

## 110.9 All Mandatory Lighting

### SECTION 110.9 – MANDATORY REQUIREMENTS FOR LIGHTING CONTROL DEVICES AND SYSTEMS, BALLASTS, AND LUMINAIRES

~~Any lighting control device, ballast, or luminaire subject to the requirements of Section 119 shall be installed only if the manufacturer has certified to the Commission that the device complies with all of the applicable requirements of Section 119.~~

~~Lighting control devices may be individual devices or systems consisting of two or more components. For control systems consisting of two or more components, such as an Energy Management Control System (EMCS), the manufacturer of the control system shall certify each of the components required for the system to comply with Section 119.~~

~~(a) All lighting control devices and systems, ballasts, and luminaires subject to the requirements of Section 110.9 shall meet the following requirements:~~

- ~~1. Shall be installed only if the lighting control device or system, ballast, or luminaire complies with all of the applicable requirements of Section 110.9.~~
- ~~2. Lighting controls may be individual devices (Self Contained Lighting Control) or systems (Lighting Control Systems) consisting of two or more components.~~
- ~~3. Self Contained Lighting Controls, as defined in Section 100.1, shall be certified by the Manufacturer in accordance with the Title 20 Appliance Efficiency Regulations.~~
- ~~4. Lighting Control Systems, as defined in Section 100.1, shall be a fully functional lighting control system complying with the applicable requirements in Section 110.9(b). Lighting Control systems shall not be required to be self-contained lighting controls when complying with the functional requirements in the Title 20 Appliance Efficiency Regulations.~~

~~5. If indicator lights are integral to a lighting control system, they shall consume no more than one watt of power per indicator light. (a) — All Devices: Instructions for Installation and Calibration. The manufacturer shall provide step by step instructions for installation and start up calibration of the device.~~

~~(b) Indicator Lights. Indicator lights integral to lighting control devices shall consume no more than one watt of power per indicator light.~~

~~(c) Automatic Time Switch Control Devices. Automatic time switch control devices or system shall:~~

~~1. — Be capable of programming different schedules for weekdays and weekends;~~

~~2. — Have program backup capabilities that prevent the loss of the device's schedules for at least 7 days, and the device's time and date setting for at least 72 hours if power is interrupted.~~

~~(d) — Occupant Sensors, Motion Sensors, and Vacancy Sensors. Occupant sensors, motion sensors, and vacancy sensors shall be capable of automatically turning off all the lights in an area no more than 30 minutes after the area has been vacated, and shall have a visible status signal that indicates that the device is operating properly or that it has failed or malfunctioned. The visible status signal may have an override switch that turns the signal off. In addition, ultrasonic and microwave devices shall have a built-in mechanism that allows calibration of the sensitivity of the device to room movement in order to reduce the false sensing of occupants, and shall comply with either Item 1 or 2 below, as applicable:~~

~~1. — If the device emits ultrasonic radiation as a signal for sensing occupants within an area, the device shall:~~

~~A. — Have had a Radiation Safety Abbreviated Report submitted to the Center for Devices and Radiological Health, Federal Food and Drug Administration, under 21 Code of Federal Regulations, Section 1002.12 (1996), and a copy of the report shall have been submitted to the California Energy Commission; and~~

~~B. — Emit no audible sound; and~~

~~C. — Not emit ultrasound in excess of the decibel (dB) values shown in TABLE 119 A, measured no more than 5 feet from the source, on axis.~~

~~2. — If the device emits microwave radiation as a signal for sensing occupants within the area, the device shall:~~

~~A. — Comply with all applicable provisions in 47 Code of Federal Regulations, Parts 2 and 15 (1996), and have an approved Federal Communications Commission Identifier that appears on all units of the device and that has been submitted to the California Energy Commission; and~~

~~B. — Not emit radiation in excess of 1 milliwatt per square centimeter measured at no more than 5 centimeters from the emission surface of the device; and~~

~~C. — Have permanently affixed to it installation instructions recommending that it be installed at least 12 inches from any area normally used by room occupants.~~

