Nonresidential and Multifamily Building

Electrical Power Distribution

What Does this Fact Sheet Cover?

California's 2022 Building Energy Efficiency Standards (Title 24, Part 6 or the Energy Code) specifies requirements for electrical power distribution (EPD) systems in multifamily building common use areas, nonresidential buildings, and hotels and motels. The requirements are triggered by New Construction, Additions and Alterations and include electrical service metering, separation of circuits, voltage drop, circuit controls and controlled receptacles, and demand-responsive controls and equipment.

Does this Fact Sheet Apply to Your Project?

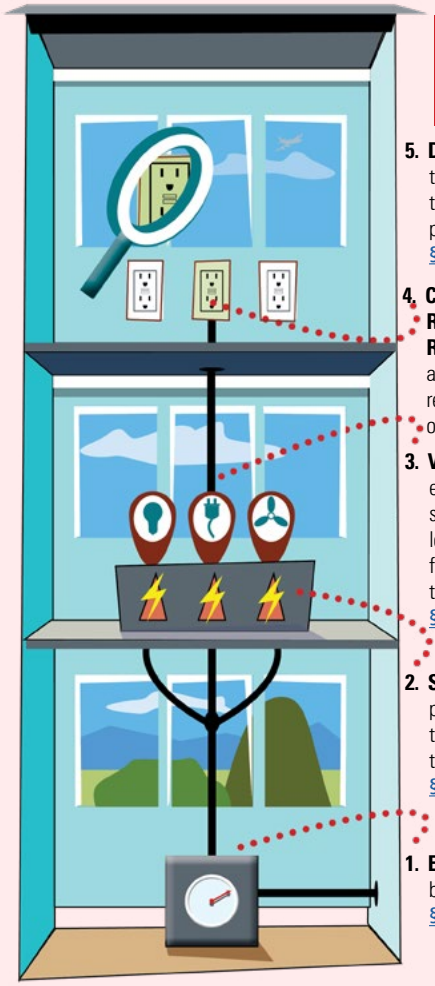
Use this fact sheet to answer these questions about requirements for your project's electrical power distribution systems:

1. What requirements does your project need to meet to comply with the Energy Code?
2. What requirements are new in the 2022 Energy Code?
3. Who's involved in the compliance process?
4. How must you document your project's compliance?

Figure 1 explains the terms and concepts involved in electrical power distribution.

To see if your project's occupancy group or building type has EPD requirements in the Energy Code, see Table 1.

If your project is an Alteration, also check Table 2 to see if the scope of work triggers the Energy Code.



Electrical Power Distribution Measures of the Energy Code

5. **Demand-responsive Controls** help the utility to manage peak demands on the power grid by shutting off electrical power to controlled receptacles. §130.5(e)
4. **Circuit Controls for 120-volt Receptacles and Controlled Receptacles** minimize plug loads by automatically turning off controlled receptacles when the space is not occupied. §130.5(d)
3. **Voltage Drop** regulations make the electrical system more efficient by setting a 5% limit on how much voltage loss is allowed due to resistance in the feeder and branch circuit conductors to the farthest connected load or outlet. §130.5(c)
2. **Separation of Electrical Circuits** provides the ability to add equipment that collects detailed end-use data to target specific operational improvements. §130.5(b)
1. **Electrical Service Metering** allows the building owner to monitor electrical use. §130.5(a)

Figure 1. Electrical Power Distribution

Importance of Compliance

Designing and installing electrical systems that comply with the Energy Code reduces uneconomic, inefficient or unnecessary consumption of energy. For example, metering and separation of circuits allow measurement to find opportunities to save energy and money. Limiting voltage drop in the feeder conductors and branch circuit conductors can result in more efficient operation of electrical equipment. Circuit controls shut off plug loads when spaces are vacant, and demand-responsive controls help grid management in critical periods.

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WHAT'S NEW

In the 2022 Energy Code, when demand-responsive lighting controls are required for a building or space, controlled receptacles that meet §130.5(d) or §160.6(d) must have demand-responsive controls that are compliant with §§110.12(a) and (e).

