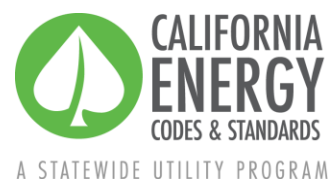


# Proposal Summary



## 2022 California Energy Code (Title 24, Part 6)

### Nonresidential Daylight Dimming to OFF

Updated: August 12, 2019

Prepared by: Chris Urairie, Energy Solutions

#### Introduction

The document summarizes proposed revisions to the California Energy Code (Title 24, Part 6) that will be discussed during a utility-sponsored stakeholder meeting on September 5, 2019. The Statewide Utility Codes and Standards Enhancement (CASE) Team is seeking input and feedback. To provide your comments, email [info@title24stakeholders.com](mailto:info@title24stakeholders.com) by September 19, 2019.

#### Measure Description

This submeasure proposes to update the nonresidential automatic daylight dimming controls provision such that, for areas other than parking garages, when daylight illuminance is greater than 150 percent of the design illuminance received from the general lighting system at full power, the general lighting power in the daylit zone is turned off. This submeasure leverages the proliferation of solid-state lighting and its dimming capability in the nonresidential sector and takes full advantage of the 0-100 percent dimming range that is already required for LED luminaires and sources in Title 24, Part 6. The proposed dimming to OFF further aims to result in higher energy savings by promoting the 0-10V "dim-to-dark" LED drivers that cuts power to the LED light engines when dimming control voltage is close to 0V. The same dim-to-off result can also be achieved by other implementations, such as a 0-100 percent dimming driver with a power relay.

#### Draft Code Language

The proposed changes to the Standards and Reference Appendices are provided below. Changes to the 2019 documents are marked with red underlining (new language) and ~~strikethroughs~~ (deletions).

#### Standards

Section 130.1:

(d) Automatic Daylighting Controls. The general lighting in skylit daylit zones primary sidelit daylit zones, as well as the general lighting in the combined primary and secondary sidelit daylit zones in parking garages, shall provide controls that automatically adjust the power of the installed lighting up and down to keep the total light level stable as the amount of incoming daylight changes. For skylight located in an atrium, the skylit daylit zone definition shall apply to the floor area directly under the atrium and the top floor area directly adjacent to the atrium.



1. All skylit daylight zones, primary sidelit daylight zones, and the combined primary and secondary sidelit daylight zones in parking garages shall be shown on the plans.

NOTE: Parking areas on the roof of a parking structure are outdoor hardscape, not skylit daylight areas.

2. The automatic daylighting controls shall provide separate control for luminaires in each type of daylight zone. Luminaires that fall in both a skylit and sidelit daylight zone shall be controlled as part of the skylit zone.

3. The automatic daylighting controls shall:

A. For spaces required to install multilevel controls under Section 130.1(b), adjust lighting via continuous dimming or the number of control steps provided by the multilevel controls;

B. For each space, ensure the combined illuminance from the controlled lighting and daylight is not less than the illuminance from controlled lighting when no daylight is available;

C. For areas other than parking garages, ensure that when the daylight illuminance is greater than ~~125~~ 150 percent of the design illuminance received from the general lighting system at full power, the general lighting power in that daylight zone shall be reduced by a minimum of ~~65~~ 90 percent; and

D. For areas other than parking garages, ensure that when the daylight illuminance is greater than 150 percent of the design illuminance received from the general lighting system at full power, the general lighting power in that daylight zone shall be automatically turned OFF; and

~~D~~ E. For parking garages, ensure that when illuminance levels measured at the farthest edge of the secondary sidelit zone away from the glazing or opening are greater than 150 percent of the illuminance provided by the controlled lighting when no daylight is available, the controlled lighting power consumption is zero.

4. When photosensors are located within the daylight zone, at least one photosensor shall be located so that they are not readily accessible to unauthorized personnel.

5. The location where calibration adjustments are made to the automatic daylighting controls shall be readily accessible to authorized personnel but may be inside a locked case or under a cover which requires a tool for access.

EXCEPTION 1 to Section 130.1(d): 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 8a.m. and 4p.m.

EXCEPTION 2 to Section 130.1(d): 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.

