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## 7. Sign Lighting

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### 7.1 Overview

This chapter discusses the requirements for sign lighting in the Building Energy Efficiency Standards (Energy Code). There are requirements for controls, maximum allowable power, and minimum efficacy. These requirements conserve energy, reduce peak electric demand, and are both technically feasible and cost-effective.

The Energy Code does not allow trade-offs between sign lighting power allowances and other end uses.

#### 7.1.1 Scope and Application

The sign lighting requirements address both indoor and outdoor illuminated signs, including signs with unfiltered light-emitting diodes (LEDs) and unfiltered neon. The Energy Code includes control requirements for all illuminated signs (§130.3) and lighting power requirements for internally and externally illuminated signs (§140.8).

The sign lighting requirements are the same for conditioned and unconditioned spaces, and they apply to lighting specifically used to illuminate a sign. Lighting that is not used to illuminate a sign must meet the requirements for indoor or outdoor lighting.

#### 7.1.2 Summary of Requirements

*§110.9, §130.0, §130.3, §140.8 and §141.0*

##### **A. Mandatory Measures**

The Energy Code requires that indoor and outdoor sign lighting be automatically controlled.

The mandatory sign lighting control requirements include:

- Automatic shutoff controls.
- Dimming controls.
- Demand responsive controls for electronic message centers.

All lighting control devices and systems must meet the functionality requirements of §110.9 as applicable. More details on mandatory controls are provided in Section 7.3 of this chapter.

##### **B. Sign Lighting Power**

Sign lighting power requirements apply to both indoor and outdoor signs and contain two prescriptive compliance options:

1. The watts per square foot approach specifies a maximum lighting power that can be installed, expressed in W/ft<sup>2</sup> of illuminated sign area.

2. The alternate light source approach specifies efficient lighting sources (and requirements for electronic ballasts, high-efficacy lamps, efficient power supplies, and efficient transformers) that comply.

More details on the sign lighting power requirements are provided in Section 7.4 of this chapter.

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## **7.2 Mandatory Measures**

Mandatory requirements for sign lighting are specified in §110.9, §110.12, §130.0, and §130.3. The mandatory requirements include control device, control installation, and system functionality requirements. Mandatory features also set requirements for how lighting systems are classified according to technology, and how to calculate installed wattage.

### **7.2.1 Lighting Control Functionality**

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 shall meet all applicable requirements for the application for which they are installed as required in §130.0 through §130.5, §140.6 through §140.8, §141.0, and §150.0(k).

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 an installation certificate before a lighting control system, including an energy management control system (EMCS), can be recognized for compliance with the lighting control requirements in the Energy Code (§130.4[b] 1 and 2).

Designers and installers should review features of their specified lighting control products for compliance with §110.9(b) as part of the code compliance process.

#### **A. Automatic Time-Switch Controls**

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

#### **B. Daylighting Controls**

Daylighting control products must provide the functionality listed in §110.9(b)2.

#### **C. Dimmers**

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

#### **D. Occupant-Sensing Controls**

Occupant-sensing control products must provide the functionality listed in §110.9(b)4 and §110.9(b)6, and must automatically reduce lighting or turn the lighting off within 20 minutes after the area has been vacated.

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## 7.2.2 Determining Luminaire Power

### *§130.0(c)*

Luminaire power must be determined in accordance with the applicable provisions of §130.0(c). Note that the installed wattage of sign lighting is not considered when using the Alternate Lighting Source compliance option in §140.8(b). See Section 7.4 of this chapter for more information about sign lighting energy requirements.

These are the requirements for determining luminaire power:

1. The wattage of luminaires with line voltage lamp holders not served by drivers, ballasts, or transformers shall be the maximum rated wattage or relamping-rated wattage of the luminaire as labeled in accordance with §130.0(c)1.
2. The wattage of luminaires with permanently installed or remotely installed ballasts shall be the operating input wattage of the rated lamp/ballast combination published in the ballast manufacturer's catalog based on independent testing lab reports as specified by UL 1598.
3. The wattage of luminaires and lighting systems with permanently installed or remotely installed transformers shall be the rated wattage of the lamp/transformer combination.
4. The wattage of LED luminaires and LED light engines shall be the maximum rated input wattage of the system when tested in accordance with UL 1598, 2108, or 8750, or IES LM-79.
5. The wattage of LED tape lighting and LED linear lighting with LED tape lighting components shall be the sum of the installed length of the tape lighting times its rated linear power density in watts per linear feet, or the maximum rated input wattage of the driver or power supply providing power to the lighting system, with tape lighting tested in accordance with UL 2108 or 8750, or IES LM-79. The rules for determining lighting wattage are discussed in greater detail in Chapter 5 of this manual.