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Occupancies and Buildings Covered in this Fact Sheet

Building Type	Code	Occupancy Group and Building Type California Building Code §§303-307, 309-312	Building and Space Types Subject to EPD Requirements
Multifamily Buildings	R-2	**Residential Group R-2:** Buildings with 3 or more dwelling units for permanent residents	**Multifamily:** A building, other than hotel or motel, of Occupancy Group R-2, R-3 or R-4 Examples: Apartment building common use areas *Hotels, motels and timeshares are excluded.*
	R-3	**Residential Group R-3:** Some multifamily congregate residences with primarily permanent residents	**Multifamily:** A building, other than hotel or motel, of Occupancy Group R-2, R-3 or R-4 Examples: Dormitory common use areas *Boarding houses or alcohol or drug abuse recovery homes with over 6 guests are excluded.*
	R-4	**Residential Group R-4:** Supervised residential environments for more than 6 ambulatory clients and up to 16 total residents, excluding staff	**Multifamily:** A building, other than hotel or motel, of Occupancy Group R-2, R-3 or R-4 Examples: Common use areas of assisted living facilities, halfway houses and drug treatment facilities
Nonresidential Buildings on Multifamily Sites	U	**Miscellaneous:** Accessory buildings and structures and miscellaneous structures not classified in any specific occupancy	**Occupancy Group U:** Miscellaneous Examples: Nonresidential accessory buildings
Nonresidential Buildings	A	**Assembly:** Buildings or spaces where groups of people gather for civic, social or religious functions, recreation, food or drink consumption, entertainment, awaiting transportation, or television and movie production, among other uses	**Occupancy Group A:** Assembly Examples: Auditoriums, convention centers (assembly buildings), libraries, tenant lease spaces,* theaters
	B	**Business:** Buildings or spaces for office, professional or service-type transactions, including storage of records and accounts	**Occupancy Group B:** Business Examples: Financial institutions, offices, restaurants, tenant lease spaces* *Healthcare facilities are exempt.*
	E	**Education:** Buildings or spaces used for more than 6 persons at any one time for educational purposes through the 12th grade	**Occupancy Group E:** Education Examples: Schools for any number of students at any grade level
	F	**Factory:** Buildings or spaces used for assembling, disassembling, fabricating, finishing, manufacturing, packaging, repair or processing operations that are not classified as a Group H hazardous or Group S storage occupancy	**Occupancy Group F:** Factory Examples: Warehouses, tenant lease spaces*
	H	**High Hazard:** Buildings or spaces that involve the manufacturing, processing, generation or storage of materials that constitute a substantial physical or health hazard	**Occupancy Group H:** High hazard Examples: Factories or storage facilities for hazardous materials
	M	**Mercantile:** Buildings or spaces used to display and sell merchandise to the public, plus supporting areas for stocks of goods, wares or merchandise	**Occupancy Group M:** Mercantile Examples: Grocery stores, retail stores, tenant lease spaces*
	R-1	**Residential Group R-1:** Buildings with sleeping units for primarily transient occupants	**Residential Group R-1:** Hotel and motel Examples: Hotel and motel buildings with 6 or more guest rooms, vacation timeshare properties, boarding houses with over 6 guests, alcohol or drug abuse treatment facilities with over 6 guests
	S	**Storage:** Buildings or spaces used to store materials that are not classified as hazardous	**Occupancy Group S:** Storage Examples: Self-storage facilities
	U	**Miscellaneous:** Accessory buildings and structures and miscellaneous structures not classified in any specific occupancy	**Occupancy Group U:** Miscellaneous Examples: Nonresidential accessory buildings

**Tenant lease space is a room or area in a building intended for lease for which a specific tenant is not identified at the time of building permit application.*

