COMPLIANCE OVERVIEW

1. Compliance and enforcement
2. Permitting and certification
3. Compliance approaches
4. Required forms
5. New additions and major changes

COMPLIANCE AND ENFORCEMENT

Primary responsibility for compliance and enforcement rests with the local enforcement agency, typically associated with a city or county government.

A building permit must be obtained from the local jurisdiction before construction of:

- A nonresidential building
- An outdoor lighting system
- Additions to existing buildings
- Significant alterations to existing lighting systems
- Signage

LOCAL ORDINANCES

State law allows local jurisdictions to adopt building energy efficiency standards that are more stringent than Title 24, Part 6, through an approval process with the California Energy Commission.

These local ordinances, sometimes called "reach codes," are listed on the Energy Commission website:

www.energy.ca.gov/title24/2016standards/ordinances

THE CORE COMPLIANCE PROCESS

1. **Meet all mandatory requirements**
   - Required controls that must be installed
   - Functionality that a lighting system must be capable of
   - Specify if a device needs to be certified by the Energy Commission

2. **Meet all prescriptive or performance requirements**
   - Maximum lighting power allowance for a building or an area
   - Some methods allow for trade-offs between building systems, so a very efficient lighting system may allow for a greater HVAC load

THE PERFORMANCE APPROACH

Performance Approach:

- More flexible than prescriptive
- Based on an energy simulation model of the building
- Requires an approved computer software program
- Uses energy budgets to determine compliance
- Typically used for flexibility and ability to find the most cost-effective solution

Approved software:
http://www.energy.ca.gov/title24/2016standards/2016_computer_prog_list.html

- CBECC-Com V3c
- IES (Integrated Environmental Solutions) Virtual Environment
- Energy Pro
- Simergy

THE PRESCRIPTIVE APPROACH

Indoor Lighting

The prescriptive lighting power requirements are determined by one of three methods:

- Complete building method
- Area category method
- Tailored method

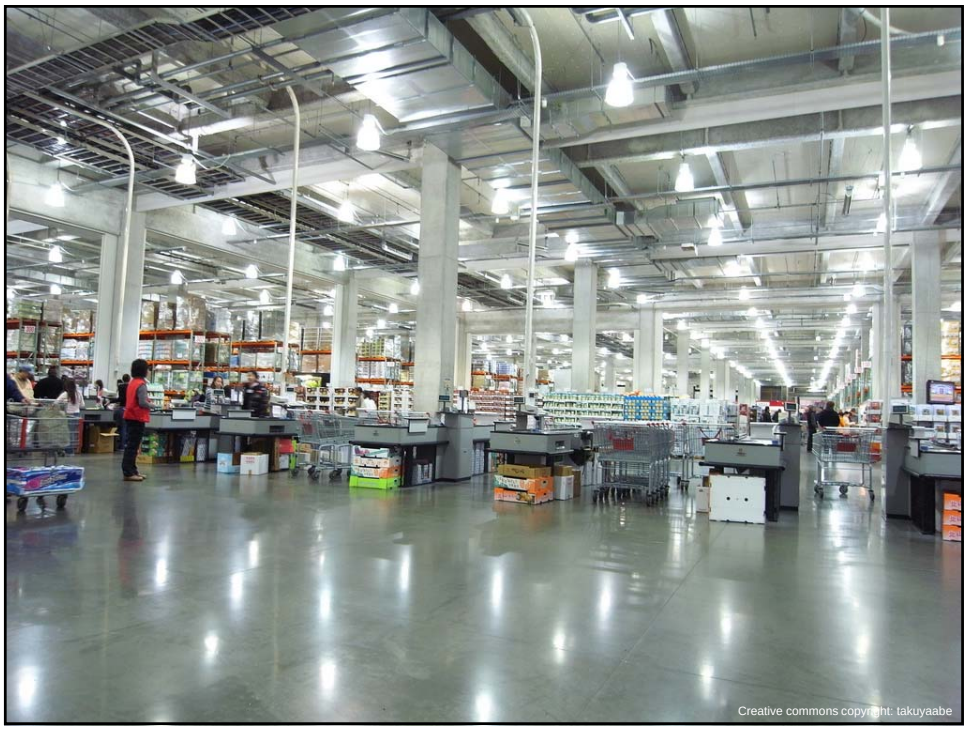
The allowed lighting varies according to building occupancy and task.

