

Nonresidential Electrical Power Distribution (EPD)

What is Electrical Power Distribution?

Electrical power distribution systems encompass electrical systems and equipment not specific to lighting. All measures in this code section are mandatory; per [Section 130.5](#) of the 2013 Building Energy Efficiency Standards (Energy Standards). For additional guidance and example calculations and applications, see [Sections 8.2- 8.6](#) of the 2013 [Nonresidential Compliance Manual](#).

These requirements, which were new in the 2013 Standards, apply to all new construction, additions, and alterations for nonresidential, high rise residential and [hotel/motel](#) buildings.

Mandatory Measures

Electrical Service Metering [Section 130.5 \(a\)](#)

All newly installed electrical services (where electrical power from utility company or on-site generation enters a building) shall have a permanently installed user-accessible meter. The intent of the measure is that the service to every building be metered so that energy can be monitored by the user.

Requirements:

The meter must be able to:

- ✦ Show the instantaneous power in kilowatts being used by the building
- ✦ Reset and measure energy use in kilowatt-hours over a period set by the user
- ✦ Be read by the building owner or occupant

Additional requirements must be met for larger services (see [Table 130.5-A](#) on [NRCC-ELC-01-E](#), page 2)

- ✦ For electrical services > 250 kVA: the meter must also record the historical peak demand in kilowatts.
- ✦ For electrical services > 1000 kVA: the meter must also be able to report the kWh for a fixed rate period.

If utility company's revenue service meter can meet the above requirements, then an additional meter does not need to be provided. In general, smart meters will meet the measure requirements if they allow building owners to access the meter data.

If a new customer-owned meter needs to be installed, it can be less accurate than a typical utility company revenue-grade meter, since it is being used to determine building energy use for management purposes.

If a building is not connected to the grid, a customer-owned meter must be in place to monitor energy use. If a building has multiple services, only the service that provides regular electric power needs to meet the measure requirements, however it is recommended that back up power be metered as well.

Compliance Documentation: Complete project information on page 2 of [NRCC-ELC-01-E](#).

Disaggregation of Electrical Circuits [Section 130.5 \(b\)](#)

EPD systems should be designed for disaggregated measurement of electrical load energy uses downstream from the service meter according to load type and service power (kVA). "Disaggregation" means to break down the total electrical use in the building into groups that allow power and energy use measurements to be taken.

Separate feeders and panels for lighting, plug and equipment loads, HVAC load, etc. will be required. This measure is designed to help building owners and managers get detailed end use data to target specific operational improvements.

The measure is triggered when a new switchboard, panelboard or subpanel are connected, or when new feeders are pulled, typically in a new building, major renovation or addition. In existing buildings, if existing switchboard, feeders, and panelboards remain "as-is," the project does not need to meet the measure requirements. The measure does not require installation of metering devices.

Requirements:

Disaggregation is progressive and not required until the service is greater than 50 kVA (unless it pertains to renewable power sources or electric vehicle charging stations). See [Table 130.5-B](#) of the Standards or page 4 of the [NRCC-ELC-01-E](#) for specific separation requirements. For most small buildings, this requirement will not apply.

- ✦ For services >50 kVA - 250 kVA, the requirements are applied to some load groups regardless of actual load, and to other load groups when the group reaches a threshold value of 25 kVA
- ✦ For services ≥ 250 kVA, lighting and plug loads are required to be disaggregated "by floor, type or area". All HVAC, DHW, elevators, and charging stations loads can be measured in aggregate, by load type

Options for compliance:

- ✦ Separate switchboards, motor control centers, or panelboards to which are connected only the required load or group of loads; or
- ✦ Subpanels of the above to which are connected only the required load or group of loads and for which the subpanel load can be independently measured in aggregate; or
- ✦ Branch circuits, taps or disconnects requiring overcurrent protection devices rated 60 amperes or greater

Exceptions:

If a complete metering and measurement system is installed and meets the disaggregation requirements in [Table 130.5-B](#) of the Energy Standards.

Compliance Documentation: Complete project information on pages 3-4 of [NRCC-ELC-01-E](#).

Voltage Drop [Section 130.5 \(c\)](#)

Following the limits in CA Electrical Code ([Title 24, Part 3](#)), the recommended voltage drop becomes mandatory. Voltage drop is the energy loss as heat in the electrical conductors.

Requirements:

- ✦ The maximum voltage drop is 2% of the design load for feeders. Feeders are conductors carrying current from one switchboard or panelboard to another.
- ✦ The maximum voltage drop is 3% of the design load for branch circuits. Branch circuits are conductors carrying current from a switchboard/panelboard to one or more connected loads.
- ✦ The cumulative voltage loss adds up to 5% loss relative to the load at the end of the branch circuit.
- ✦ Emergency power circuits are exempt.

Voltage drops can be calculated by hand or through an online or computer program calculator with a few inputs including feeder length and branch circuit lengths, wire gauge by type, and circuit amps. Since electrical loads vary, the calculations are based on design load.