~~(e) — Multi Level Occupant Sensor. Multi level occupant sensors shall have an automatic OFF function that turns off all the lights, and either an automatic or a manually controlled ON function capable of meeting all the multi level and uniformity requirements of Section 131(b) for the controlled lighting. The first stage shall be capable of activating between 30-70 percent of the lighting power in a room either through an automatic or manual action, and may be a switching or dimming system. After that event occurs the device shall be capable of all of the following actions when manually called to do so by the occupant:~~

~~1. — Activating the alternate set of lights.~~

~~2. — Activating 100 percent of the lighting power.~~

~~3. — Deactivating all lights.~~

~~(f) — Automatic Daylighting Control Devices. Automatic daylighting control devices used to control lights in daylit zones shall:~~

~~1. — Be capable of reducing the power consumption of the general lighting in the controlled area by at least two thirds in response to the availability of daylight; and~~

~~2. — If the device is a dimmer controlling incandescent or fluorescent lamps, provide electrical outputs to lamps for reduced flicker operation through the dimming range, so that the light output has an amplitude modulation of less than 30 percent for frequencies less than 200 Hz, and without causing premature lamp failure; and~~

~~3. — If the devices reduce lighting in control steps, incorporate time delay circuits to prevent cycling of light level changes of less than 3 minutes and have a manual or automatic means of adjusting the deadband to provide separation of on and off points for each control step; and~~

~~4. — If the device is placed in calibration mode, automatically restore its time delay settings to normal operation programmed time delays after no more than 60 minutes; and~~

~~5. — Have a setpoint control that easily distinguishes settings to within 10 percent of full scale adjustment; and~~

~~6. — Have a light sensor that has a linear response with 5 percent accuracy over the range of illuminance measured by the light sensor; and~~

~~7. — Have a light sensor that is physically separated from where calibration adjustments are made, or is capable of being calibrated in a manner that the person initiating calibration is remote from the sensor during calibration to avoid influencing calibration accuracy.~~

~~(g) — Interior Photosensors. Interior photosensor shall not have a mechanical slide cover or other device that permits easy unauthorized disabling of the control, and shall not be incorporated into a wall mounted occupant sensor.~~

~~(h) — Multi level Astronomical Time switch Controls. Multi level astronomical time switch controls used to control lighting in daylit zones shall:~~

~~1. — Contain at least 2 separately programmable steps per zone that reduces illuminance in a relatively uniform manner as specified in Section 131(b); and~~