THE PRESCRIPTIVE METHODS

1. **Complete building method**
   Usable when at least 90% of the building is one primary type of use or sometimes for a single tenant space within a building. A Single allowed lighting power value governs the entire building.

2. **Area category method**
   Applicable for any permit situation, including tenant improvements. Lighting power values are assigned to each major function areas of a building (offices, lobbies, etc.). The allowed lighting power is the weighted average of these areas.

3. **Tailored method**
   Applicable when additional flexibility is needed to accommodate special task lighting needs in specific task areas. Lighting power allowances are determined room-by-room and task-by-task, with the area category method used for other areas in the building.



COMPLETE BUILDING ALLOWANCES

TABLE 140.6-B COMPLETE BUILDING METHOD LIGHTING POWER DENSITY VALUES

TYPE OF BUILDING	ALLOWED LIGHTING POWER DENSITY (WATTS PER SQUARE FOOT)	
Auditorium Building	1.4	Was 1.5
Classroom Building	1.1	
Commercial and Industrial Storage Building	0.60	
Convention Center Building	1.0	Was 1.2
Financial Institution Building	1.0	Was 1.1
General Commercial Building/Industrial Work Building	1.00	
Grocery Store Building	1.50	
Library Building	1.2	Was 1.3
Medical Building/Clinic Building	1.0	Was 1.1
Office Building	0.80	Was 1.6
Parking Garage Building	0.20	
Religious Facility Building	1.5	
Restaurant Building	1.1	Was 1.2
School Building	0.95	Was 1.0
Theater Building	1.3	
All others buildings	0.50	Was 0.6

AREA METHOD ALLOWANCES

TABLE 140.6-C AREA CATEGORY METHOD - LIGHTING POWER DENSITY VALUES (WATTS/FT²)

PRIMARY FUNCTION AREA		ALLOWED LIGHTING POWER DENSITY (W/ft²)	PRIMARY FUNCTION AREA		ALLOWED LIGHTING POWER DENSITY (W/ft²)
Auditorium Area		1.40 [3]	Library Area	Reading areas	1.1 [3]
Auto Repair Area		0.90 [2]		Stack areas	1.5 [3]
Beauty Salon Area		1.7	Lobby Area	Hotel lobby	0.95 [3]
Civic Meeting Place Area		1.3 [3]		Main entry lobby	0.95 [3]
Classroom, Lecture, Training, Vocational Areas		1.2 [5]	Locker/Dressing Room		0.70
Commercial and Industrial Storage Areas (conditioned and unconditioned)		0.60	Lounge Area		0.90 [3]
Commercial and Industrial Storage Areas (refrigerated)		0.7	Malls and Atria		0.95 [3]
Convention, Conference, Multipurpose and Meeting Center Areas		1.2 [3]	Medical and Clinical Care Area		1.2
Corridor, Restroom, Stair, and Support Areas		0.60	Office Area	> 250 square feet	0.75
Dining Area		1.0 [3]		≤ 250 square feet	1.0
Electrical, Mechanical, Telephone Rooms		0.55 [2]	Parking Garage Area	Parking Area [10]	0.14
Exercise Center, Gymnasium Areas		1.0		Dedicated Ramps	0.30
Exhibit, Museum Areas		1.8		Daylight Adaptation Zones [9]	0.60
Financial Transaction Area		1.0 [3]	Religious Worship Area		1.5 [3]
General Commercial and Industrial Work Areas	Low bay	0.9 [2]	Retail Merchandise Sales, Wholesale Showroom Areas		1.2 [6 and 7]
	High bay	1.0 [2]			
	Precision	1.2 [4]	Theater Area	Motion picture	0.90 [3]
Grocery Sales Area		1.2 [6 and 7]		Performance	1.4 [3]

2016 TABLE 140.6-C AREA CATEGORY METHOD *Lighting Power Density (LPD) (Watt/Ft²) / <85% of LPD for Alteration Control Exceptions*

