control exception but are not exempted from the daylight responsive lighting controls exception.
    - Cost differential between on/off control and dimming control in daylight responsive control implementations.
    - Information on the fraction of practitioners' projects meeting the multilevel lighting control exceptions but not exempted from daylight responsive controls that already have continuous dimming.
    - Determining the additional material required in the equipment and wiring for continuous dimming
- Require manual overrides of daylight responsive controls to be timed or reset at the next ON cycle
    - Any additional cost to enable manual overrides to daylight responsive controls to be timed or reset at the next ON cycle.
    - Information on any technical or programming complexity of enabling manual overrides to daylight responsive controls to be timed or reset at the next ON cycle.
    - Information on the control companies and control solutions that can provide the required control override programming.

    - Information on the current programming of manual override for daylight responsive controls in practice.
- Make the Alternate Partial Daylight Test the only test method for the Daylight Responsive Control Acceptance Test
    - ATTs' estimate of the difference in time and effort between performing the Alternate Partial Daylight Test and performing the original Partial Daylight Test.
    - Determining the factors that currently prevent ATTs from using the Alternative Partial Daylight Test.
- Improve the lighting controls acceptance test methods for luminaire-level lighting controls (LLLC)
    - Information on ATTs' current practice in applying the sampling rules when conducting occupant sensing and daylight responsive controls acceptance tests on LLLC systems.
    - Information on ATT's current practice in conducting the Full Daylight Test on LLLC systems.
    - The differences in time and effort when performing acceptance tests on LLLC systems vs. non-LLLC systems.

Draft Code Language

1.1 Guide to Marked Up Language

The proposed changes to the Standards and Reference Appendices are provided below. Changes to the 2025 documents are marked with blue underlining (new language) and ~~strikethroughs~~ (deletions).

1.2 Title 24, Part 1

There are no proposed changes to Title 24, Part 1.

1.3 Title 24, Part 6

SECTION 130.1 – MANDATORY INDOOR LIGHTING CONTROLS

(a) Manual controls. Each space shall be provided with lighting controls that allow the lighting in that space to be manually turned on and off. The manual control shall:

1. Be readily accessible; and

Exception to Section 130.1(a)1: 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.

2. Be located in the same space, or be located such that the controlled lighting or the status of the controlled lighting can be seen when operating the controls; and

   Exception to Section 130.1(a)2: In healthcare facilities, for restrooms and bathing rooms intended for a single occupant, the lighting control may be located outside the enclosed area but directly adjacent to the door.

3. Provide separate control of general, floor display, wall display, window display, case display, ornamental, and special effects lighting, such that each type of lighting can be turned on or off without turning on or off other types of lighting. 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.

4. Manual dimming controls. Manual dimming controls, including scene controllers, shall be control general lighting in spaces complying with Section 130.1(c)5A and in the following areas: auditorium areas, classrooms, convention rooms, conference rooms, multipurpose rooms, civic meeting areas, fine dining, lobbies, lounges, breakrooms, waiting areas, hotel function areas, financial transaction areas, civic meeting place areas, religious worship areas, museum exhibition/display areas.

   Exception to Section 130.1(a): Up to 0.1 watts per square foot of indoor lighting may be continuously illuminated to allow for means of egress illumination consistent with California Building Code Section 1008…

(b) ~~**Multilevel lighting controls**~~ **Continuously Dimmable Lighting.** The general lighting of any space ~~with a size of 100 square feet or larger and with a connected lighting load greater than 0.50watts per square foot shall be provided with multilevel lighting controls. The multilevel lighting controls shall provide and enable~~ shall be capable of continuous dimming from 100 percent to 10 percent or lower of lighting power for other controls, including manual dimmers, shut-off controls, daylight responsive controls, and demand responsive lighting controls.

Exception 1 to Section 130.1(b): An indoor space that has only one luminaire.

Exception 2 to Section 130.1(b): Restrooms.

Exception 3 to Section 130.1(b): Healthcare facilities.

Exception 4 to Section 130.1(b): The general lighting with light source of HID and induction shall have a minimum of one control step between 30 and 70 percent of full rated power.

(c) **Shut-OFF Controls.** All installed indoor lighting shall be equipped with controls able to automatically reduce lighting power when the space is typically unoccupied.

1. All installed indoor lighting shall be equipped with controls that meet the following requirements:

   A. Shall be controlled with an occupant sensing control set to no more than a ~~20~~15-minute time delay, automatic time-switch control, or other control capable of automatically shutting OFF all of the lighting when the space is typically unoccupied; and

   …

5. **Occupant sensing controls.** In offices 250 square feet or smaller, multipurpose rooms of less than 1,000 square feet, classrooms of any size, conference rooms, and restrooms, lighting shall be controlled with occupant sensing controls to automatically shut OFF all of the lighting in ~~20~~15 minutes or less after the control zone is unoccupied.

   In areas required by Section 130.1(b) to have multi-level lighting controls, the occupant sensing controls shall function either as a:

   A. Partial-ON occupant sensing controls capable of automatically activating between 50 and 70 percent of controlled lighting power, or

   B. Vacancy sensing controls, where all lighting responds to a manual ON input only.

~~In areas not required by Section 130.1(b) to have multilevel lighting controls, the occupant sensing controls shall function either as:~~

~~A. Automatic full-on occupant sensing controls; or~~

~~B. Partial-ON occupant sensing controls, or~~

~~C. Vacancy sensing controls, where all lighting responds to a manual ON input only.~~

In addition, controls shall be provided that allow the lights to be manually shut OFF in accordance with Section 130.1(a) regardless of the sensor status.