~~2. — Have a separate offset control for each step of 1 to 240 minutes; and~~

- ~~3. Have sunrise and sunset prediction accuracy within +/- 15 minutes and timekeeping accuracy within 5 minutes per year; and~~
- ~~4. Store astronomical time parameters (used to develop longitude, latitude, time zone) for at least 7 days if power is interrupted; and~~
- ~~5. Display date/time, sunrise and sunset, and switching times for each step; and~~
- ~~6. Have an automatic daylight savings time adjustment; and~~
- ~~7. Have automatic time switch capabilities specified in Section 119(e).~~
- ~~(i) Outdoor Astronomical Time switch Controls. Outdoor astronomical time switch controls used to control outdoor lighting as specified in Section 132(c) shall:~~
  - ~~1. Contain at least 2 separately programmable steps per function area; and~~
  - ~~2. Have the ability to independently offset the on and off times for each channel by 0 to 99 minutes before or after sunrise or sunset; and~~
  - ~~3. Have sunrise and sunset prediction accuracy within +/- 15 minutes and timekeeping accuracy within 5 minutes per year; and~~
  - ~~4. Store astronomical time parameters (used to develop longitude, latitude, time zone) for at least 7 days if power is interrupted; and~~
  - ~~5. Display date/time, sunrise and sunset; and~~
  - ~~6. Have an automatic daylight savings time adjustment; and~~
  - ~~7. Have automatic time switch capabilities specified in Section 119(e).~~
- ~~(j) Manual On Occupant Sensor (Residential) (Vacancy Sensor). A residential manual on occupant sensor (also known as a vacancy sensor) used to comply with Section 150(k) shall be a device or system which meets all of the following requirements:~~
  - ~~1. Turns off the lighting automatically within 30 minutes or less after the room has been vacated in response to the absence of occupants in the room; and~~
  - ~~2. Has a visible status signal in accordance with Section 119(d); and~~
  - ~~3. Shall not turn on the lighting automatically, except the sensor shall have a grace period of 15 seconds to 30 seconds to turn on the lighting automatically after the sensor has timed out; and~~
  - ~~4. Shall not have an override switch that disables the occupant sensor; and~~
  - ~~5. Shall not have an override switch that converts the sensor from a manual on to an automatic on system.~~
- ~~(k) Dimmers. Dimmers used to control lighting shall:~~
  - ~~1. Be capable of reducing power consumption by a minimum of 65 percent when the dimmer is at its lowest light level; and~~
  - ~~2. If the device is a dimmer controlling incandescent or fluorescent lamps, provide electrical outputs to lamps for reduced flicker operation through the dimming range, so that the light output has an amplitude modulation of less than 30 percent for frequencies less than 200 Hz, and without causing premature lamp failure; and~~
  - ~~3. Be listed by a rating lab recognized by the International Code Council (ICC) as being in compliance with Underwriters Laboratories Standards; and~~
  - ~~4. If the device is a wall box dimmer designed to be used in a three or more way circuit with non-dimmable switches, the level set by the dimmer shall not be overridden by any of the switches in the circuit. The dimmer and all of the switches in the circuit shall have the capability of turning lighting OFF if it is ON, and turning lighting ON to the level set by the dimmer if the lighting is OFF. Any wall box dimmer that is connected to a system with an emergency override function shall be controlled by the emergency override.~~
  - ~~5. If the device is a stepped dimmer, it shall include an off position to turn lights completely off.~~

**(b) All Installed Lighting Control Systems** listed in Section 110.9(b) shall comply with the requirements listed below; and shall functionally meet all applicable requirements for the application for which they are installed as required in Sections 130.0 through 130.5, Sections 140.6 through 140.8, Section 141.0, and Section 150.0(k).

**1. Time-Lighting Controls**

- A. **Automatic Time Lighting Controls** shall functionally meet all requirements for Automatic Time Switch Control devices in the Title 20 Appliance Efficiency Regulations.
- B. **Astronomical Time-Lighting Controls** shall functionally meet all requirements for Astronomical Time-Switch Control devices in the Title 20 Appliance Efficiency Regulations.
- C. **Multi-Level Astronomical Time Lighting Controls**, in addition to meeting all of the requirements for Astronomical Time-Switch Controls, shall include at least 2 separately programmable steps per zone.

**2. Daylighting Controls**

- A. **Automatic Daylight Controls** shall functionally meet all requirements for Automatic Daylight Control devices in the Title 20 Appliance Efficiency Regulations
- B. **Lighting Photo Controls** shall functionally meet all requirements for Lighting Photo Control devices in the Title 20 Appliance Efficiency Regulations.

**3. Dimmer Controls** shall functionally meet all requirements for Dimmer Control devices in the Title 20 Appliance Efficiency Regulations.

**4. Occupancy Sensing Controls:** Occupancy, Motion, and Vacancy Sensor Controls shall meet the following requirements:

- A. **Occupancy Sensor Controls** shall functionally meet all applicable requirements for occupancy sensor control devices in the Title 20 Appliance Efficiency Regulations.
- B. **Motion Sensor Controls** shall functionally meet all applicable requirements for motion sensor controls devices in the Title 20 Appliance Efficiency Regulations.
- C. **Vacancy Sensor Controls** shall functionally meet all applicable requirements for vacancy sensor controls devices in the Title 20 Appliance Efficiency Regulations.