PRIMARY FUNCTION AREA		2013 100%	2016 100%	PRIMARY FUNCTION AREA		2013 100%	2016 100%
Auditorium Area		1.5 [3]	1.4 [3]	Library Area	Reading areas	1.2 [3]	1.1 [3]
Auto Repair Area			0.9 [2]		Stack areas		1.5 [3]
Beauty Salon Area			1.7	Lobby Area	Hotel lobby	1.1 [3]	0.95 [3]
Civic Meeting Place Area			1.3 [3]		Main entry lobby	1.5 [3]	0.95 [3]
Classroom, Lecture, Training, Vocational Areas			1.2 [5]	Locker/Dressing Room		0.8	0.7
Commercial and Industrial Storage Areas (conditioned and unconditioned)			0.6	Lounge Area		1.1 [3]	0.90 [3]
Commercial and Industrial Storage Areas (refrigerated)			0.7	Malls and Atria		1.2 [3]	0.95 [3]
Convention, Conference, Multipurpose and Meeting Center Areas		1.4 [3]	1.2 [3]	Medical and Clinical Care Area			1.2
Corridor, Restroom, Stair, and Support Areas			0.6	Office Area	> 250 square feet		0.75
Dining Area		1.1 [3]	1.0 [3]		≤ 250 square feet		1.0
Electrical, Mechanical, Telephone Rooms		0.7 [2]	0.55 [2]	Parking Garage Area	Parking Area [10]		0.14
Exercise Center, Gymnasium Areas			1.0		Dedicated Ramps		0.3
Exhibit, Museum Areas		2.0	1.8		Daylight Adaptation Zn [9]		0.6
Financial Transaction Area		1.2 [3]	1.0 [3]	Religious Worship Area			1.5 [3]
General Commercial and Industrial Work Areas	Low bay		0.9 [2]	Retail Merchandise Sales, Wholesale Showroom Areas			1.2 [6 and 7]
	High bay		1.0 [2]				
	Precision		1.2 [4]	Theater Area	Motion picture		0.9 [3]
Grocery Sales Area			1.2 [6 and 7]		Performance		1.4 [3]
Hotel Function Area		1.5 [3]	1.2 [3]	Transportation Function Area	Concourse & Baggage		0.5
					Ticketing	1.2	1.0
Kitchen, Food Preparation Areas		1.6	1.2	Videoconferencing Studio			1.2 [8]
Laboratory Area, Scientific			1.4 [1]	Waiting Area		1.1 [3]	0.8 [3]
Laundry Area		0.9	0.7	All other areas		0.6	0.5

Footnote #	Type of lighting system allowed	Maximum allowed added lighting power.
1	Specialized task work	0.2 W/ft²
2	Specialized task work	0.5 W/ft²
3	Ornamental lighting as defined in Section 100.1 and in accordance with Section 140.6.(c)2.	0.5 W/ft²
4	Precision commercial and industrial work	1.0 W/ft²
5	Per linear foot of white board or chalk board.	5.5 W per linear foot
6	Accent, display and feature lighting - luminaires shall be adjustable or directional	0.3 W/ft²
7	Decorative lighting - primary function shall be decorative and shall be in addition to general illumination	0.2 W/ft²
8	Additional Videoconferencing Studio lighting complying with all of the requirements in Section 140.6(c)2Gvii	1.5 W/ft²
9	Daylight Adaptation Zones shall be no longer than 66 feet from the entrance to the parking garage	
10	Additional allowance for ATM locations in Parking Garages (allowance per ATM)	200 watts for the 1st ATM location; 50 watts for each additional ATM locations in a group

COMPLIANCE FORMS

NR CC – LTI – 01 – E

- NR: Nonresidential
- CF: Residential
- CC: Certificate of Compliance
- CA: Certificate of Acceptance
- CI: Certificate of Installation
- CV: Certificate of Verification
- LT: Lighting
- CXR: Commissioning Review
- ELC: Electrical
- ENV: Envelope
- MCH: Mechanical
- PLB: Plumbing
- PRC: Process
- O: Outdoor
- I: Indoor
- S: Signs
- Number in Sequence
- E: Used by Enforcement Authority
- A: Used by Acceptance Tester