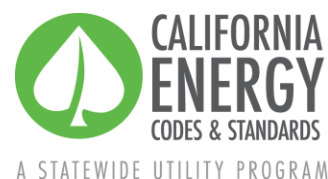
EXCEPTION 3 to Section 130.1(d): Rooms in which the combined total installed general lighting power in the Skylit Daylit Zone and Primary Sidelit Daylit Zone is less than 120 Watts, or parking garage areas where the total combined general lighting power in the sidelit daylight zones is less than 60 watts.

EXCEPTION 4 to Section 130.1(d): Rooms that have a total glazing area of less than 24 square feet, or parking garage areas with a combined total of less than 36 square feet of glazing or opening.

EXCEPTION 5 to Section 130.1(d): For parking garages, luminaires located in the daylight adaptation zone and luminaires for only dedicated ramps. Daylight adaptation zone and dedicated ramps are defined in Section 100.1.

EXCEPTION 6 to Section 130.1(d): Luminaires in sidelit daylit zones in retail merchandise sales and wholesale showroom areas.

# Proposal Summary



## 2022 California Energy Code (Title 24, Part 6)

### Nonresidential Daylighting – Mandatory Controls in secondary sidelit daylight zones (SDZs)

Updated: Wednesday, August 7, 2019

Prepared by: Mudit Saxena, Vistar Energy

#### Introduction

The document summarizes proposed revisions to the California Energy Code (Title 24, Part 6) that will be discussed during a utility-sponsored stakeholder meeting on September 5<sup>th</sup> 2019. The Statewide Utility Codes and Standards Enhancement (CASE) Team is seeking input and feedback. To provide your comments, email [info@title24stakeholders.com](mailto:info@title24stakeholders.com) by September 19<sup>th</sup> 2019.

#### Measure Description

This proposed sub-measure would move the prescriptive requirements for automatic daylighting controls in secondary sidelit daylight zones (SDZs) to the mandatory section of the Title 24, Part 6 where all their lighting controls requirements appear. Currently, the requirement for automatic daylighting controls in SDZs is prescriptive, which means that users who choose the performance approach can trade off other high efficiency features in the building against SDZ controls. This results in confusion and uncertainty during code compliance inspection about whether the controls in SDZs were traded off, or if they were required and installed. As a prescriptive requirement, it is less likely that there is reliable enforcement of the control's requirements. By converting the SDZ controls requirements into mandatory requirements, this proposal will simplify the daylighting code and the compliance enforcement process and align the daylighting requirements in Title 24, Part 6 with daylighting requirements in ASHRAE 90.1. The proposed changes will also provide certainty about when daylighting controls in SDZs are required, which will make it more likely that lighting in SDZs are controlled with photocontrols.

#### Draft Code Language

The proposed changes to the Standards and Reference Appendices are provided below. Changes to the 2019 documents are marked with red underlining (new language) and ~~strikethroughs~~ (deletions).

#### Standards

##### SECTION 130.1 - MANDATORY INDOOR LIGHTING CONTROLS

**(d) Automatic Daylighting Controls.** The general lighting in skylit daylight zones, ~~and~~ primary and secondary sidelit daylight zones, as well as the general lighting in the combined primary and secondary sidelit daylight zones



in parking garages, shall provide controls that automatically adjust the power of the installed lighting up and down to keep the total light level stable as the amount of incoming daylight changes. For skylight located in an atrium, the skylit daylit zone definition shall apply to the floor area directly under the atrium and the top floor area directly adjacent to the atrium.

1. All skylit daylit zones, primary sidelit daylit zones, secondary sidelit daylit zones, and the combined primary and secondary sidelit daylit zones in parking garages shall be shown on the plans.

NOTE: Parking areas on the roof of a parking structure are outdoor hardscape, not skylit daylit areas.

2. The automatic daylighting controls shall provide separate control for luminaires in each type of daylit zone: primary sidelit, secondary sidelit and skylit daylit zones. Luminaires that fall in both a skylit and sidelit daylit zone shall be controlled as part of the skylit zone. Luminaires that fall in both a primary sidelit daylit zone and a secondary sidelit daylit zone shall be controlled as part of the primary sidelit daylit zone.