Table 1. *Occupancies and Buildings Covered in this Fact Sheet*

Alterations Trigger Sheet

Electrical Power Distribution Trigger Sheet - Alterations					
For Details: Click a code section → / Project Scope: Change this and nothing else ↓	**Service Metering** Nonresidential: §§130.5(a), 141.0(b)2Pi Multifamily: §§160.6(a), 180.2(b)4Bviia	**Separation of Circuits** Nonresidential: §§130.5(b), 141.0(b)2Pii Multifamily: §§160.6(b), 180.2(b)4Bviib	**Voltage Drop** (A) Nonresidential: §§130.5(c), 141.0(b)2Piii Multifamily: §§160.6(c), 180.2(b)4Bviic	**Circuit Controls** Nonresidential: §§130.5(d), 141.0(b)2Piv Multifamily: §§160.6(d), 180.2(b)4Bviid	**Demand-responsive Controls** Nonresidential: §§130.5(e), 110.12(e) Multifamily: §§160.6(e), 110.12(e)
Replacing all electrical power distribution system features in an existing building	**YES**	**YES**	**YES**	**YES**	No
Replacing all electrical power distribution system features PLUS lighting in an existing building	**YES**	**YES**	**YES**	**YES**	**YES** (B)
Replacing the service meter or service feeder only	**YES**	No	No	No	No
Adding, modifying or replacing existing feeders and branch circuits with or without rewiring	No	No	**YES**	No	No
Rewiring all or parts of the building but NOT replacing feeders and branch circuits	No Requirements				
Adding, modifying or replacing 120-volt circuits	No Requirements				
Adding onto existing building and completely new electrical power distribution system being installed	**YES**	**YES**	**YES**	**YES**	**YES** (B)
Adding onto existing building and using existing service meter but adding feeders, branch circuits and wiring	No	No	**YES**	No	No

(A) *An exception to voltage drop is permitted by the California Electrical Code §§647.4, 695.6 and 695.7.*

(B) *Demand-responsive receptacle controls are required per §130.5(e) and §160.6(e) when the entire electrical power distribution system is replaced AND there is altered or new lighting requiring demand-responsive controls per §110.12(c).*

Table 2. *Electrical Power Distribution Trigger Sheet - Alterations*

Key Terms

Addition is any change to a building that increases floor area and conditioned volume.

Alteration is any change to a building's water-heating system, space-conditioning system, lighting system, electrical power distribution system or envelope that is regulated by the Energy Code and is not an Addition.

Common Use Area is a space outside of the dwelling unit in multifamily buildings that is shared by building owners, residents, and their guests and includes spaces used by building managers and maintenance staff.

Controlled Receptacle is a receptacle that allows plug loads to be turned off automatically when the space is unoccupied, using a timer or occupancy sensor or when a demand response signal is received about pricing, electricity use modification or system jeopardy.

Demand Responses are short-term changes in electricity usage from their normal consumption patterns by end-use customers that occur in response to changes in the price of electricity, participation in programs or services designed to modify electricity use, changes in wholesale market prices or when the system reliability is jeopardized.

Demand Response Period is a period of time during which electricity loads are modified in response to a demand response signal.

Demand Response Signal is a signal sent by the local utility, Independent System Operator (ISO) or designated curtailment service provider or aggregator to a customer, indicating a price or request to modify electricity consumption for a limited time period.

Demand-responsive Control is a control capable of receiving and automatically responding to a demand response signal.

Dwelling Unit is a single unit providing complete, independent living facilities for one or more persons including access, permanent provisions for living, sleeping, eating, cooking and sanitation.

Electrical Metering is a device or system for measuring the electrical power and energy supplied to a customer or premises.

Electrical Power Distribution (EPD) System is a system including service equipment, disconnecting means, overcurrent protection devices, feeders, circuit feeders, luminaires, receptacles and electrical equipment such as switchboards, step-down transformers and panelboards.

Feeders are all circuit conductors between the service equipment, the source of a separately derived system, or other power supply source and the final branch-circuit overcurrent device.

Newly Constructed Building is a building that has never been used or occupied for any purpose.

Receptacle is a place in a wiring system where current can be taken to run electrical devices, commonly known as an electrical socket or outlet into which appliances or electronic devices can be plugged to receive electricity.

Repair is a reconstruction or renewal to maintain any component, system or equipment of an existing building that does not increase the preexisting energy consumption of the repaired component, system or equipment: Replacement of any component, system or equipment for which there are requirements in the Energy Code is considered an Alteration and not a Repair.

Separation of Electrical Circuits allow monitoring of the specific contributions of separate loads to the overall energy use of a building.