CERTIFICATES OF COMPLIANCE

NRCC-ELC-01-E	Electrical Power Distribution
NRCC-LTI-01-E	Indoor Lighting
NRCC-LTI-02-E	Indoor Lighting Controls
NRCC-LTI-03-E	Indoor Lighting Power Allowance
NRCC-LTI-04-E	Tailored Method
NRCC-LTI-05-E	Line-Voltage Track Lighting Worksheet
NRCC-LTI-06-E	Indoor Lighting Existing Conditions
NRCC-LTO-01-E	Outdoor Lighting
NRCC-LTO-02-E	Outdoor Lighting Controls
NRCC-LTO-03-E	Outdoor Lighting Power Allowance
NRCC-LTO-04-E	Outdoor Lighting Existing Conditions
NRCC-LTS -01-E	Sign Lighting

CERTIFICATES OF INSTALLATION

NRCI-LTI-01-E	Validation of Certificate of Compliance (All Buildings)
NRCI-LTI-02-E	Energy Management Control System or Lighting Control System
NRCI-LTI-03-E	Line-Voltage Track Lighting
NRCI-LTI-04-E	Two Interlocked Lighting Systems
NRCI-LTI-05-E	Power Adjustment Factors
NRCI-LTI-06-E	Video Conferencing Studio Lighting
NRCI-LTO-01-E	Outdoor Lighting
NRCI-LTO-02-E	Energy Management Control System or Lighting Control System
NRCI-LTS-01-E	Sign Lighting
NRCI-ELC-01-E	Electrical Power Distribution

ACCEPTANCE TESTING FOR LIGHTING CONTROLS

Acceptance testing helps ensure building equipment and systems perform properly. It is not a replacement for commissioning.

Lighting controls acceptance testing is NOT the same as the commissioning requirements in 120.8.

1. Review documents to make sure that controls are properly documented
2. Review the installation and perform testing to ensure controls operate as required by Title 24
3. Fill out the Certificates of Acceptance and submit them to the enforcement agency in order to receive an occupancy permit

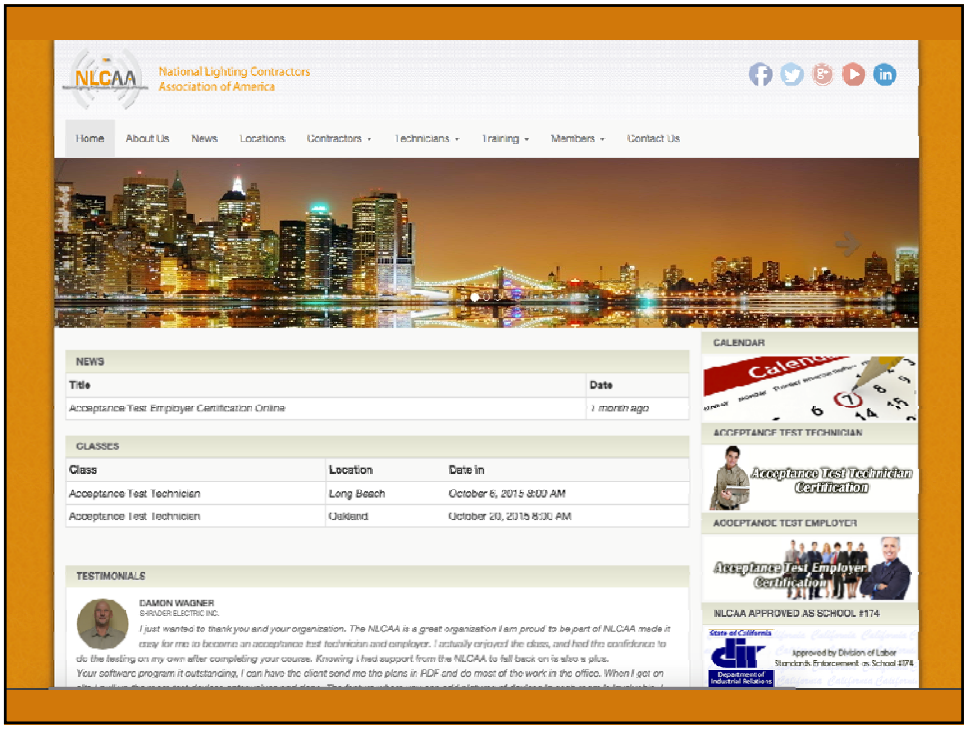
http://www.energy.ca.gov/title24/attcp/

WHO CAN BE AN ATT?