**EXCEPTION to Section 130.1(d)2: In parking garages the primary sidelit daylit zone and secondary sidelit daylit zone may be controlled together.**

3. The automatic daylighting controls shall:

A. For spaces required to install multilevel controls under Section 130.1(b), adjust lighting via continuous dimming or the number of control steps provided by the multilevel controls;

B. For each space, ensure the combined illuminance from the controlled lighting and daylight is not less than the illuminance from controlled lighting when no daylight is available;

C. For areas other than parking garages, ensure that when the daylight illuminance is greater than 150 percent of the design illuminance received from the general lighting system at full power, the general lighting power in that daylight zone shall be reduced by a minimum of 65 percent; and

D. For parking garages, ensure that when illuminance levels measured at the farthest edge of the secondary sidelit zone away from the glazing or opening are greater than 150 percent of the illuminance provided by the controlled lighting when no daylight is available, the controlled lighting power consumption is zero.

4. When photosensors are located within the daylit zone, at least one photosensor shall be located so that they are not readily accessible to unauthorized personnel.

5. The location where calibration adjustments are made to the automatic daylighting controls shall be readily accessible to authorized personnel but may be inside a locked case or under a cover which requires a tool for access.

**EXCEPTION 1 to Section 130.1(d): Areas Skylit daylit zones 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 8a.m. and 4p.m.**

**EXCEPTION 2 to Section 130.1(d): Areas Primary sidelit and secondary sidelit daylit zones 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.**

**EXCEPTION 3 to Section 130.1(d): Secondary sidelit daylit zones where the combined total general lighting power is less than 120 watts, or where the combined total general lighting power in primary and secondary sidelit daylit zones is less than 240 watts.**

**EXCEPTION 4 to Section 130.1(d):** Rooms in which the combined total installed general lighting power in the skylit daylit zone(s), ~~and~~ primary sidelit daylit zone(s) and secondary sidelit daylit zone(s) is less than 120 Watts, or parking garage areas where the total combined general lighting power in the sidelit daylight zones is less than 60 watts.

**EXCEPTION 5 to Section 130.1(d):** Rooms that have a total glazing area of less than 24 square feet, or parking garage areas with a combined total of less than 36 square feet of glazing or opening.

**EXCEPTION 6 to Section 130.1(d):** For parking garages, luminaires located in the daylight adaptation zone and luminaires for only dedicated ramps. Daylight adaptation zone and dedicated ramps are defined in Section 100.1.

**EXCEPTION 7 to Section 130.1(d):** Luminaires in sidelit daylit zones in retail merchandise sales and wholesale showroom areas.

## SECTION 140.6 – PRESCRIPTIVE REQUIREMENTS FOR INDOOR LIGHTING

~~(d) Automatic Daylighting Controls in Secondary Daylit Zones. All luminaires providing general lighting that is in, or partially in a Secondary Sidelit Daylit Zone, and that is not in a Primary Sidelit Daylit Zone shall:~~

- ~~1. Be controlled independently from all other luminaires by automatic daylighting controls that meet the applicable requirements of Section 110.9; and~~
- ~~2. Be controlled in accordance with the applicable requirements in Section 130.1(d); and~~
- ~~3. All Secondary Sidelit Daylit Zones shall be shown on the plans submitted to the enforcing agency.~~

~~**EXCEPTION 1 to Section 140.6(d):** Luminaires in Secondary Sidelit Daylit Zone(s) in an enclosed space in which the combined total general lighting power in Secondary Daylit Zone(s) is less than 120 watts, or where the combined total general lighting power in Primary and Secondary Daylit Zone(s) is less than 240 watts.~~

~~**EXCEPTION 2 to Section 140.6(d):** Luminaires in parking garages complying with Section 130.1(d)3.~~

~~**EXCEPTION 3 to Section 140.6(d):** Areas adjacent to vertical glazing below an overhang, where there is no vertical glazing above the overhang and where the ratio of the overhang projection to the overhang rise is greater than 1.5 for South, East and West orientations, or where the ratio of the overhang projection to the overhang rise is greater than 1 for North orientations.~~

~~**EXCEPTION 4 to Section 140.6(d):** Rooms that have a total glazing area of less than 24 square feet, or parking garage areas with a combined total of less than 36 square feet of glazing or opening.~~

~~**EXCEPTION 5 to Section 140.6(d):** Luminaires in sidelit daylit zones in retail merchandise sales and wholesale showroom areas.~~