Service includes the conductors and equipment for delivering electric energy from the serving utility to the wiring system of the premises served.

Voltage Drop is voltage loss due to resistance in the feeder and branch circuit conductors to the farthest connected load or outlet.

Electrical Power Distribution System Requirements

Electrical power distribution (EPD) systems have five components that may trigger Mandatory Energy Code requirements.

Electrical Service Metering

§§130.5(a), 141.0(b)2Pi, 160.6(a), 180.2(b)4Bviia

Mandatory Requirement

Commonly Applicable Project Scopes

All newly installed or replacement electrical services or feeders must have a permanently installed electrical meter when providing power to a multifamily building's common use areas (interior and exterior), nonresidential building, hotel or motel when the project is classified as:

- New Construction
- Addition installing new or replacement electrical service equipment
- Alteration installing new or replacement electrical service equipment

Non-applicable Projects and Exceptions

A permanently installed metering system is not required for the following:

- A utility company-provided metering system for the service or feeder that indicates instantaneous kW demand and kWh usage
- An EPD system in a healthcare facility (as defined by *California Electrical Code* Article 517) that is subject to the Electrical Code
- Dwelling units in multifamily buildings
- Additions and Alterations that do not install new service equipment or replace existing service equipment

This requirement applies only to the service and does not apply to new or replaced feeders.

Requirements

The electrical service meter must display instantaneous demand in kW and measure kWh usage over time for a user-definable period. Each electrical service or feeder that provides power to a multifamily building's common use areas, nonresidential building, hotel or motel must have a permanently installed metering system that measures electrical energy use in accordance with Table 130.5-A for nonresidential buildings, hotels or motels or Table 160.6-A for multifamily building common use areas.

Utility-provided smart meters usually meet the requirements as long as they can measure instantaneous demand and energy use over a utility-defined period.

Separation of Electrical Circuits

§§130.5(b), 141.0(b)2Pii, 160.6(b), 180.2(b)4Bviib

Mandatory Requirement

Commonly Applicable Project Scopes

A multifamily building's common use areas, nonresidential building, hotel or motel when the project is classified as:

- New Construction
- Addition installing an entirely new or complete replacement EPD system
- Alteration installing an entirely new or complete replacement EPD system

Non-applicable Projects and Exceptions

The following are not required to meet Mandatory requirements for separation of electrical circuits:

- An EPD system in a healthcare facility (as defined by *California Electrical Code* Article 517) and is subject to the Electrical Code
- Submetered EPD systems in multifamily buildings that provide power to dwelling units
- Dwelling units in multifamily buildings
- Additions and Alterations that do not install an entirely new or complete replacement EPD system

For each separate load type, up to 10% of the connected load may be of any type.

Requirements

The separation of electrical circuits requirement allows monitoring the specific contributions of separate loads to the overall energy use of a building. These requirements vary depending on the kVA rating of the electrical service. The Energy Code does not require that monitoring equipment be installed. It requires only that the electrical distribution system allows for the monitoring equipment to be added in the future to support separated loads.

EPD systems in nonresidential buildings, hotels or motels must have load types separated as specified in Table 130.5-B. EPD for multifamily building common use areas require loads to be separated as shown in Table 160.6-B.

Voltage Drop

§§130.5(c), 141.0(b)2Piii, 160.6(c), 180.2(b)4Bviic

Mandatory Requirement

Commonly Applicable Project Scopes

A multifamily building's common use areas, nonresidential building, hotel or motel when the project is classified as:

- New Construction
- Addition
- Alteration of feeders and branch circuits that include any addition, modification, or replacement of both feeders and branch circuits: Requirements apply only to the altered circuits.

Non-applicable Projects and Exceptions

An exception is made for voltage drops that are permitted by §§647.4, 695.6 and 695.7 of the *California Electrical Code* for sensitive electronic devices, fire pump transformers and fire pump power wiring.

Alterations that do not include both the feeder and branch circuit do not need to meet voltage drop requirements.

EPD requirements do not apply to multifamily dwelling units.