Including (but not limited to):

1. Electrical Contractors
2. Certified General Electricians
3. Professional Engineers
4. Controls Installation & Startup Contractors
5. Certified Commissioning Professionals
6. HVAC Installers
7. Mechanical Contractors

Participation in the ATT program is limited to persons who have at least three years of verifiable professional experience and expertise in lighting controls and electrical systems.



ACCEPTANCE TESTING PROCESS

1. **Plan Review (installing contractor, engineer of record)**
   Review plans and specifications to ensure they meet all Title 24 requirements. Typically done prior to signing a Certificate of Compliance.
2. **Construction Inspection (installing contractor, engineer of record)**
   Check that the equipment installed is capable of complying with the requirements of the Standards. Construction inspection also assures that the equipment is installed correctly and is calibrated.
3. **Functional Testing (Field Technician)**
   Acceptance tests are performed to ensure that all equipment performs as required by Title 24.
4. **Occupancy**
   Once all required Certificates of Acceptance are submitted, the enforcement agency releases a Certificate of Occupancy.

ACCEPTANCE TESTS AND FORMS

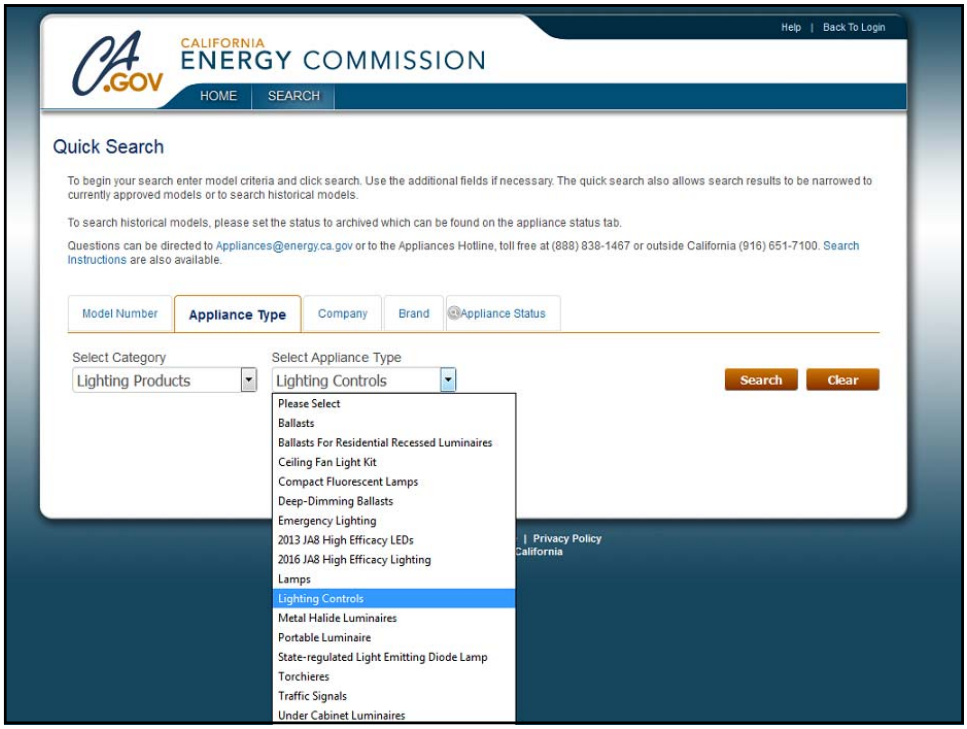
Acceptance tests apply to all new equipment and controls installed on new or existing lighting systems. These tests cover:

NRCA-LTI-02-A	Lighting Controls
NRCA-LTI-03-A	Automatic Daylighting Controls
NRCA-LTI-04-A	Demand Responsive Lighting Controls
NRCA-LTI-05-A	Institutional Tuning Controls
NRCA-LTO-02-A	Outdoor Lighting Controls

MANDATORY DEVICE REQUIREMENTS

The majority of lighting control devices are now regulated by California Appliance Efficiency Standards, Title 20

- Devices must be certified to the California Energy Commission
- Expanded requirements for:
  - Automatic time switch controls
  - Dimmers
  - Occupant sensing devices
  - Photocontrols
- Check **www.appliances.energy.ca.gov**



WHAT IS AN ENTIRE LUMINAIRE ALTERATION?