# Proposal Summary



## 2022 California Energy Code (Title 24, Part 6)

### Nonresidential Daylighting - Shading PAF Improvements

Updated: Thursday August 8, 2019

Prepared by: Eric Shadd, Determinant

#### Introduction

The document summarizes proposed revisions to the California Energy Code (Title 24, Part 6) that will be discussed during a utility-sponsored stakeholder meeting on September 5, 2019. The Statewide Utility Codes and Standards Enhancement (CASE) Team is seeking input and feedback. To provide your comments, email [info@title24stakeholders.com](mailto:info@title24stakeholders.com) by September 19, 2019

#### Measure Description

This submeasure would simplify and correct the existing language for the Daylighting Design Power Adjustment Factors (PAFs). Some features of the PAF are better placed in the mandatory sections of the code rather than the prescriptive sections so that those features are also required under the performance path. Requirements would also be reviewed to evaluate whether their modification or deletion can be justified so as to increase the opportunities for installation on projects and ease the burden of compliance.

While implementing the PAFs in the 2019 code cycle, various errors or ambiguities were uncovered that require correction. The set of savings calculations derived in the development of the PAFs in 2019 vary depending on spacing, tilt and reflectance. This set would replace the single PAF value in the performance path compliance software.

#### Draft Code Language

The proposed changes to the Standards and Reference Appendices are provided below. Changes to the 2019 documents are marked with red underlining (new language) and ~~striketroughs~~ (deletions).

#### Standards

##### SECTION 100.1 – DEFINITIONS AND RULES OF CONSTRUCTION

**LIGHT SHELF** is an adjacent, opaque surfaced daylighting device located at or below the sill of clerestory glazing, oriented horizontally and projecting horizontally from an interior or exterior vertical surface.

**CLERESTORY ~~FENESTRATION~~** is fenestration installed above a roofline greater than or equal to 60 degrees from the horizontal, or any portion of exterior vertical glazing greater than eight feet per floor above the finished floor of a space.

##### SECTION 140.3 – PRESCRIPTIVE REQUIREMENTS FOR BUILDING ENVELOPES



(d) **Daylighting Design Power Adjustment Factors (PAFs).** To qualify for a Power Adjustment Factor (PAF) as specified in Section 140.6(a)2L, daylighting devices shall meet the following requirements:

1. **Clerestory Fenestration.** To qualify for a PAF, clerestory fenestration shall meet the following requirements:

~~A. Shall be installed on east, west, or south facing facades.~~

B. Shall have a head height that is at least 10 feet above the finished floor.

C. Shall have a glazing height that is greater than or equal to 10 percent of the head height.

D. If operable shading is installed on the clerestory fenestration, then the clerestory fenestration shading shall be controlled separately from shading serving other vertical fenestration.

2. **Interior and Exterior Horizontal Slats.** To qualify for a PAF, horizontal slats shall meet the following requirements:

A. Shall be installed adjacent to vertical fenestration on east- or west-facing facades with Window Wall Ratios between 20 and 30 percent, ~~and extend to the entire height of the vertical fenestration.~~

B. Exterior horizontal slats shall be level or sloped downwards from fenestration. Interior horizontal slats shall be level or sloped upwards from fenestration.

C. Shall have a projection factor as specified in Table 140.3-D. The projection factor is calculated using EQUATION 140.3-D.

~~D. Shall have a minimum Distance Factor of 0.3. The distance factor is calculated using EQUATION 140.3-D.~~

~~EXCEPTION to Section 140.3(d)2D: Where it is documented that existing adjacent structures or natural objects within view of the vertical fenestration block direct sunlight onto the vertical fenestration between 8am and 5pm for less than 500 daytime hours per year.~~

~~E. Shall have a minimum Visible Reflectance of 0.50 when tested as specified in ASTM E903.~~

F. Shall be opaque.

~~EXCEPTION to Section 140.3(d)2F: Horizontal slats with a Visible Transmittance of 0.03 or less when tested as specified in ASTM E1175.~~

~~G. Shall be permanently mounted and not adjustable.~~

H. Shall extend the entire height of the vertical fenestration and beyond each side of the window jamb by a distance equal to or greater than their horizontal projection.

~~EXCEPTION to Section 140.3(d)2H: Where the slats are located entirely within the vertical fenestration's rough opening or a fin is located at the window jambs and extends vertically the entire height of the window jamb and extends horizontally the entire depth of the projection.~~

I. Shall be shown on the plans with the dimensions for the slat projection and slat spacing as specified in EQUATION 140.3-D.