Requirements

The maximum combined voltage drop for both installed feeder conductors and branch circuit conductors to the farthest connected load or outlet must not exceed 5%. This is the steady-state voltage drop under normal load conditions.

Circuit Controls for 120-volt Receptacles and Controlled Receptacles

§§130.5(d), 141.0(b)2Piv, 160.6(d), 180.2(b)4Bviid

Mandatory Requirement

Commonly Applicable Project Scopes

A multifamily building's common use areas, nonresidential building, hotel or motel when the project is classified as:

- New Construction
- Addition installing an entirely new or complete replacement EPD system
- Alteration installing an entirely new or complete replacement EPD system

The entire system must meet the requirements for circuit controls for 120-volt receptacles and controlled receptacles.

Non-applicable Projects and Exceptions

In the following situations, circuit controls for 120-volt receptacles or controlled receptacles are not required:

- Refrigerators and water dispensers in kitchen areas
- Clock receptacles ≥ 6 ft above the floor
- Network copiers, fax machines, A/V and data equipment in copy rooms
- Receptacles on circuits rated more than 20 amps
- Receptacles connected to an uninterruptible power supply (UPS) intended to be in continuous use, 24 hours per day and 365 days per year, and marked to differentiate them from other uncontrolled receptacles
- Receptacles in healthcare facilities
- Receptacles in multifamily building common use areas that provide shared provisions for living, eating, cooking or sanitation that are not provided in dwelling units
- Dwelling units in multifamily buildings
- Additions and Alterations that do not install new or complete replacement EPD systems

Requirements

In all multifamily building common use areas, nonresidential buildings, hotels and motels, both controlled and uncontrolled 120-volt receptacles must be installed in office areas, lobbies, conference rooms, kitchen areas in office spaces and copy rooms. Either circuit controls or controlled receptacles can be used for meeting the requirements. Controlled receptacles or circuits must be capable of automatically switching off when the space is not occupied.

These receptacles must meet the requirements in §130.5(d) for nonresidential buildings, hotels and motels and §160.6(d) for multifamily common use areas. Hotel and motel guest rooms also require both controlled and uncontrolled 120-volt receptacles that meet the requirements in §130.5(d)4.

Demand-responsive Controls and Equipment

§§110.12(e), 130.5(e), 160.6(e)

Mandatory Requirement

§§130.5(e) and 160.6(e) point to §110.12 in the Energy Code and add specific requirements for demand response (DR) control functionality.

In demand response control systems, controlled receptacles are capable of automatically turning off all connected loads in response to a demand response signal. For more information about controlled receptacles and the part they play in these systems, see the 2022 Nonresidential and Multifamily Compliance Manual, Appendix D.

Commonly Applicable Project Scopes

A multifamily building's common use areas, nonresidential building, hotel or motel when the project is classified as:

- New Construction
- Addition installing an entirely new or complete replacement EPD system and also a completely new indoor lighting system
- Alteration to a nonresidential, hotel or motel building installing an entirely new or complete replacement EPD system and also a completely new indoor lighting system

The entire system must meet the applicable requirements for demand-responsive controls and equipment, including those for controlled receptacles.

If demand-responsive lighting controls are required in the building or space per §130.1(e) or §160.5(b)4E, and if a completely new EPD system is installed, demand-responsive controls are also required for controlled receptacles. The demand- responsive control must be capable of automatically turning off all loads connected to the receptacle in response to a demand response signal.

Non-applicable Projects and Exceptions

The following are exempt from these requirements:

- Buildings not required to have demand-responsive lighting controls
- Spaces where lighting cannot be reduced because of a health or life safety statute, ordinance or regulation
- Dwelling units in multifamily buildings
- Alterations to multifamily common use areas
- Additions and Alterations that do not install new or complete replacement EPD systems while also replacing the indoor lighting system

Requirements

When an electrical power system is required to have controlled receptacles that meet §130.5(e) or §160.6(e), demand-responsive controls must automatically turn off all connected loads for the duration of the demand response period.

The demand-responsive controls must comply with §§110.12(a) and (e) and must pass acceptance testing as specified in Nonresidential Reference Appendix NA7.6.5.