- Removing and reinstalling (at least 10% per enclosed space or 3 fixtures per room)
- Replacing or Adding Entire Luminaires (3 fixtures or more per room)
- Adding, removing, or replacing walls or ceilings as part of a lighting redesign

Alterations trigger Title 24 requirements!

WHAT IS A LUMINAIRE MODIFICATION IN PLACE?

- Replacing ballast/driver AND lamps in luminaire
- Permanently changing the light source of a luminaire
- Changing the optical system of a luminaire

These trigger Title 24 requirements if you modify at least 70 luminaires per floor or tenant space!

WHAT IS A REPAIR?

"Reconstruction or renewal for the purpose of maintenance of any component, system, or equipment of an existing building."

- Replacement of lamps, lamp holders, or lenses
- Alterations caused directly by the disturbance of asbestos
- Repairs may not increase energy consumption of repaired equipment
- If you replace any component, system, or equipment that is regulated by Title 24, that modification is considered an **alteration** and not a repair.

Repairs do not trigger Title 24.

TITLE 24 TRIGGERS FOR INTERIOR ALTERATIONS

2016 Indoor Luminaire Component Modification: ≥70 per floor/tenant per year changed fixtures: 3 or more fixtures per room

Entire Luminaire Alterations: ≥10% moved, changed, replaced fixtures: 3 or more fixtures per room

Mandatory Control	*Table 141.0-E*		Reduced **installed wattage from existing** method* §141.0(b)2Jii	**Adding to connected load or remodeling**
	Reduced LPD(§140.6) **≤85%** of allowable	Reduced LPD (§140.6) **>85%** of allowable		
Area device (on/off): §130.1(a)1,2,3	Yes *Excluding 130.1(a)4: separately controlled lighting systems.*	Yes *Excluding 130.1(a)4: separately controlled lighting systems.*	Yes *Excluding 130.1(a)4: separately controlled lighting systems.*	Yes
Multi-level control: §130.1(b)	Yes *2 level or 130.1(b) Only for modified luminaires*	Yes *Only for modified luminaires*	**No**	Yes
Auto shut-off control: §130.1(c)	Yes	Yes	**Yes:** auto shut-off all building types. Partial-OFF required for warehouse and parking garages **Partial-OFF excluded at**: *130.1(c)6B: libraries / 130.1(c)6C:/7A stairs/corridors 130.1(c)8: Hotel/Motel guest rm 30 min. controls N/A*	Yes
Daylighting control: §130.1(d)	**No**	Yes *Only for modified luminaires*	**No**	Yes
Demand response: §130.1(e)	**No**	Yes	**No**	Yes

*50% Office, retail and hotel occupancies / *35% All other occupancies

Acceptance test technician required when any number of controls for **≥20** fixtures being added for project

TITLE 24 TRIGGERS FOR OUTDOOR APPLICATIONS

New Construction

- Incandescent >100 watts
  - Motion Sensor
- Lamp>150 watts
  - BUG
- Controls
  - When not regulated by health or safety to always remain on

Alterations

- 5 fixtures *OR* ≥10% (whichever is greater) of the fixtures changed, moved or replaced
  - Mandatory controls only
- ≥50% of the fixtures changed, moved or replaced
  - Mandatory Controls AND
  - *Prescriptive requirements*
- Reduced Wattage Method:
  - Mandatory Controls

ELECTRICAL POWER DISTRIBUTION SYSTEMS, 130.5

Mandatory requirements that apply to:

- All non-residential,
- high-rise residential, and
- hotel/motel buildings.