For example calculations and additional guidance on performing calculations, see [Section 8.4](#) of the 2013 Nonresidential Compliance Manual. Typical power factors for voltage drop calculations are located in [Table 8-2](#) of the 2013 Nonresidential Compliance Manual or on page 5 of [NRCC-ELC-01-E](#).

Compliance Documentation: Complete project information on page 5 of [NRCC-ELC-01-E](#). Attach a voltage drop worksheet (showing calculations) to the form.

Circuit Controls for 120-Volt Receptacles [Section 130.5 \(d\)](#)

This measure is designed to minimize plug loads in office areas and other similar space types. The measure requires that controlled and uncontrolled 120 volt receptacles be provided in all of the following locations: each private office, open office areas, reception lobby, conference rooms, kitchenette in office spaces, and copy rooms. Practical cost effective approaches to meet this measure are noted in [Section 8.5.1](#) of the 2013 Nonresidential Compliance Manual.

Requirements:

- ✦ For each uncontrolled receptacle, provide a controlled receptacle within 6 feet; or,
- ✦ Use split wired duplex receptacles, with one uncontrolled and one controlled.
- ✦ Controlled receptacles should be permanently marked to differentiate them from uncontrolled receptacles
- ✦ Plug-in strips with motion sensors cannot be used to meet this requirement.

For open offices:

- ✦ Controlled circuits shall be provided and marked to support installation and configuration of workstations
- ✦ As an alternative, controlled circuit receptacles are not required if at the time of final permit, work stations are installed with an occupant sensing control permanently mounted in each workstation, which controls a hardwired, nonresidential-rated power strip.

For hotel/motel guest rooms:

- ✦ At least 1/2 of the 120-volt receptacles in each room must be controlled receptacles, controlled by captive card controls, occupancy sensing controls, or automatic controls such that, no longer than 30 minutes after the guest room has been vacated, power is switched off.

The controlled receptacles must have an automatic shut-OFF control meeting requirements as described in [Section 130.1\(c\)](#), 1 through 5 of the Energy Standards.

The most common means will be a local motion sensor that can be connected to control both general lighting and receptacles and using the occupancy (not vacancy) control method. Another common method will be to employ time of day controls with manual override switches.

Exceptions:

- ✦ Receptacles for refrigerators and water dispensers in kitchenettes.
- ✦ Clock receptacles \geq six feet above the floor
- ✦ Receptacles for network copiers, fax machines, A/V and data equipment in copy rooms.
- ✦ Receptacles on circuits rated more than 20 amperes.

Compliance Documentation: Complete project information on page 5 of [NRCC-ELC-01-E](#).

Demand Responsive Controls & Equipment [Section 130.5 \(e\)](#)

This measure does not require that [Demand Response](#) (DR) controls be installed, just that if they are installed to meet another section of the code (like lighting, sign message centers, or HVAC), then the following control requirements are applicable:

- ✦ DR controls and equipment shall be capable of receiving and automatically responding to at least one standards-based messaging protocol which enables demand response after receiving a demand response signal.

Compliance Documentation: There is no specific DR compliance information required on the NRCC form for this measure.

Energy Management Control System (EMCS) [Section 130.5 \(f\)](#)

This measure allows EMCSs to be used as an alternative to standalone controls. For example, an EMCS can be used to provide mandatory lighting controls or replace a thermostat.

Requirements:

If EMCSs are used for one or more lighting controls, it must comply with the following requirements:

- ✦ Provides same functionality required from standalone controls in the same application. Required functionalities are outlined in [Section 110.9](#) of the Energy Standards.
- ✦ Complies with all applicable acceptance testing and installation certificate requirements described in [Section 130.4](#) of the Energy Standards.

An EMCS can be used in lieu of a thermostat as long as it complies with all applicable requirements for a standalone thermostat.

Compliance Documentation: There is no specific EPD compliance information required on the NRCC form for this measure.

What forms do I need and when do I submit them?

During design, the Certificate of Compliance [NRCC-ELC-01-E](#) (which encompasses all the mandatory measures discussed in this fact sheet) should be completed and signed by the designer, electrical engineer, or installing contractor. The intent of the NRCC form is to show compliance with energy code for EPD. The form should be submitted (in a separate document or on plan sheets, depending on building department preference) to the building department during permit application, along with applicable plans, or equipment cut sheets.

During construction, the NRCI Installation Certificates should be completed by the installing contractor. The intent of these forms is to verify the field installation meets code or better. These forms should be available for the Inspector when they are onsite.

- ✦ [NRCI-ELC-01-E](#) Electrical Power Distribution
- ✦ [NRCI-LTI-02-E](#) EMCS Control System (if used to control 120-Volt receptacles)

The building department may also need more than one set of compliance forms for the plan reviewer and inspector. The NRCC form should also be available onsite for the Building Inspector to use to verify code compliance.