Exception to Section 130.1(c)5: Lighting systems exempted from Section 130.1(b), shall be permitted to comply with this section with automatic full-on occupant sensing controls

6. **Full or partial-OFF occupant sensing controls.** For warehouse aisle ways, warehouse open areas, computer rooms and computer room open areas, library book stack aisles,~~=~~exercise/fitness centers, gymnasium areas, auditorium areas, lounge, breakrooms, waiting areas, hotel function areas, financial transaction areas, , main entry lobbies, civic meeting place areas, religious worship areas, museum exhibition/display areas, corridors, stairwells, offices greater than 250 square feet, parking garages, parking areas, loading areas, and unloading areas, the installed general lighting shall be controlled by occupant sensing controls that reduce lighting power within 15 minutes the zone being unoccupied and meet the following requirements:

   A In warehouse and computer room aisle ways and warehouse and computer room 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 shall independently control lighting in each warehouse and computer room aisle way, and shall not control lighting beyond the aisle way being controlled by the sensor.

   B. In library book stack aisles 10 feet or longer..

   C. In corridors and stairwells,,..

   D. In office spaces greater than 250 square feet, general lighting shall be controlled with occupant sensing controls that meet all of the following:

      …

      ii. In ~~20~~15 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; and

      iii. In ~~20~~15 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; and

      …

   E. In parking garages, parking areas and loading and unloading areas,…

F. In laboratory spaces, lighting shall be controlled with occupant sensing controls that automatically reduce lighting power to between 50 percent and 20 percent of full power when the space is unoccupied during normally occupied hours and shall turn off lighting when the space is unoccupied during normally unoccupied hours. Where the lighting system occupant sensors are providing the occupancy status of the laboratory space for ventilation control in accordance with Section 140.9(c)1, the ventilation signal shall be independent of daylighting, manual lighting overrides or manual control of lighting.

8. Hotel/motel guest rooms shall be controlled with one of the following controls such that, no longer than ~~20~~15 minutes after the guest room has been vacated, lighting power is switched off:

   i. Captive card key controls; or

   ii. Occupant sensing controls; or

   iii. Other automatic controls.

(d) **Daylight Responsive Controls.**

…

2. All daylight responsive controls shall meet the following requirements:

   …

   C. The daylight responsive controls shall control general lighting as follows ~~meet the following~~:

      i. ~~For spaces where the installation of multilevel lighting controls is required under Section 130.1(b), allow the multilevel lighting controls to adjust the light level with continuous dimming~~ In response to availability of daylight in the space, the daylighting control shall dim the lighting system continuously between 100 percent to 10 percent or lower of lighting power;

      …

      Exception to 130.1(d)2Ci: Where general lighting is provided by HID or induction light sources, a control shall be permitted that has a minimum of one control step between 30 and 70 percent of full rated power in addition to OFF.

   F. ~~The automatic daylighting control shall permit the multilevel lighting control to adjust the level of lighting.~~In spaces where manual controls are required, the

manual controls shall be capable of turning off or decreasing light levels below the light level set by the daylight responsive controls. When manual controls are capable of temporarily increasing electric lighting light levels above the light level set by the daylight responsive controls, the controls shall be configured to reset electric lighting controls back to the Section 130.1(d)2C defaults after electric lighting have been turned off or reduced by a manual control, occupancy sensor or timeclock.

(g) **Parking Garage Daylight Adaptation Zone Lighting Controls.** Parking garage daylight adaptation zone lighting shall be separately controlled to automatically reduce the lighting to no more than the general light level in the parking zone and ramps from sunset to sunrise.

1.4 Reference Appendices

NA7.6 Indoor Lighting Controls Acceptance Tests

NA7.6.1 **Daylight Responsive Controls Acceptance Tests**

…

NA7.6.1.4 **Continuous Dimming Control Systems Functional Testing**

Continuous dimming control systems provide more than 10 levels of controlled light output per zone.

…

~~(d) **Partial Daylight Test**. Simulate or provide daylight conditions where illuminance provided only by daylight only at the Reference Location is between 60 and 95 percent of Reference Illuminance measured during the No Daylight Test. Verify and document the following:~~

~~1. Measure that the combined daylight and controlled electric lighting illuminance at the Reference Location is no less than the reference illuminance measured at this location during the No Daylight Test.~~

~~2. Verify that the combined daylight and controlled electric lighting illuminance at the Reference Location is no greater than 150 percent of the reference illuminance.~~

~~3. Light output is stable with no visible flicker. (Note: only luminaires in daylit zones are affected by daylight control)~~

~~(e)~~(d) ~~**Alternate**~~ **Partial Daylight Test**. When outdoor horizontal illuminance is at least 4,000 fc and where illuminance from daylight only at the Reference Location (Partial Daylight Illuminance) is no greater than 80 percent of Reference Illuminance measured at this location during the No Daylight Test. Measure the outdoor horizontal illuminance level and the daylight illuminance level, and do not proceed until the illuminance criteria are met.

Verify and document the following:

1. Measure the Partial Daylight Illuminance at the Reference Location. This can be measured by turning the electric lighting off. (Turn the electric lighting back on before proceeding to next step.)
2. Measure the combined daylight and controlled electric lighting at the Reference Location.
3. This alternate partial daylight test is passed if the measured illuminance value (from Step 2) is no less than the Reference Illuminance measured at this location during the no daylight test and no greater than Partial Daylight Combined Illuminance Maximum (PDCIM).

   In other words, the measured value must be within the following range in order to pass this test.

   Reference Illuminance (from the no daylight test) ≤ measured illuminance value (from Step 2) ≤ PDCIM, where PDCIM = Reference Illuminance (from the no daylight test) + 0.40 x Daylight Illuminance (from Step 1)
4. Light output is stable with no visible flicker.
5. Only luminaires in daylit zones are affected by daylight control.