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## 7.3 Mandatory Sign Lighting Controls

### 7.3.1 Indoor Sign Lighting Controls

#### *§130.3(a)1*

All indoor sign lighting other than exit sign lighting and sign lighting installed at healthcare facilities must be controlled with an automatic time-switch control or astronomical time-switch control.

These controls must meet the functionality requirements in §110.9. See Section 7.2.1 of this chapter for more information.

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#### **Example 7-1: Indoor Sign Lighting Controls**

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**Question**

Because the Energy Code require sign lighting to be controlled by an automatic time-switch control, will a sign inside a mall be required to automatically turn off during the day?

**Answer**

No, the sign is not required to be turned off during the day. The automatic time-switch control will allow the owner/occupant to program the sign to automatically turn on and off according to their needs.

**7.3.2 Outdoor Sign Lighting Controls****§130.3(a)2**

Outdoor sign lighting must meet the following requirements as applicable.

**A. Controls for All Outdoor Sign Lighting**

All outdoor sign lighting must be controlled with one of the following:

1. A photo control and automatic time-switch control
2. An astronomical time-switch control

Lighting for outdoor signs in tunnels and signs in large, permanently covered outdoor areas that are intended to be lit 24 hours per day and 365 days per year are exempt from this requirement.

**B. Controls for Outdoor Sign Lighting That Is On Day and Night**

Additional control requirements apply to outdoor sign lighting that is on during the day and night.

Outdoor sign lighting that is on day and night shall be controlled with a dimmer that provides the ability to automatically reduce sign lighting power by a minimum of 65 percent during nighttime hours.

Signs that are illuminated at night and for more than 1 hour during daylight hours shall be considered on both day and night.

Lighting for outdoor signs in tunnels and large covered areas that are intended to be illuminated both day and night are exempt from this requirement.

**7.3.3 Demand Responsive Lighting Controls for Electronic Message Centers****§110.12(d)**

An “electronic message center” (EMC) is a pixelated image producing an electronically controlled sign formed by any light source. Bare lamps used to create linear lighting animation sequences through the use of chaser circuits, also known as “chaser lights,” are not considered an EMC.

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EMCs that have a connected lighting load greater than 15 kW must have demand-responsive controls unless a health or life safety statute, ordinance, or regulation does not permit EMC lighting to be reduced. See Appendix D for guidance on compliance with the demand responsive control requirements.

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## **7.4 Sign Lighting Power Requirements**

### **7.4.1 Scope of Sign Lighting Power Requirements**

The sign lighting power requirements apply to all internally illuminated signs, externally illuminated signs, unfiltered LEDs, and unfiltered neon, indoors or outdoors. Examples include cabinet signs, channel letters, lightboxes, backlit signs, illuminated billboards, and electronic message centers.

### **7.4.2 Applications Excluded From Sign Lighting Power Requirements**

#### **§140.8**

The following sign lighting applications are not required to comply with the sign lighting power requirements:

#### **A. Unfiltered Incandescent Lamps**

Unfiltered incandescent lamps are lamps that are not part of an EMC, internally illuminated sign, or externally illuminated sign.

This exception applies only to portions of a sign that are unfiltered incandescent lamps. An “unfiltered sign” is defined in the Energy Code as a sign where the viewer perceives the light source directly as the message, without any colored filter between the viewer and the light source. Although internally illuminated signs are mentioned in this exception, it is only those portions of a hybrid sign consisting of unfiltered incandescent lamps that are excluded from the sign lighting power requirements.

#### **B. Exit Signs**

Exit signs are required to meet the requirements of the Appliance Efficiency Regulations.

#### **C. Traffic Signs**

Traffic signs are required to meet the requirements of the Appliance Efficiency Regulations.

### **7.4.3 Sign Lighting Power Compliance Options**

There are two options for complying with the sign lighting power requirements:

- Maximum allowed lighting power (watts per square foot)
- List of compliant alternate lighting sources

**7.4.4 Maximum Allowed Lighting Power****§140.8(a)**

The maximum allowed lighting power compliance approach limits allowed sign lighting power based on the illuminated sign area. When using this approach, there are rules in the Energy Code for classifying the lighting technology used and determining luminaire power. Additional information on determining luminaire power is including in Section 7.2.2 of this chapter.