Forms for Compliance with Electrical Power Distribution Energy Code Requirements

The 2022 forms are available through the Virtual Compliance Assistant (VCA).

Get help filling out LMCC, LMCI, NRCC and NRCI forms and determining if your project complies with the Energy Code using the Virtual Compliance Assistant.

Required Forms for Multifamily Buildings ≤ 3 Habitable Stories Electrical Power Distribution Systems

Building Feature	Certificate of Compliance	Certificate of Installation	Certificate of Acceptance
Electrical Power Distribution (EPD)	LMCC-ELC-01-E	LMCI-ELC-E	N/A
Electrical Service Metering	Table F	Section F	See Below
Separation of Electrical Circuits	Table G	Section F	See Below
Voltage Drop	Table H with attached calculations	Section F	See Below
Circuit Controls	Table I	Section F	See Below
Demand-responsive Controls and Equipment	LMCC-ELC-E	LMCI-ELC-E	NRCA-LTI-##-A

***Table 3**. Required Forms for Multifamily Buildings ≤ 3 Habitable Stories Electrical Power Distribution Systems*

Required Forms for Multifamily Buildings ≥ 4 Habitable Stories, Nonresidential Buildings, Hotels and Motels Electrical Power Distribution Systems

Building Feature	Certificate of Compliance	Certificate of Installation	Certificate of Acceptance
Electrical Power Distribution (EPD)	NRCC-ELC-E	NRCI-ELC-E	N/A
Electrical Service Metering	Table F	Section F	See Below
Separation of Electrical Circuits	Table G	Section F	See Below
Voltage Drop	Table H with attached calculations	Section F	See Below
Circuit Controls	Table I	Section F	See Below
Demand-responsive Controls and Equipment	NRCC-LTI-E	NRCI-LTI-E	NRCA-LTI-##-A

***Table 4.** Required Forms for Multifamily Buildings ≥ 4 Habitable Stories, Nonresidential Buildings, Hotels and Motels Electrical Power Distribution Systems*

For More Information

CALIFORNIA ENERGY COMMISSION

www.energy.ca.gov

Learn more about the California Energy Commission (CEC) and its programs on its website.

2022 Building Energy Efficiency Standards

Explore the main CEC web portal for the 2022 Energy Code, including information, documents and historical information.

2022 Building Energy Efficiency Standards Summary

Download this visual summary of the Energy Code's purpose, current changes and impact.

Energy Code Hotline

Call: 1-800-772-3300 (Free)

Email: Title24@energy.ca.gov

Online Resource Center

Use these online resources developed for building and enforcement communities to learn more about the Energy Code.

2022 Nonresidential and Multifamily Compliance Manual, Ch. 8, 11, Appendix D

EnergyCodeAce™

www.energycodeace.com

Stop by this online "one-stop-shop" for no-cost tools, training and resources designed to help you comply with California's Title 24, Part 6 and Title 20.

Tools

Energy Code Ace Tools

Explore this suite of interactive tools to understand the compliance process, required forms, installation techniques and energy efficiency regulations in California.

Reference Ace

Navigate the Title 24, Part 6 Energy Code using an index, keyword search and hyperlinked text.

Get Forms

Find the LMCC forms you need.

Virtual Compliance Assistant

Get interactive help to fill in NRCC or LMCC Forms.

Q&Ace

Search our online knowledge base or submit your question to Energy Code Ace experts.

Training

Energy Code Ace Training

On-demand, live in-person and online training alternatives are tailored to a variety of industry professionals and address key measures.

Of Special Interest:

- 2022 Title 24, Part 6 Essentials – Residential Standards: What's New
- 2022 Title 24, Part 6 Essentials – Nonresidential Standards: What's New

Resources

Energy Code Ace Resources

Downloadable materials provide practical and concise guidance on how and when to comply with California's building and appliance energy efficiency standards.

Of Special Interest:

Fact Sheets

- Residential Electric Readiness Fact Sheet
- Nonresidential and Multifamily Acceptance Testing Fact Sheet

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SCAN ME

SDGE™ SOUTHERN CALIFORNIA EDISON® Energy for What's Ahead® Pacific Gas and Electric Company®

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