~~J. Shall have a conspicuous factory installed label permanently affixed and prominently located on an attachment point of the device to the building envelope, stating the following: "NOTICE: Removal of this device will require re-submittal of compliance documentation to the enforcement agency responsible for compliance with California Title 24, Part 6".~~

3. **Interior and Exterior Light Shelves.** To qualify for a PAF, light shelves shall meet the following requirements:

A. Where there is vertical fenestration area below the light shelf, both interior and exterior light shelves shall be installed.

- B. Shall be installed adjacent to clerestory fenestration on south-facing facades with Window Wall Ratios greater than 30 percent. The head height of the light shelves shall be no more than one foot below the finished ceiling. The clerestory fenestration shall meet the requirements of Section 140.3(d)1.
- C. ~~Shall be level or sloped based on their installation.~~ Exterior light shelves shall be level or sloped downwards from fenestration. Interior light shelves shall be level or sloped upwards from fenestration.
- D. Shall have a projection factor of the applicable value as specified in Table 140.3-D. The light shelf projection factor is calculated using EQUATION 140.3-D.
- ~~E. Shall have a minimum Distance Factor of 0.3. The distance factor is calculated using EQUATION 140.3-D.~~
- ~~**EXCEPTION to Section 140.3(d)3E:** Where it is documented that existing adjacent structures or natural objects within view of the vertical fenestration block direct sunlight onto the vertical fenestration between 8am and 5pm for less than 750 daytime hours per year.~~
- ~~F. Shall have a top surface with a minimum Visible Reflectance of 0.50 when tested as specified in ASTM E903.~~
- ~~**EXCEPTION to Section 140.3(d)3F:** Where an exterior light shelf is installed greater than two feet below the clerestory sill.~~
- G. Shall extend beyond each side of the window jamb by a distance equal to or greater than their horizontal projection.
- H. Shall be shown on the plans with the dimensions for the light shelf projection and light shelf spacing as specified in EQUATION 140.3-D.

TABLE 140.3-D Daylighting Devices

Daylighting Device	Orientation of the Vertical Fenestration	Projection Factor
Horizontal Slats	East or West	2.0 to 3.0
Interior Light Shelf	South	1.0 to 2.0
Exterior Light Shelf	South	0.25 to 1.25

EQUATION 140.3-D PROJECTION AND DISTANCE FACTOR CALCULATION

Projection Factor = Projection / Spacing

~~Distance Factor =  $D / (H_{AS} \times \text{Projection Factor})$~~

**WHERE:**

Projection = The horizontal distance between the base edge and the projected edge of the slat or light shelf.

Spacing = For horizontal slats, the vertical distance between the projected edge of a slat to the base edge of the slat below

For interior light shelves, the vertical distance between the projected edge of the light shelf and head of the clerestory fenestration above it.

For exterior light shelves, the vertical distance between the projected edge of the light shelf and sill of the vertical fenestration below it.

~~D = Distance between the existing structure or nature object and the fenestration~~

~~H<sub>AS</sub> = Height difference between the top of the existing structure or nature object and the bottom of the fenestration~~

**NOTE:** The base edge is the edge of a slat or light shelf that is adjacent to the vertical fenestration. The projected edge is the opposite edge from the base edge.

TYPE OF CONTROL	TYPE OF AREA		FACTOR
a. To qualify for any of the Power Adjustment Factors in this table, the installation shall comply with the applicable requirements in Section 140.6(a)2			
b. Only one PAF may be used for each qualifying luminaire unless combined below.			
c. Lighting controls that are required for compliance with Part 6 shall not be eligible for a PAF			
1. Daylight Dimming plus OFF Control	Luminaires in skylit daylit zone or primary sidelit daylit zone		0.10
2. Occupant Sensing Controls in Large Open Plan Offices	In open plan offices > 250 square feet: One sensor controlling an area that is:	No larger than 125 square feet	0.40
		From 126 to 250 square feet	0.30
		From 251 to 500 square feet	0.20
3. Institutional Tuning	Luminaires in non-daylit areas. Luminaires that qualify for other PAFs in this table may also qualify for this tuning PAF.		0.10
	Luminaires in daylit areas. Luminaires that qualify for other PAFs in this table may also qualify for this tuning PAF.		0.05
4. Demand Responsive Control	All building types of 10,000 square feet or smaller. Luminaires that qualify for other PAFs in this table may also qualify for this demand responsive control PAF		0.05
5. Clerestory Fenestration	Luminaires in daylit areas adjacent to the clerestory. Luminaires that qualify for daylight dimming plus OFF control may also qualify for this PAF.		0.05
6. Horizontal Slats	Luminaires in daylit areas adjacent to vertical fenestration with interior or exterior horizontal slats. <u>This PAF may be combined with the PAF for clerestory fenestration.</u>  Luminaires that qualify for daylight dimming plus OFF control may also qualify for this PAF.		0.05
7. Light Shelves	Luminaires in daylit areas adjacent to clerestory fenestration with interior or exterior light shelves. <u>This PAF may be combined with the PAF for clerestory fenestration.</u> Luminaires that qualify for daylight dimming plus OFF control may also qualify for this PAF		0.10