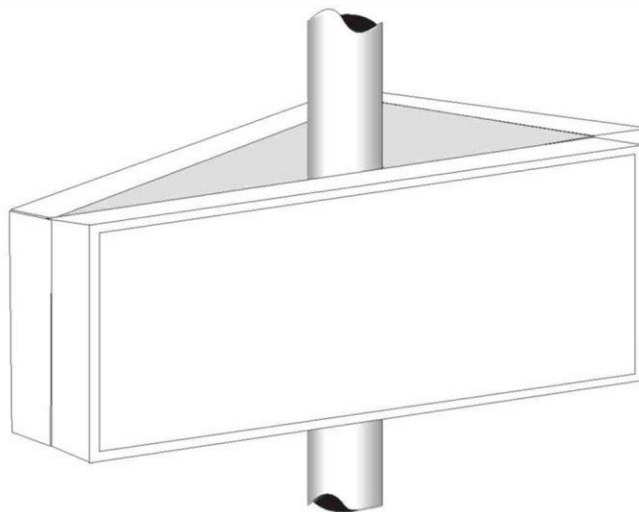
This compliance approach may be used for any light source type except unfiltered LED and unfiltered neon lighting, which must comply with the alternate lighting source compliance method described in Section 7.4.5.

The maximum allowed lighting power for internally and externally illuminated signs is calculated as follows:

**A. Internally Illuminated Signs**

Internally illuminated signs (see Figures 7-1 and 7-2) are defined in the Energy Code as signs that are illuminated by a light source that is contained inside a sign where the message area is luminous, including cabinet signs and channel letter signs. The maximum allowed lighting power shall not exceed the product of the illuminated sign area and 12 watts per square foot of illuminated sign area. For double-faced signs (see Figure 7-3), only the area of a single face shall be used to determine the allowed lighting power.

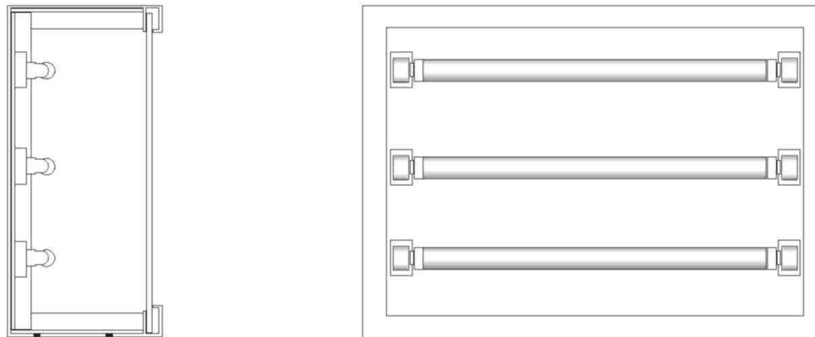
**Figure 7-1: Multifaced Sign**



Source: California Statewide CASE Team

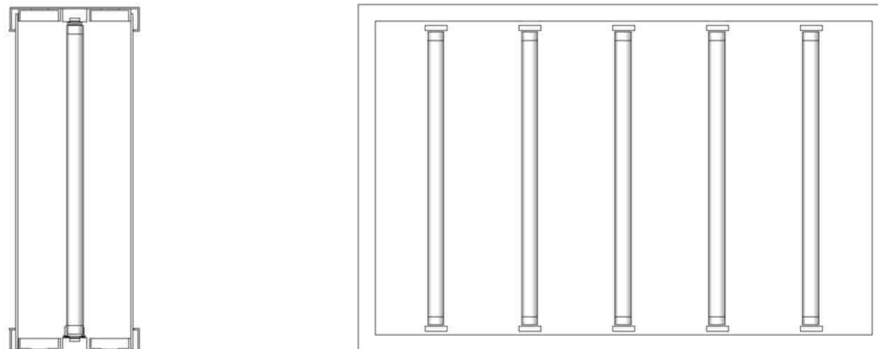
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**Figure 7-2: Single-Faced Internally Illuminated Cabinet Sign With Fluorescent Lamps and Translucent Face**