**(4c) Track Lighting Integral Current Limiter.** An integral current limiter for line-voltage track lighting shall be recognized for compliance with Title 24, Part 6 only if it meets all of the following requirements ~~shall meet the following requirements or a method approved by the Executive Director:~~

1. Shall be certified to the Energy Commission as meeting all of the requirements in Section 110.9(c)
2. Shall comply with the Lighting Control Acceptance requirements in accordance with Section 130.4
3. Shall be manufactured so that the current limiter housing is used exclusively on the same manufacturer's track for which it is designed
4. Shall be designed so that the ~~integral~~ current limiter housing is permanently attached to the track so that the ~~track system~~ will be irreparably damaged if the integral current limiter housing were to be removed after installation into the track. Methods of attachment may include but are not limited to one-way barbs, rivets, and one-way screws
5. Shall employ tamper resistant fasteners for the cover to the wiring compartment; ~~and~~
6. Shall have the identical volt-ampere (VA) rating of the current limiter, as installed and rated for compliance with Title 24, Part 6, -clearly marked as follows:
  - A. ~~clearly marked on the circuit breaker~~ So that it is visible for the building officials' field inspection without opening coverplates, fixtures, or panels
  - B. Permanently marked on the circuit breaker
  - C. On a factory-printed label that is permanently affixed to a non-removable base-plate inside the wiring compartment

~~and also on a permanent factory installed label inside the wiring compartment shall have that shall be identical to the rating; and~~

~~Employ tamper resistant fasteners for the cover to the wiring compartment; and~~

7. ~~Shall have a conspicuous permanent factory installed label permanently affixed to the inside of the wiring compartment warning against removing, tampering with, rewiring, or bypassing the device.~~
8. ~~Each electrical panel from which track lighting integral current limiters are energized shall have a factory printed label permanently affixed and prominently located, stating the following: "NOTICE: Current limiting devices installed in track lighting integral current limiters connected to this panel shall only be replaced with the same or lower amperage. Adding track or replacement of existing current limiters with higher continuous ampere rating will void the track lighting integral current limiter certification, and will require re-submittal and re-certification of California Title 24, Part 6 compliance documentation."~~

**(d) Dedicated Line-Voltage Track Lighting Supplementary Overcurrent Protection Panel.** ~~A Dedicated Line-Voltage Track Lighting Supplemental Overcurrent Protection Panel used for line-voltage track lighting shall be recognized for compliance with Title 24, Part 6 only if it meets all of the following requirements:~~

1. ~~Shall comply with the Lighting Control Acceptance requirements in accordance with Section 130.4~~
2. ~~Shall be listed as defined in Section 100.1~~
3. ~~Shall be used only for line voltage track lighting. No other lighting or building power shall be used in a Supplementary Overcurrent Protection Panel used to determine input wattage for track lighting.~~
4. ~~Be permanently installed in an electrical equipment room, or permanently installed adjacent to the lighting panel board providing supplementary overcurrent protection for the track lighting circuits served by the supplementary over current protection pane~~
5. ~~Shall have a permanently installed label that is prominently located stating the following: "NOTICE: This Panel for Track Lighting Energy Code Compliance Only. The overcurrent protection devices in this panel shall only be replaced with the same or lower amperage. No other overcurrent protective device shall be added to this panel. Adding to, or replacement of existing overcurrent protective device(s) with higher continuous ampere rating, will void the panel listing and require re-submittal and re-certification of California Title 24, Part 6 compliance documentation."~~

**(me) Residential High Efficacy Light Emitting Diode (LED) Lighting Systems.** ~~To qualify as high efficacy for compliance with the residential lighting Standards in Section 150.0(k), a residential high efficacy LED luminaire, or LED light engine with integral heat sink shall meet the minimum efficacy requirements in TABLE 150-C and luminaire power shall be determined as specified by Section 130(d)5. shall be certified to the Energy Commission according to Reference Joint Appendix JA-8. LED lighting not certified to the Energy Commission shall be classified as low efficacy for compliance with Section 150.0(k). Nonresidential LED lighting shall not be certified to the Energy Commission.~~

**(#f) Ballasts for Residential Recessed Luminaires.** ~~To qualify as high efficacy for compliance with Section 150.0(k), any compact fluorescent lamp ballast in a residential recessed luminaire shall meet all of the following conditions:~~