## Reference Appendices

### 7.4.5 Interior and Exterior Horizontal Slats for PAF

#### 7.4.5.1 Procedures

These procedures detail the installation and verification protocols necessary to meet acceptance requirements of interior and exterior horizontal slats for PAF. In addition, the responsible person shall fill out the Certificate of Installation and the Certificate of Acceptance. The responsible person shall verify the horizontal slat to be installed matches the energy compliance documentation (Certificate of Compliance) and building plans. A copy of the Installation and Acceptance certificate shall be given to the building owner and the enforcement agency for their records.

For buildings with up to seven (7) horizontal slat assemblies claiming the Interior and Exterior Horizontal Slats for PAF, all horizontal slat assemblies shall be tested. For buildings with more than seven (7) horizontal slat assemblies claiming the PAF, random sampling may be done to select the seven horizontal slat assemblies. If any of the horizontal slat assemblies in the sample group or seven horizontal slat assemblies fails the acceptance test, another group of seven horizontal slat assemblies must be tested.

Each horizontal slat assembly shall be provided with documentation of visible reflectance testing per ASTM E903 and may come with documentation of visible transmittance testing per ASTM E1175. The documentation shall be located at the job site for verification by the enforcement agency.

#### 7.4.5.2 The Responsible Person or Installer Shall Meet the Following Protocols before Installation:

- (a) Verify the horizontal (not diagonal or vertical) distance from the front edge of the slat to the back edge of the slat matches the building plans;
- (b) Verify the vertical (not diagonal or horizontal) distance from the lowest edge of the slat to the highest edge of the slat below it matches the building plans;
- ~~(c) Verify there is a factory installed label permanently affixed and prominently located at a mounting point of the slat to the building;~~
- ~~(d) Verify the visible reflectance on the ASTM E903 test results matches the building plans;~~
- ~~(e) If the horizontal slat surfaces are not opaque and free of perforations, verify that the horizontal slats ASTM E1175 test results matches the building plans;~~
- (f) Installation of horizontal slats shall meet the manufactures installation instructions; and
- (g) After the installation the installer completes and signs the Declaration Statement on the Certificate of Installation. A signed copy of the Certificate(s) shall remain at the job site for verification by the building inspector.

#### 7.4.5.3 Field Technician or Responsible Person Shall Meet the Following Protocols After Installation:

- (a) Verify the Certificate of Installation and the Declaration Statement is signed before inspection of the installation;

- ~~(b) Verify that horizontal slats are permanently mounted;~~
- ~~(c) If the horizontal slats extend beyond each side of the window jamb, then verify the extension matches the length shown on the building plans;~~
- ~~(d) If the horizontal slats do not extend beyond each side of the window jamb, then verify that the horizontal slats are entirely within the window rough opening or that fins at the window jambs match the building plans;~~
- (e) Verify that horizontal slat assemblies extend the entire height of the window and beyond each side of the window jamb;
- (f) Verify that exterior horizontal slats are horizontal or slope downwards from the window and that interior horizontal slats are horizontal or slope upwards from the window;
- (g) After horizontal slats inspection is completed, complete the Certificate of Acceptance Test and sign the Declaration Statements of the certificate; and
- (h) Provide certificates and additional copies to the builder, enforcement agency and building owner at occupancy.

#### **7.4.5.4 Documentation at Occupancy:**

The following documentation shall be made available to the responsible party of construction or building owner at occupancy;

- (a) A completed and signed copy of the Certificate of Installation and the Certificate of Acceptance Test, form(s);
- (b) If supplied by the manufacturer, a copy of the manufacturer's warranty and user manual.