Requirements include:

- **Service metering**
- **Disaggregation of electrical loads**
- **Voltage drop**
- **Receptacle Control**
- **Demand Response**

SERVICE METERING

The building owner or occupant must have access to read a meter with:

1. Display instantaneous demand in kW
2. Measure kWh usage over time
3. Larger services over 250 kVA require additional capabilities

"Smart meters" usually meet the requirements as long as the data is accessible to the building owner or occupant.

TABLE 130.5-A MINIMUM REQUIREMENTS FOR METERING OF ELECTRICAL LOAD

Metering Functionality	Electrical Services rated 50 kVA or less	Electrical Services rated more than 50kVA and less than or equal to 250 kVA	Electrical Services rated more than 250 kVA and less than or equal to 1000kVA	Electrical Services rated more than 1000kVA
Instantaneous (at the time) kW demand	Required	Required	Required	Required
Historical peak demand (kW)	Not required	Not required	Required	Required
Tracking kWh for a user-definable period.	Required	Required	Required	Required
kWh per rate period	Not required	Not required	Not required	Required

DISAGGREGATION OF ELECTRICAL LOADS

Measurement devices must be able to monitor the electrical energy usage of load types per:

TABLE 130.5-B MINIMUM REQUIREMENTS FOR SEPARATION OF ELECTRICAL LOAD

Electrical Load Type	Electrical Services rated 50 kVA or less	Electrical Services rated more than 50kVA and less than or equal to 250 kVA	Electrical Services rated more than 250 kVA and less than or equal to 1000kVA	Electrical Services rated more than 1000kVA
Lighting including exit and egress lighting and exterior lighting	Not required	All lighting in aggregate	All lighting disaggregated by floor, type or area	All lighting disaggregated by floor, type or area
HVAC systems and components including chillers, fans, heaters, furnaces, package units, cooling towers, and circulation pumps associated with HVAC	Not required	All HVAC in aggregate	All HVAC in aggregate and each HVAC load rated at least 50 kVA	All HVAC in aggregate and each HVAC load rated at least 50kVA
Domestic and service water system pumps and related systems and components	Not required	All loads in aggregate	All loads in aggregate	All loads in aggregate
Plug load including appliances rated less than 25 kVA	Not required	All plug load in aggregate Groups of plug loads exceeding 25 kVA connected load in an area less than 5000 sf	All plug load separated by floor, type or area Groups of plug loads exceeding 25 kVA connected load in an area less than 5000 sf	All plug load separated by floor, type or area All groups of plug loads exceeding 25 kVA connected load in an area less than 5000 sf
Elevators, escalators, moving walks, and transit systems	Not required	All loads in aggregate	All loads in aggregate	All loads in aggregate
Other individual non-HVAC loads or appliances rated 25kVA or greater	Not required	All loads in aggregate	All loads in aggregate	All loads in aggregate
Industrial and commercial load centers 25 kVA or greater including theatrical lighting installations and commercial kitchens	Not required	All loads in aggregate	All loads in aggregate	All loads in aggregate
Renewable power source (net or total)	Each group	Each group	Each group	Each group
Loads associated with renewable power source	Not required	All loads in aggregate	All loads in aggregate	All loads in aggregate
Charging stations for electric vehicles	All loads in aggregate	All loads in aggregate	All loads in aggregate	All loads in aggregate

VOLTAGE DROP

The maximum **combined voltage drop** on both installed **feeder conductors** and **branch circuit conductors** to the farthest connected load or outlet cannot exceed **five percent**.

Exceptions are voltage drops permitted by California Electrical Code

- Section 647.4 – **Sensitive electronic devices**
- Section 695.6 – **Fire Pump Transformers**
- Section 695.7 – **Fire Pump Power Wiring**

The California Electrical Code is available online here:
http://www.bsc.ca.gov/Codes.aspx

CIRCUIT CONTROLS FOR 120-VOLT RECEPTACLES

Plug loads are a large and increasing electrical load in most office buildings.

All of the following spaces must have **both** controlled and uncontrolled 120-volt receptacles:

- Office areas
- Lobbies
- Conference room
- Kitchens in office spaces
- Copy rooms
- Hotel/motel guest rooms

The controlled outlets must be clearly marked. Each uncontrolled receptacle should have a controlled receptacle within 6 feet of it.