Source: California Statewide CASE Team

**Figure 7-3: Double-Faced Internally Illuminated Cabinet Sign With Fluorescent Lamps and Translucent Faces**



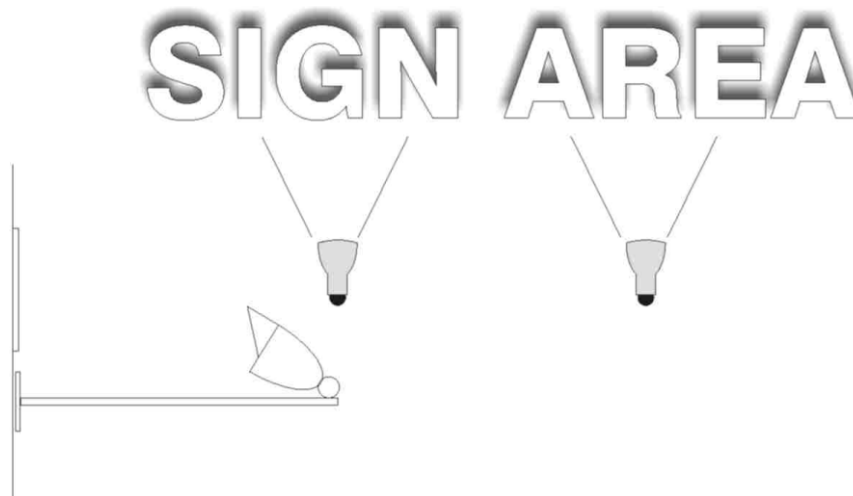
Source: California Statewide CASE Team

## **B. Externally Illuminated Signs**

Externally illuminated signs (see Figure 7-4) are defined in the Energy Code as any sign or billboard that is lit by a light source that is external to the sign directed toward and shining on the face of the sign.

The maximum allowed lighting power shall not exceed the product of the illuminated sign area and 2.3 watts per square foot of illuminated sign area. Only areas of an externally lighted sign that are illuminated without obstruction or interference, by one or more luminaires, shall be used.



**Figure 7-4: Externally Illuminated Sign Using Flood Lighting**

Source: California Statewide CASE Team

### 7.4.5 Alternate Lighting Sources

#### **§140.8(b)**

The alternate lighting sources compliance approach specifies lighting technologies that may be used to meet the sign lighting power requirements. A sign is in compliance if it is equipped only with one or more of the following light sources:

1. High-pressure sodium lamps.
2. Metal-halide lamps that are:
  - Pulse start or ceramic served by a ballast that has a minimum efficiency of 88 percent or greater.
  - Pulse start that are 320 watts or less, are not 250 watts or 175 watts, and are served by a ballast that has a minimum efficiency of 80 percent.Ballast efficiency is the reference lamp power divided by the ballast input power when tested according to ANSI C82.6-2015.
3. Neon or cold cathode lamps with transformer or power supply efficiency greater than or equal to one of the following:
  - A minimum efficiency of 75 percent when the transformer or power supply rated output current is less than 50 mA.
  - A minimum efficiency of 68 percent when the transformer or power supply rated output current is 50 mA or greater.The ratio of the output wattage to the input wattage is at 100 percent tubing load.
4. Fluorescent lighting systems meeting either of the following requirements:

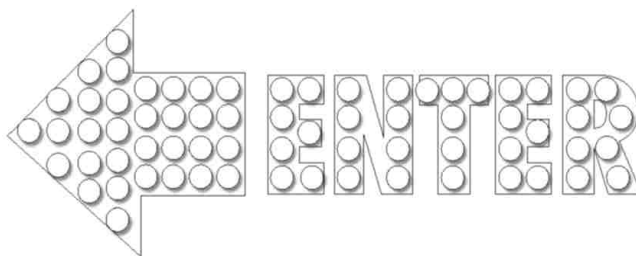
- Use only lamps with a minimum color rendering index of 80.
  - Use only electronic ballasts with a fundamental output frequency not less than 20 kHz.
5. LEDs with a power supply efficiency of 80 percent or greater.
- Single-voltage external power supplies that are designed to convert 120 volt AC input into lower voltage DC or AC output and which have a nameplate output power less than or equal to 250 watts and must comply with the applicable requirements for external power supplies in the Appliance Efficiency Regulations
6. Compact fluorescent lamps that do not contain a medium screw base socket (E24/E26).

#### 7.4.6 Hybrid Signs

A sign may consist of components that are regulated and components that are not regulated. For example, a single sign structure may have a regulated internally illuminated cabinet, regulated externally illuminated letters attached to a brick pedestal, and unregulated unfiltered incandescent “chaser” lamps forming an illuminated arrow. Figure 7-5 shows an arrow, which is not part of an EMC using unfiltered incandescent lamps.

If the lamps are not covered by a lens, then only the control regulations (§130.3) apply to the sign. This type of unfiltered incandescent sign is not regulated by §140.8.