### **7.4.6 Interior and Exterior Light Shelves for PAF**

#### **7.4.6.1 Procedures**

These procedures detail the installation and verification protocols necessary to meet acceptance requirements of interior and exterior light shelves for PAF. In addition, the responsible person shall fill out the Certificate of Installation and the Certificate of Acceptance. The responsible person shall verify the light shelf to be installed matches the energy compliance documentation (Certificate of Compliance) and building plans. A copy of the Installation and Acceptance certificate shall be given to the building owner and the enforcement agency for their records.

For buildings with up to seven (7) light shelf units claiming the Interior and Exterior Light Shelves for PAF, all light shelf units shall be tested. For buildings with more than seven (7) light shelf units claiming the PAF, random sampling may be done to select the seven light shelf units. If any of the light shelf units in the sample group or seven light shelf units fails the acceptance test, another group of seven light shelf units must be tested.

Each interior light shelf shall be provided with documentation of visible reflectance testing per ASTM E903. Exterior light shelves may be provided with documentation of visible reflectance testing per ASTM E903. The documentation shall be located at the job site for verification by the enforcement agency.

#### **7.4.6.2 The Responsible Person or Installer Shall Meet the Following Protocols before Installation:**

- (a) Verify the horizontal (not diagonal or vertical) distance from the front edge of the interior light shelf to the back edge of the light shelf matches the building plans;
- (b) Verify the vertical (not diagonal or horizontal) distance from the highest edge of the interior light shelf to the top of the clerestory window above it matches the building plans;
- ~~(c) Verify the visible reflectance on the ASTM E903 test results of the interior light shelf matches the building plans;~~
- (d) If there is an exterior light shelf:
  - 1. Verify the horizontal (not diagonal or vertical) distance from the front edge of the exterior light shelf to the back edge of the exterior light shelf matches the building plans;
  - 2. verify the vertical (not diagonal or horizontal) distance from the lowest edge of the exterior light shelf to the sill of the window below it matches the building plans;
  - ~~3. If the exterior light shelf is less than two feet below the clerestory window sill, verify the visible reflectance on the ASTM E903 test results matches the building plans;~~
- ~~(e) Verify that light shelves are installed at the height specified in the building plans ;~~
- (f) Installation of light shelves shall meet the manufactures installation instructions;
- (g) After the installation the installer completes and signs the Declaration Statement on the Certificate of Installation. A signed copy of the Certificate(s) shall remain at the job site for verification by the building inspector.

#### **7.4.6.3 Field Technician or Responsible Person Shall Meet the Following Protocols After Installation:**

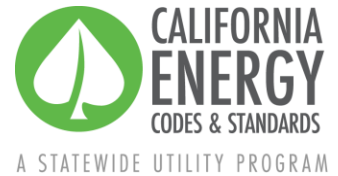
- (a) Verify the Certificate of Installation and the Declaration Statement is signed before inspection of the installation; and
- ~~(b) If there is any window area below the interior light shelf on the same floor, then verify there is an exterior light shelf above that window area.~~
- ~~(c) Verify that that the light shelf is permanently mounted;~~
- (d) Verify the light shelf extends beyond each side of the window jamb by the length shown on the building plans;
- (e) Verify that interior light shelves are horizontal;
- (f) If there is an exterior light shelf, verify that the exterior light shelf is horizontal or slopes downwards from the window;
- (g) If operable shading is installed on the clerestory window, then verify the clerestory window shading is controlled separately from shading serving other vertical fenestration;
- (h) After light shelves inspection is completed, complete the Certificate of Acceptance Test and sign the Declaration Statements of the certificate; and
- (i) Provide certificates and additional copies to the builder, enforcement agency and building owner at occupancy.

#### **7.4.6.4 Documentation at Occupancy:**

The following documentation shall be made available to the responsible party of construction or building owner at occupancy;

- (a) A completed and signed copy of the Certificate of Installation and the Certificate of Acceptance Test, form(s);
- (b) If supplied by the manufacturer, a copy of the manufacturer's warranty and user manual.

# Proposal Summary



## 2022 California Energy Code (Title 24, Part 6)

### Refine Prescriptive Exterior Shading Reflective Solar Heat Gain Coefficient Requirements

Updated: Thursday August 8, 2019

Prepared by: Eric Shadd, Determinant

#### Introduction

The document summarizes proposed revisions to the California Energy Code (Title 24, Part 6) that will be discussed during a utility-sponsored stakeholder meeting on September 5, 2019. The Statewide Utility Codes and Standards Enhancement (CASE) Team is seeking input and feedback. To provide your comments, email [info@title24stakeholders.com](mailto:info@title24stakeholders.com) by September 19, 2019.