1. ~~Be rated by the ballast manufacturer to have a minimum rated life of 30,000 hours when operated at or below a specified maximum case temperature. This maximum ballast case temperature specified by the ballast manufacturer shall not be exceeded when tested in accordance to UL 1598 Section 19.15; and~~
2. ~~Have a ballast factor of not less than 0.90 for non-dimming ballasts and a ballast factor of not less than 0.85 for dimming ballasts.~~

**(og) Minimum Relative System Efficiency (RSE) for Dimmable Fluorescent Ballasts for Power Adjustment Factor.** ~~To qualify for the Power Adjustment Factor in Section 146(a)2 and TABLE 146-C, ballasts for T5 and T8 linear fluorescent lamps shall be electronic, dimmable, and shall meet the minimum Relative System Efficiency (RSE) in TABLE 146-D. All dimmable ballasts for T5 and T8 linear fluorescent lighting systems shall be electronic and shall comply with the minimum Tier 1 RSE in Table 110.9-A. Additionally, dimmable ballasts for T5 and T8 linear fluorescent lighting systems used to earn a PAF in accordance with Table 140.6-A shall comply with the minimum Tier 2 RSE in Table 110.9-A.~~

**TABLE 119-A ULTRASOUND MAXIMUM DECIBEL VALUES**

<b>MIDFREQUENCY OF SOUND PRESSURE THIRD-OCTAVE BAND (in kHz)</b>	<b>MAXIMUM dB LEVEL WITHIN THIRD-OCTAVE BAND (in dB reference 20 micropascals)</b>
Less than 20	80
20 or more to less than 25	105
25 or more to less than 31.5	110
31.5 or more	115

**TABLE 110.9-A MINIMUM RELATIVE SYSTEM EFFICIENCY (RSE) FOR DIMMABLE ELECTRONIC BALLASTS**

		Minimum Relative System Efficiency (RSE)			Corresponding Ballast Efficacy Factor (BEF) <sup>1</sup>			
<u>Tier Lamp Category</u>	<u>Tier</u>	<u>1 or 2 Lamps</u>			<u>1 x 28W Lamp</u>	<u>2 x 28W Lamps</u>	<u>1 x 54W HO Lamps</u>	<u>2 x 54W HO Lamps</u>
<u>T-5</u>	<u>Tier 1</u>	<u>0.85</u>			<u>3.03</u>	<u>1.51</u>	<u>1.57</u>	<u>0.78</u>
	<u>Tier 2</u>	<u>0.90</u>	<u>0.92</u>		<u>3.23</u>	<u>1.64</u>	<u>1.67</u>	<u>0.85</u>
		Minimum Relative System Efficiency (RSE)			Corresponding Ballast Efficacy Factor (BEF) <sup>1</sup>			
<u>Lamp Category</u>	<u>Tier</u>	<u>1 Lamp</u>	<u>2 or 3 Lamps</u>	<u>4 Lamps</u>	<u>1 x 32W Lamps</u>	<u>2 x 32W Lamps</u>	<u>3 x 32W Lamps</u>	<u>4 x 32W Lamps</u>
<u>T-8</u>	<u>Tier 1</u>	<u>0.86</u>	<u>0.90</u>	<u>0.98</u>	<u>2.69</u>	<u>1.40</u>	<u>0.93</u>	<u>0.76</u>
	<u>Tier 2</u>	<u>0.91</u>	<u>0.94</u>	<u>0.98</u>	<u>2.86</u>	<u>1.47</u>	<u>0.98</u>	<u>0.76</u>
<sup>1</sup> To calculate corresponding BEFs for lamp wattages and number of lamps not shown, use the following formula: $BEF = \left( \frac{RSE \times 100}{\# \text{ lamps} \times \text{lamp watts}} \right)$								
$RSE = \left( \frac{\text{Ballast Factor}}{\text{Ballast Input Power} / \text{Total Rated Lamp Power}} \right)$								
NOTE: Total Rated Lamp Power = number of Lamps per Ballast x Rated Lamp Power.								