**Figure 7-5: Unfiltered Incandescent Sign**



Source: California Statewide CASE Team

**Example 7-2: Neon and Cold Cathode Lighting****Question**

Can I use neon or cold cathode lighting in my sign and comply with the Energy Code under Option 2 (compliant alternate lighting sources)?

**Answer**

Yes, neon and cold cathode lighting are allowed under the alternate light source compliance option, provided that the transformers or power supplies have an efficiency of 75 percent or greater for output currents less than 50 mA and 68 percent or greater for output currents 50 mA or greater.

**Example 7-3: Indoor Sign Lighting in a Theater Lobby****Question**

Do signs inside a theater lobby or other indoor environments need to comply with the sign requirements?

**Answer**

Yes, all illuminated signs must comply with either the maximum allowed lighting power or compliant alternate lighting sources compliance option.

**Example 7-4: Alternate Lighting Sources – Incandescent Lamps****Question**

My sign is equipped with both hardwired compact fluorescent lamps and incandescent lamps. Can my sign comply under the alternate lighting sources approach?

**Answer**

No. Because your sign is not exclusively equipped with -energy efficient technologies allowed under the alternate lighting sources approach (incandescent sources are not allowed), it must comply under the maximum-allowed lighting power compliance option. Your other option is to replace the incandescent sources with an option allowed under the alternate lighting sources, such as compliant LED, pulse start or ceramic metal halide, or fluorescent.

**Example 7-5: Alternate Lighting Sources – Multiple Light Source Types****Question**

My sign has an internally illuminated panel sign equipped with electronic ballasts and unfiltered 30 mA neon tubes above and below the panel sign having power supplies with 76 percent efficiency. Does this sign comply with the compliant alternate lighting sources option?



### Answer

Yes, as long as the internally illuminated panel portion is illuminated with a compliant technology. This sign is essentially made up of three different signs (the panel sign and the two neon tubes); the entire sign complies as long as each part complies.

## Example 7-6: Sign Lighting and Outdoor Lighting Zones

### Question

Do outdoor lighting zone requirements apply to sign lighting?

### Answer

No. Lighting for signs must meet the sign lighting requirements and does not need to meet the outdoor lighting requirements.

## 7.5 Additions and Alterations

*§141.0(a)1, §141.0(b)2H*

All new signs, regardless of whether they are installed in conjunction with an indoor or outdoor addition or alteration to a building or lighting system, must meet the requirements in §110.9, §130.0, §130.3, and §140.8.

### 7.5.1 Sign Alterations

*§141.0(b)2M*

Existing indoor and outdoor internally and externally illuminated signs that are altered as specified by §141.0(b)2M are required to meet the sign lighting power

requirements in §140.8. Altered components of existing indoor and outdoor internally and externally illuminated signs must also meet the requirements in §130.0.

The sign lighting power requirements (either maximum-allowed power or alternate lighting sources) are triggered by alterations to existing internally or externally illuminated signs when any of the following occurs as result of the alteration, as specified in §141.0(b)2M:

- The connected lighting power is increased.
- More than 50 percent of the ballasts are replaced and rewired.
- The sign is relocated to a different location on the same site or on a different site.

These requirements are not triggered when only the lamps are replaced, the sign face is replaced, or the ballasts are replaced without rewiring.

Sign ballast rewiring that triggers the alterations requirements generally involves rewiring from parallel to series or vice versa, or when a ballast(s) is relocated within the same sign requiring relocating the wires. This does not include routine in-place ballast replacements.

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**Example 7-7: Replacing More Than 50 Percent of Ballasts****Question**

We are replacing 60 percent of the ballasts in a sign. Must we replace the remaining ballasts in the sign to comply with the Energy Code?