#### Measure Description

This submeasure would revise the prescriptive Relative Solar Heat Gain Coefficient (RSHGC) requirement to offer credit for both louvers and overhangs based on a formula derived from updated Time-Dependent Valuation energy values. This revision may also possibly eliminate unexpected characteristics of the current formula.

#### Draft Code Language

#### Standards

##### SECTION 140.3 – PRESCRIPTIVE REQUIREMENTS FOR BUILDING ENVELOPES

- C. Have an area-weighted average Relative Solar Heat Gain Coefficient, RSHGC, excluding the effects of interior shading, no greater than the applicable value in TABLE 140.3-B, C or D.

For purposes of this paragraph, the Relative Solar Heat Gain Coefficient, RSHGC, of a vertical window is:

- i. The Solar Heat Gain Coefficient of the window; or
- ii. Relative Solar Heat Gain Coefficient is calculated using EQUATION 140.3-A, if the window has an overhang or exterior horizontal slats that extends beyond each side of the window jamb by a distance equal to the overhang's horizontal projection.



EQUATION 140.3-A RELATIVE SOLAR HEAT GAIN COEFFICIENT, RSHGC

$$\cancel{RSHGC} = \cancel{SHGC}_{win} \times \left[ 1 + \frac{aH}{V} + b \left( \frac{H}{V} \right)^2 \right]$$

$$RSHGC = SHGC_{win} \times \underline{\hspace{2cm}}$$

WHERE:

RSHGC = Relative Solar Heat Gain Coefficient.

$SHGC_{win}$  = Solar Heat Gain Coefficient of the window.

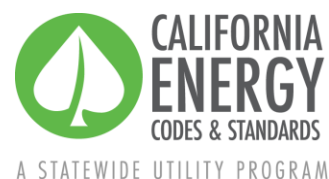
H = Horizontal projection of the overhang from the surface of the window in feet, but no greater than V.

V = Vertical distance from the window sill to the bottom of the overhang in feet.

a = ~~-0.41~~ for north-facing windows, ~~-1.22~~ for south-facing windows, ~~and -0.92~~ for east-facing windows and west-facing windows.

b = ~~0.20~~ for north-facing windows, ~~0.66~~ for south-facing windows, and ~~0.35~~ for east-facing and west-facing windows.

# Proposal Summary



## 2022 California Energy Code (Title 24, Part 6)

### Nonresidential Daylighting - Exterior Shading Thermal Breaks

Updated: Thursday August 8, 2019

Prepared by: Eric Shadd, Determinant

#### Introduction

The document summarizes proposed revisions to the California Energy Code (Title 24, Part 6) that will be discussed during a utility-sponsored stakeholder meeting on September 5, 2019. The Statewide Utility Codes and Standards Enhancement (CASE) Team is seeking input and feedback. To provide your comments, email [info@title24stakeholders.com](mailto:info@title24stakeholders.com) by September 19, 2019.

#### Measure Description

##### Thermal Breaks

This submeasure would add a mandatory requirement for thermal breaks that mitigate heat transfer where exterior shading devices connect to interior spaces. The measure would likely only apply in certain climate zones.

#### Draft Code Language

The proposed changes to the Standards and Reference Appendices are provided below. Changes to the 2019 documents are marked with red underlining (new language) and ~~strikethroughs~~ (deletions).

#### Standards

##### SECTION 100.1 – DEFINITIONS AND RULES OF CONSTRUCTION

**THERMAL BREAK** is a material or assembly of materials which have a low thermal conductivity and completely separates two other materials.

##### SECTION 110.6 – MANDATORY REQUIREMENTS FOR FENESTRATION PRODUCTS AND EXTERIOR DOORS

(d) **Exterior shading thermal breaks.** Any overhang, exterior light shelf or exterior louver with more than square feet of surface area installed in climate zones \_\_, \_\_ or \_\_ shall incorporate thermal breaks with a conductivity less than or equal to 0.45 BTU in/ hr sf degree F per ASTM C518 that separate the shading's mounting surfaces from the exterior wall.