**Answer**

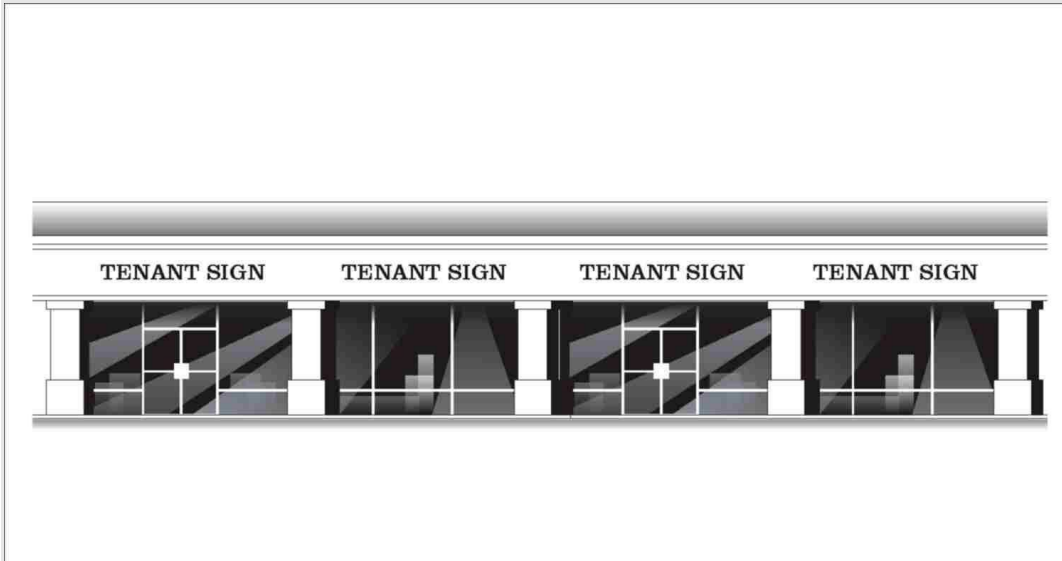
If more than 50 percent of the ballasts are being replaced, and the replacement involves rewiring the ballasts, then the requirements of §140.8 apply to the whole sign. If more than 50 percent of the ballasts are being replaced during regular maintenance, and the ballasts are not being rewired, then compliance with §140.8 is not required. However, when existing wiring will allow the direct replacement of a magnetic ballast with a high-efficiency, high-frequency electronic fluorescent ballast, the owner may wish to do this, even though it is not required.

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### **Example 7-8: Altering Existing Signs**

#### **Question**

I have a strip mall full of signs, and I will be altering some of them. Must I immediately bring all signs into compliance?



#### **Answer**

No. Only those signs in which at least 50 percent of the ballasts are replaced and rewired or those signs that are moved to a new location (on the same property or a different property) must comply with the sign lighting power requirements. All newly installed signs must comply with sign lighting control requirements and sign lighting power requirements.

## **7.6 Energy Compliance Documentation**

### **7.6.1 Overview**

This section describes the documentation required to demonstrate compliance with the sign lighting requirements.

When the permit application is submitted to the local enforcement agency, the applicant must submit certificate of compliance (NRCC-LTS-E) documentation. The person responsible for constructing the lighting system should submit the certificate of installation to the local enforcement agency after installation.

### **7.6.2 Inspection**

The sign lighting compliance inspection is carried out along with other building inspections performed by the local enforcement agency. The inspector relies upon the plans (when required for signs) and the NRCC-LTS-E.

Note: For projects that involve building plans, the person with overall responsibility must ensure that the mandatory measures that apply to the project are listed on the plans. The principal designer can decide the format of this list.

### 7.6.3 Explanation of Compliance Document Numbering System

The following is an explanation of the Compliance Document Numbering System:

NRCC	Nonresidential (NR) Certificate of Compliance (CC)
LTS	Lighting (LT), Signs (S)
E	Enforcement Document (Developed primarily for the Enforcement Agency)

### 7.6.4 Certificates of Compliance and Installation

The certificate of compliance documents demonstrate that the overall design of the regulated building or system complies with the Energy Code.

The plans examiner is responsible for verifying that these documents are submitted with the building plans and are complete when required. See Section 2.2.2 for more information about the certificate of compliance.

The NRCC-LTS-E is the nonresidential sign lighting certificate of compliance.

The certificates of installation primarily declare that what was installed matches the plans and certificates of compliance. The certificate of installation is signed by a person with an approved license.

Even if the design has errors and has specified incorrect features and devices, the installer is responsible to meet all the applicable requirements that he or she installs.

A copy of the completed, signed, and dated certificate of installation must be posted at the building site for review by the local enforcement agency in conjunction with requests for final inspection. See Section 2.2.5 for more information about certificates of installation.

The NRCI-LTS-01-E is the nonresidential sign lighting certificate of installation.

### 7.6.5 Lighting Control Systems Certificate of Installation

A certificate of installation is required when a lighting control system or EMCS is installed to comply with the sign lighting control requirements.

Before a lighting control system, including an EMCS, can be recognized for compliance with the lighting control requirements in the Energy Code, the following requirements must be met:

1. 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.

Documentation

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2. If any of the requirements in the certificate of installation fail the installation tests, that application shall not be recognized for compliance with the Energy Code.